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**HEALTH INEQUALITIES  
AND EXPOSURE TO COVID-19:  
AN EXPLORATORY ANALYSIS OF  
SOCIABILITY AND  
PREVENTIVE BEHAVIOURS  
IN FIVE ITALIAN PROVINCES.**

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## INTRODUCTION

This paper will deal with social inequalities in health by combining the theme of social determinants of health with the emerging theme of the Covid-19 pandemic. Before delving into the topic, it is necessary to contextualise the health problem that the world has been facing since 2020.

Coronaviruses are responsible for severe enteric and systemic respiratory infections in numerous hosts such as birds, fish, mammals and humans. They are a large family of respiratory viruses that cause diseases in humans that can be mild, such as a cold, or severe such as Middle Eastern Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). MERS and SARS caused worldwide epidemics in 2012 and 2003 respectively (Rezza et al. 2020). In 2019 the new coronavirus Sars-Cov-2 appeared for the first time in the city of Wuhan in the People's Republic of China. It is suspected that the virus reservoir is bat and that a spillover from animal to man occurred (Malik et al. 2020). The outbreaks of this zoonosis led the World Health Organization to declare the "Public Emergency of International Interest" on January 30, 2020 (World Health Organization 2020e). The new virus causes a disorder characterized by high fever, cough, dyspnea, kidney dysfunction and other symptoms of viral pneumonia and has been named coronavirus disease 2019 (Covid-19). Covid-19 is an infectious disease that according to current knowledge seems to be transmitted from man to man via droplets or direct contact. Doubts, meanwhile, remain about mother-child transmissibility (Rothan and Byrareddy 2020). The incubation period is estimated to be between 2 and 14 days (Linton et al. 2020). Not even one month after the declaration of emergency by the World Health Organization, on February 21, 2020, the first cases of secondary transmission of Covid19 in Italy in Codogno in the province of Lodi (Lombardy) and Vo' in the province of Padua (Veneto) were ascertained. The World Health Organization declared the pandemic on March 12, 2020. In Italy, from the beginning of the epidemic to August 31, 2020, 269214 cases of Covid19 have occurred. The patients have a median age of 59 years and 13.6% died from the new coronavirus. Women are more affected than men (53.2% of cases) and 30,725 cases are registered among health workers: the most affected regions were the northern ones, including Lombardy, Trentino and Veneto (Istituto Superiore di Sanità 2020a).

As visible in Pubmed, in less than six months since the first case of pneumonia from unknown cause reported to the World Health Organization on December 31, 2019 (World Health Organization 2020d) more than 1300 articles have been published on different aspects of the new coronavirus including virology, epidemiology, etiology, diagnosis and treatment. Given the importance that the pandemic has assumed worldwide, it is clear that the subject/field is still under continuous evaluation and development.

What has been evident from the outset, however, is that the importance of this global event transcends the mere medical aspects of the problem. This is why the situation we are currently experiencing can be defined as a syndemic (Horton 2020). The term, originally developed by Merrill Singer in relation to the relationship between HIV, substance use and violence (Singer 2009), is now being combined with health inequalities and Covid-19 (Bambra et al. 2020). Syndemic is seen as the encounter of a disease with difficult social conditions or risk factors related to social conditions (Favretto, Mauro, and Tomelleri 2021) and has a multidimensional impact on health conditions, economic activities, and aspects of daily life (Busilacchi 2021).

Indeed, when serious outbreaks of infectious diseases occur, as in the case of Covid-19, the routine of daily life is disrupted due to uncertainty, anxiety and fear and is also affected by restrictions imposed to reduce the spread of contagion. Contagion is not only a medical problem, but a social phenomenon that needs to be understood both through situated meanings and practices that change during outbreaks and by identifying the contexts in which disease outbreaks take place (Lupton and Willis 2021). Confirming this, the history of medicine teaches that the course of epidemics and pandemics is not only linked to biological aspects, but also to environmental, economic, social and cultural dynamics (Tognotti 2015:17). The analysis of the past makes it possible to show that material things, space and places have been central in responses to epidemic situations caused by infectious diseases. Furthermore, analysis of past epidemic or pandemic experiences has allowed documentation of the existence of health inequalities in these contexts (Bengtsson, Dribe, and Eriksson 2018; Biggerstaff et al. 2014; Blumenshine et al. 2008; Charu et al. 2011; Farmer 1996; Lowcock et al. 2012; Lupton and Willis 2021; Quinn and Kumar 2014; Rutter et al. 2012; Sydenstricker 1931). Health inequalities are avoidable, unfair and unequal differences that do not depend on biological variation. They are due to lack of choice in lifestyle and working conditions, unhealthy and stressful living conditions, and inadequate access to health services (Whitehead 1992). Inequalities are conditioned by health determinants. Determinants of health are the non-medical factors that influence health outcomes. They are the conditions under which people are born, grow, live, work, and age, and are shaped by a broader set of systems and forces that influence the conditions of everyday life (Braveman, Egerter, and Williams 2011; CSDH 2008; Nutbeam 1986, 1998; Nutbeam and Muscat 2021; World Health Organization 1998, 2021b, 2021c).

In relation to the Covid-19 pandemic, health inequalities in relation to various aspects have also been noted since the beginning of the health crisis (Bambra et al. 2020; Blair et al. 2021; Chung et al. 2020; Krieger, Waterman, and Chen 2020; Marmot et al. 2020). The pandemic situation requires that the health determinants approach is used to understand and reduce health inequalities (Buse et al. 2020; Paremoer et al. 2021; Prasad, Sri, and Gaitonde 2020; Terraneo 2020). One of the causes of these

inequalities is related to exposure to the Sars-Cov-2 virus. By exposure we mean the risk or possibility of contact with a microbe that is a necessary precondition for the development of an infection and subsequent possible disease (Pirofski and Casadevall 2002). When considering airborne diseases, exposure to the spread of the virus can occur either through direct contact with a virus carrier or possibly indirectly through contaminated objects or surfaces. Avoiding contact with non-cohabitants and limiting the frequency of places where other people are present reduces the possibility of contracting the virus. Different living conditions lead to different exposure to Sars-Cov-2 (Lüdecke and Von Dem Knesebeck 2020), also considering that not everyone can adopt the preventive behaviours that reduce the risk of contact with Sars-Cov-2 because they do not have the conditions to implement them (Prasad et al. 2020). Frequenting certain places or not adopting preventive behaviours exposes more people to the risk of contracting the virus and these elements are often socially determined. Socio-economic position and stratifying factors (education, income, employment, social, class, gender, ethnicity, age), leisure activities and the area in which one lives are some of the elements that increase or decrease exposure to infection (Blumenshine et al. 2008; Callaghan et al. 2021; Lang et al. 2021; Ooi et al. 2021; Quinn and Kumar 2014; Terraneo 2020). Exposure to the virus is a social phenomenon, and needs to be understood through people's practices. When the pandemic began to reduce exposures to the virus, the government decreed the use of lockdown, and it was not until June 2020 that many restrictions were relaxed, allowing people to resume a daily routine similar to that before the pandemic. We will not dwell on the various virus exposure issues that occurred during the first pandemic wave (February-June 2020) in which the virus affected in particular healthcare workers and residents in nursing homes (Chirico et al. 2021; Chirico and Nucera 2020), but we are interested in exploring some differences in exposure during the second pandemic wave (September-December 2020) in which Covid-19 spread more in the general population since the beginning of the pandemic (Chirico et al. 2021). The end of the lockdown that forced isolation, the reopening of activities, fewer constraints on meeting non-cohabitants, and restaurants and bars being open for customers are some of the situations that probably favoured a different exposure to the virus. Meeting non-cohabitants, frequenting places more at risk of contagion during leisure time and not adopting preventive behaviour are some of the elements that play a role in Sars-Cov-2 exposure. As the situation was unprecedented, too little was known about the habits of people in the midst of the pandemic. For this reason, it was decided to conduct an exploratory study on inequalities in exposure to Sars-Cov-2 by focusing on the contexts in which disease outbreaks take place, the places frequented to meet non-cohabitants and the preventive behaviours adopted. The analysis will be developed with a special focus on spatial differences, since the literature shows that

the characteristics of places and space may also have a connection with the conditions that favour contagion (Haining 2003; Ma 2000).

The contemporary process of extensive urbanisation, due to the transformation of metropolitan edges, has increased the vulnerability of suburban and peri-urban areas to infectious diseases (Connolly, Keil, and Ali 2020). In Italy, the areas most affected during the first wave were peri-urban areas (Biglieri, De Vidovich, and Keil 2020). Since people's habits and behaviours are conditioned by social position and structural factors, the aim of this study is to explore the behaviours in terms of sociability with non-cohabitants and adherence to prevention that expose people to the risk of Covid-19. This is why it was decided to carry out a suitable online survey to explore the phenomenon in an era of restricted mobility and the need to remain as isolated as possible through which to try to answer questions that were still unanswered in the autumn of 2020 and that still represent an important question to answer in order to counter the ongoing pandemic.

Understanding where contagion occurs and where people believe they will fall ill, knowing the characteristics of the people who expose themselves most to the virus both in their free time by frequenting places at risk and by not adopting preventive behaviour, and territorial differences are non-medical elements that must, however, be taken into account in order to limit the spread of Covid-19. They were so in 2020 when there was no vaccine and they are still so today because health inequalities at the level of exposure to the virus due to lifestyles could also be avoided by reasonable means (Marmot 2016:27).

Before addressing the questions that guide this paper, Chapter 1 will define what health is, a fundamental concept to be able to then analyse and understand the concepts of health inequalities and social determinants of health. These will be illustrated through a historical excursus that aims to emphasize the models that have best synthesized the results of empirical research on the subject over the decades to allow the reader to orientate himself on the causes of health inequalities that are also at the basis of the inequalities that are emerging due to the Covid-19 pandemic. In order to better understand the relationship between inequalities and the pandemic situation, some key elements that contribute to different levels of disease and, as a consequence, mortality will be illustrated (Terraneo 2020). Socio-economic position, stratifying factors and exposure to the virus are the elements that will be focused on.

In section two, the research design will be explained. The objectives, questions and hypotheses underlying this work will be explained. The construction of the questionnaire, how it was administered, the data analysis procedures used and the ethical issues will be addressed. It will also explain why it was chosen to analyse behaviour in the provinces of Bergamo, Milan, Padua, Treviso

and Trento, which are characterised by different levels of urbanisation (Istituto Nazionale di Statistica 2017).

Chapter three is constructed to describe the results of the research. First of all, the places where the most contagions occur and the respondents' perceptions of the risk of contagion will be described because few studies focus on these aspects (Menichella 2021). The aim is to enable the reader to find his or her way around a new situation that is unprecedented and strongly characterised by the period in which the data were collected (autumn 2020). The characteristics of those who frequent places at risk and those who do not take preventive action will then be analysed to see whether there are elements that can be traced back to the social determinants of health that can lead to inequalities in health due to different exposure. A profile of the respondents based on preventive behaviour will be outlined. At the end of the chapter the results will be discussed by comparing them with what has already been found in the literature and an attempt will be made to provide a unified and explanatory view of what has been found in the sample under examination culminating in the concluding chapter. The health determinants approach will allow us to understand any differences in the data that could lead to health inequalities that can be addressed by public health through health promotion and communication projects with the aim of avoiding unfair and eliminable inequalities.

# 1 HEALTH INEQUALITIES AND COVID-19

## 1.1 Health definitions

Before focusing on health inequalities, it is necessary to discuss the concept of health. Health can appear as an easy concept but when someone tries to define it, (s)he discovers that the definition of health is complex. For instance, it can be referred to a negative concept (i.e. absence of symptoms, not having a disease or a life threat) or as a positive concept (i.e. ability to do, well-being or psycho-physical balance) (Blaxter 1990; Herzlich 1975; Wilson 1970). The absence of illness or of physical or psychological disability, the lack of pain, but also the length of life, the high quality of life, strength and robustness can be used to define health (Larson 1999). In fact, health is often defined not only in negative terms (as the absence of pathologies or life-threatening situations), but also in positive terms, as a state of psycho-physical well-being of the individual. Health has different meanings that are subject to change. Changes can be due to different points of view such as medical, social, economic, or to different cultures, to historical eras or even to different religions (think about illness as God's punishment in many popular cultures). Health can be interpreted time to time as a fundamental human right, a physiological, psychological and social status, a social construction, a cultural representation, an economic value, a metaphor, an aesthetic ideal, a life style (Berlinguer 2011:31–32), and as a common good (Giobbi 1970; Tognetti Bordogna 2017). Furthermore health can be configured as a capability (Leonardi 2018; Marmot 2013, 2016; Tognetti Bordogna 2017) derived from the Capability Approach proposed by Sen (Sen 1993) and as a status or a process (Giarelli and Venneri 2009:159–62).

Health can become a social problem in contemporaneous post-industrial societies and this is because the focus on health has been moved from illness and disease, from medicine and health services to health and health promotion in the societies (Giarelli and Venneri 2009:157). The negative conception of health intended as absence of disease is connected with an historical period where illness and mortality were so relevant to attract the society and health system's attention. Health was a sort of hidden dimension where illness and disease dominated the spotlight. A similar conception is still present in the medical model where health is the absence of disease or disability (Larson 1999). Since the Twentieth century the decrease of birth rate and overall mortality, the ageing of population, the reduction of childhood mortality and mortality for infectious diseases in combination with the spreading of chronic and degenerative diseases led to a new conception of health. Health becomes a problem due not only to no communicable disease but also to new trends such as to be healthy, to be in shape, to be active and happy (Giarelli and Venneri 2009:158). The new definition of health was

given in the Preamble to the Constitution of World Health Organization (WHO) as adopted by the International Health Conference, held in New York from 19 June to 22 July 1946, signed on 22 July 1946 by the representatives of 61 States and entered into force on 7 April 1948. "*Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*" (WHO 2014:1). This concept has not been amended since 1948. It is a model of reference of values to orient health services. There are three elements that are important. "State" is correlated with an ideal condition to reach. "Complete well-being" extends the concept of health. The definition is multidisciplinary. Humans are not only a body-machine, since mind and social relations are considered as well (Giarelli and Venneri 2009:159). WHO's description is an integrated definition of health that takes into account biological, psychological and social aspects (De Piccoli 2014:23). Even though it is a broad and ambitious definition, it was criticised over the past 60 years for many reasons (Berlinguer 2011; Anthony C Gatrell and Elliott 2015; Giarelli and Venneri 2009; Huber et al. 2011; Mittelmark et al. 2017; Tognetti Bordogna 2017). For instance, the fact that health is described as a complete well-being has the effect of leaving most of individuals unhealthy in many cases. This unintentionally contributes to the medicalisation of society. Furthermore, reference to a "complete state" leads to difficulties in the operationalisation of the concept. Complete is neither operational nor measurable. Since 1948 the nature of disease and the demography of population have changed. Ageing with chronic illnesses has become common. If we use the WHO definition in this new context those who have disabilities or chronic disease are definitively ill. On the contrary people with similar problems can be able to work or to participate in social activities. They can feel healthy despite limitation thanks to adaptation to illness (Huber et al. 2011).

There are other possible definitions of health. According to the wellness model Larson describes health as a health promotion and progress toward higher functioning, energy, comfort and integration of mind, body and spirit. He also states that health can be interpreted by environmental models as an adaption to physical and social surroundings, a sort of balance free from undue pain, discomfort or disability (Larson 1999).

According to Sarti, from a sociological point of view, health is the necessary condition for social, economic, socio-cultural and political systems to develop and reproduce. Health is the bio-psychic efficiency that not only enables people to maintain the physical and psychological conditions necessary to adapt to the demands of political, cultural and economic systems, but also to form individual identities "*through socially stabilised and integrated roles such that social action is collectively ordered and predictable*" (Sarti 2018:665).

The Sociologist Achille Ardigò, instead, described health as a process resulting by the interaction of four conceptual spots that he describes in a matrix called "Quadrilateral" (Ardigò 1997:97). The

spots are physical environment, social system, ego-social self, bio-psyche base. They are all connected one with the others. The focus in fact is on mutual connections between the four corners that are components of the scheme that summarizes Andrigò's model. Concepts illustrated in this model are necessary to understand social phenomenon regarding individual or collective health and disease and their causes (Giarelli and Venneri 2009:159–62).

Aaron Antonovsky created a new orientation about health called Salutogenesis that focuses attention on the study of origins of health and assets for health instead of disease and risk factors (Mittelmark et al. 2017:7). He has exceeded the classical dichotomy health/sickness related to the pathogenic paradigm and has described the "health ease-dis/ease continuum" or "breakdown continuum" (Antonovsky 1979:57). In everyday life individuals are not all well and occasionally they fall ill. The point is that persons are on a continuum with different degrees of health. Everyone is in part healthy and in part sick all along his/her life (Mittelmark et al. 2017:30). In Antonovsky's health conception is included subjective judgment. He has pointed to the operationalization of the health-dis/ease continuum using the following mapping sentence:

*“Breakdown is any state or condition of the human organism that is felt by the individual to be not at all/mildly/moderately/severely painful that is felt by him/her to be not at all/mildly/moderately/severely limiting for the performance of life activities self-defined as appropriate that would be defined by the professional health authorities as a not acute or chronic/mild, acute, and self-limiting/mild, chronic, and stable/serious, chronic, and stable/serious, chronic, and degenerative/serious, acute, and life-threatening condition and that would be seen by such authorities as requiring no particular health-related action/efforts at reduction of known risk factors/observation, supervision, or investigation by the health care system/active therapeutic intervention” (Antonovsky 1987:65).*

According to this model, an individual that does not feel pain, does not have functional limitation by his/her judgment, does not have medically defined conditions and does not need treatment, has the maximum degree of health. It means that health is more than absence of disease or infirmity. It is based on absence of certain characteristics. To conclude, Antonovsky's concept of health is best understood as a continuum, so Salutogenesis is concentrated on the movement towards the ease pole of the ease-dis/ease continuum. No matter how far into the positive the continuum might lengthen. The focus is on interaction between factors promoting health and stressors in human life and how

individuals may move along the continuum. Antonovsky used the Sense of Coherence (SOC) as significant variable in effecting this movement (Mittelmark et al. 2017:37–39). SOC is

*"a global orientation that express the extent to which one has a pervasive, enduring though dynamic feeling of confidence that the stimuli deriving from one's internal and external environments in the course of living are structured, predictable, and explicable; the resources are available to one to meet the demands posed by these stimuli; and these demands are challenges, worthy of investment and engagement". (Antonovsky 1987:19).*

In the '70 also the sociologist Michel Foucault in relation with the concept of health identified a distinction between medicine of species and medicine of social spaces. The first definition is connected with the strong emphasis in western medicine upon classifying disease, diagnosing and treating patients and finding cures. Instead medicine of social spaces is concerned with preventing diseases and not with curing them (Foucault 1973).

There is therefore no single or universal definition of health. The aim of this review is to highlight a peculiarity of the concept derived from sociological definitions. The focus of this perspective is on the factors influencing health and seems to be increasingly converging towards a positive concept emphasising social and personal resources. A concept that will be recalled in the course of this work, which is intended to fit into the framework of health promotion

*"the process of enabling people to increase their control and improve their health. To achieve a state of complete physical, mental and social well-being, an individual or group must be able to identify and realise aspirations, meet needs, change or cope with the environment. Health is, therefore, seen as a resource for everyday life, not as the goal of life. Health is a positive concept that emphasises social and personal resources as well as physical abilities. Therefore, health promotion is not only the responsibility of the health sector, but goes beyond healthy lifestyles to wellbeing" (WHO 1986).*

If health is such a complex concept, in the perspective of a sociological definition we will now focus on the factors able to impact deeply on health.

## 1.2 Health inequalities

Statistical analysis of health data from all areas of the world indicates that there are differences or variations in health, both between social groups within the same territory and between different geographical areas. These differences are referred to as health inequalities or health inequities. Health inequalities are unnecessary, avoidable, unfair and unequal differences, which do not depend on biological variations, but are due to lack of choice in lifestyle and working conditions, unhealthy and stressful living conditions, inadequate access to health services and the existence of health-related social mobility (Whitehead 1992). These are conditions that are experienced throughout life, as we live, grow, work and grow old, and are shaped by political, social and economic forces. It is therefore not a question of mere differences in health status due to biological characteristics but of inequalities caused by the social context which is capable of shaping people's behaviour and impact people's well-being and behaviour.

The focus on health differences has had alternating periods over time. In the Seventeenth Century the first scholar started to study the relationship between health and social condition. He was an Italian doctor, Bernardo Ramazzini. He started to analyse the connection between health and working conditions (Franco 2000) and he can be considered the precursor of the medical sociology (Maturio 2004). Ramazzini was the first doctor not to see differences in health as caused by biological factors alone, but to realise that there was a link with social conditions. Actually, scholar's interest in this field increased since Nineteenth Century. When the miasma theory was still predominant, the French economist and physician Louis-René Villermé (Villermé 1840) started to studied the effect of socioeconomic status on health and proved the association between poverty and mortality (Julia and Valleron 2011). Also Sir Edward Chadwick, a lawyer and an English social reformer that created a programmer of measure to restore to British cities' healthy conditions, collected data about the lives of the poor and published the first report on "*The Sanitary Conditions of the Labouring Population in Great Britain*" (Chadwick 1842). In the Report he highlighted life expectancy variations caused by class or place of residence. At the same time in England, Engels also focused attention on the poor health conditions affecting workers in particular. In his famous work "The condition of the Working Class in England" Engels dedicates a chapter to "The great towns" where he reflects on health and inhabitants and describe the level of disease, wretchedness, and demoralization reached (Engels 2001). Engel's attention to working conditions led him to describe the effect of tuberculosis, that was called "consumption", malnutrition, industrial accidents, disability, and eye problems due to environmental pollution, poor housing conditions, poor nutrition, and poor working conditions. He focused on problems that required basic social change (Anthony C Gatrell and Elliott 2015).

From this works, health begins to be considered not only as a problem of the individual, but of the whole community. Both the causes and the consequences of health do not allow health to be considered as a problem of the individual (Cotichelli 2013).

In fact, the milestone that brought the issue of inequality to the fore is the report "Social Insurance and Allied Services" published in 1942 by social economist William Beveridge (Beveridge 1942). In order to combat what he calls the five giants (idleness, ignorance, disease, squalor and lack) he goes so far as to propose a public health service to take people from the cradle to the grave. An ambitious project that would influence the evolution of the public health system and the fight against health inequalities in the following years.

The powerful impulse given by the publication of documents supporting health after the Second War World, as a right such as the Universal Declaration of Human Rights (United Nations 1948) and the Preamble to the Constitution of WHO (WHO 2014), led to increase research about health and equity. In fact article 25 of the Universal Declaration of Human Right state:

*"Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control"* (United Nations 1948). In the Preamble to the Constitution of WHO it is written: *"The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition"* (WHO 2014:1).

As a consequence, in the '70 the global interest in health inequalities grew up and many studies collected data about it (Kitagawa and Hauser 1972; Lalonde 1974). Also the attention for social movements and labour struggles promoted reflections about health, health services, social interventions and assistance policies (Maccacaro and Martinelli 1977). It was found that, despite the growth in life expectancy across the board, inequalities in mortality and morbidity that separate individuals by social class are worsening. Life expectancy tends to contract in a regular pattern moving from the superordinate to the subordinate classes (Cardano and Marinacci 2004).

In Europe, the issue of health inequalities in academic debate and public policy emerged following the publication of the Black Report, which presented the findings of a working group set up in the late 1970s that demonstrated, despite the presence of a public and universal health system, the existence of an unequal distribution of health, illness and death in Great Britain (Black et al. 1992).

Nowadays, even in the developed countries of the old continent there are detectable differences in health between countries, but also within each country, both in terms of the social groups involved and the different geographical areas considered. The most disadvantaged people are more likely to die young and less likely to survive than the most advantaged social groups (Whitehead 1992). The social link between social position and health is defined by Marmot as the social gradient of health (Marmot 2004, 2016). According to Costa, social inequalities in health can in fact be described precisely as a gradient of variable form:

*“The gradient means that whenever health is measured on a scale of social position that has an ordinal meaning, the level of health of each social position is systematically worse than that of the immediately superordinate social position and better than that of the subordinate one” (Costa 2009:253).*

In sociology, unequal health differences are underlined by the paradigm of differences as opposed to the paradigm of inequalities (Lucchini and Sarti 2009). According to the former, which adopts a biological and social Darwinist perspective, the top of social stratification is reached by those who are genetically more gifted and healthiest (Kitcher 2004; Sommers and Rosenberg 2003), while the latter, highlights that social characteristics are able to directly influence the distribution of health status in the population (Link and Phelan 1995; Phelan, Link, and Tehranifar 2010).

According to Cardano e Sarti the definition of social inequalities in health refers to systematic and objective inequalities inherent in the possession of economic, cultural and social resources inherent in the ability to use the same resources in order to achieve full psycho-physical efficiency of the body (Cardano and Marinacci 2004; Sarti 2006, 2018).

In order to distinguish inequalities it is necessary to operationally distinguish four elements (Sarti 2006; Sarti et al. 2011). The first is the socio-environmental context. It constitutes a set of properties with an ecological dimension shared by people in the same group. These properties are contextual variables that affect all members of the group regardless of individual characteristics. Examples of elements that can vary from context to context and that make a difference between groups regardless of individual characteristics are pollution or local health care. The second element is the social conditions that the authors identify with Bourdieu's economic, cultural and social capital. They are therefore material and symbolic resources that can be used when interacting with others. The third element relates to individual conditions, each person's own genetic heritage that conditions the natural qualities available to the individual. The fourth and final element is represented by health itself, the states of health that individuals can assume. They can be negative, e.g. in the case of pathologies, or

positive, e.g. one's self-perception of one's own well-being, or as variables linked to the quality of life. In addition to these elements, there are also risk factors, which are intermediary variables between health, individual characteristics, social conditions, socio-environmental context and health. Social inequalities in health are defined as differences in health due to social conditions for the same socio-environmental context and individual characteristics.

### 1.2.1 Explanations of health inequalities

There are several explanatory models of health inequalities. Black, in his 1980 report cited above, described the underlying causes of inequalities in four categories: artefact explanations, theories of natural or social selection, materialist explanations and cultural/behavioural explanations.

Besides Black's explanations other theories emerge and they will be described as follows: ecological theories, psycho-social theories and life course theories (Bartley 2004; Giarelli 2009; Sarti 2018). We will now analyse in detail all the categories of explanation.

#### 1.2.1.1 Artefact explanation

The first explanation denies the existence of social inequalities in health since they are the result of the measurement process used. There is only an apparent association between social position and health with little casual significance. The artefact explanation can be interpreted according to Macintyre not as a total exclusion of the relationship between social class and health, but because of the presence of some measurement problems related to the fact that

*“Particular occupations may be reclassified into different social classes at different censuses, social classes may vary in size over time with secular changes in the labour market, and certain social or age groups may be excluded from the social class classification or the calculation of mortality rates, thus creating problems for the valid comparisons of occupational class death rates over time” (Macintyre 1997).*

According to Giarelli, artefact explanation has been refuted by the empirical evidence gathered over the years from studies and research (Giarelli 2009).

#### 1.2.1.2 Social selection explanation

The social selection theory considers health as the origin of social position. It is not social position that influences health status, but vice versa. Elements such as physical strength, vigour, agility or

poor health are the basis of selection and directly or indirectly influence, through illness and disability, an individual's social position and health status. Diseases and disabilities influence social mobility by preventing individuals with pathological conditions from improving their status or by worsening their initial status. This type of explanation was used by Black to explain the preponderance of individuals with severe mental disorders in the lowest social class. It also clarifies why there is a concentration of people with a higher risk of morbidity and mortality among the lower socio-economic status groups (Smith, Bartley, and Blane 1990). Some criticism of this explanation has been made by several scholars. If the differences are biologically determined, they are not inequalities and do not merit collective intervention or social concern (Macintyre 1997). In addition, several studies have found that social position has little effect on the mortality gradient and therefore this social Darwinist explanation is not very reliable (Blane, Smith, and Bartley 2008; Cardano, Costa, and Demaria 2004; Giarelli 2009; Smith et al. 1990).

#### *1.2.1.3 Materialist explanation*

Materialist or structural explanations emphasise the role of economic and socio-structural factors associated with health and well-being. Underlying this approach, which focuses on poverty and economic deprivation, are Marxist theories. Health inequalities are due to social stratification and deprivation that cause worse health, disability and mortality among the most disadvantaged social positions. On the one hand, these theories consider socio-economic status (SES) as a mechanism of inequalities because it provides knowledge, money, power and prestige which are resources that can be used to avoid the risks of illness and death (Link and Phelan 2010).

Those who occupy more advantageous positions in terms of health have a favourable position because they possess these resources. Furthermore, health resources also include social networks which are distributed according to a social gradient. Also, in the case of new risks those in an advantaged position will be able to use new knowledge, tools and technologies to deal with them because of their privileged position. Material conditions are thus seen as the 'root cause' of health inequalities, but this explains why resources are distributed inequitably. On the other hand, these theories focus on the distributional dimension of resources that is more class-related in terms of relationships, power and distribution of labour. Inequalities are thus linked to the inability to control living conditions, economic level, social exclusion that determine health. The social division of labour and the social stratification it produces are the cause of health inequalities as well as social inequalities (Cotichelli 2013; Giarelli 2009).

#### *1.2.1.4 Cultural/behavioural explanations*

Cultural-behavioural theories explain health inequalities from the lifestyles adopted by people in their own life context, which play a role in the onset of disease and death. In the Black report they are described as explanations that focus on the individual as the unit of analysis and emphasise unhealthy behaviours. Unknowingly, people harm themselves by engaging in unhealthy behaviours or by not using preventive health care, vaccination, prenatal surveillance or contraception. For some, the underlying reasons are lack of education or stupidity or poverty, or other individual characteristics. If one assumes that individuals possess all the information necessary to make choices and that they act according to their preferences in order to maximise their utility (Fararo and Coleman 1992; Goldthorpe 1998), cultural behavioural theory would clearly explain inequalities, but human action is in fact guided by more complex mechanisms (Green and Shapiro 1996; Sen 1977). Otherwise the choice to adhere to certain behaviour could be interpreted as being due to free will or differences in personal intelligence (Gottfredson 2004). If this were the case, each person would be responsible for his or her own conduct in life, from which the victim would be blamed (Sarti 2018). But Blaxter identifies that habits related to sedentariness, alcohol abuse, smoking, and poor diet are strongly influenced by the culture of the group to which individuals belong. Being those habits more widespread in disadvantaged social groups, people belonging to these groups are more likely to adopt these lifestyles because they are considered normal in their context (Blaxter 1990). Clearly, a limitation of cultural and behavioural theories is the failure to consider the relationship between action and social structure, between individual choice and cultural constraint (Giarelli 2009). It is not possible to make the individual solely responsible for adopting behaviours that are unsuitable for health because there are cultural contexts that influence lifestyles, and in order to modify individual choices it is necessary to modify the contexts. In fact, it is important to downplay personal responsibility, unwillingness, considering behaviour as socially conditioned. We also need to consider that behaviours can be linked to habitus (Bourdieu 2001).

#### *1.2.1.5 Psychosocial explanations*

Psychosocial theories focus on the psychological effects of certain living, working or housing conditions. Stress has an impact on the health conditions of individuals. In particular, within this strand, it is possible to recognise two main lines of development that refer to stress in relation to social roles and hierarchical stress. The first refers in particular to the effort-reward concept, and is inspired by Homans' exchange theory (Homans 1973).

Stress derives from the imbalance between effort made and reward judged to be inadequate. Basically, it has the capacity to affect the efficiency of the neuro-biological system. The link between biological and social processes relates critical experiences of active distress to impaired long-term control of

social status (Siegrist, Siegrist, and Weber 1986). The second refers to the demand-control theory (Karase and Theorell 1990) and traces stress to reduced social recognition and strong subordination which generate an imbalance that produces health outcomes such as depression and addictions. Marmot, using this approach, explains inequalities mainly as the effect of psychosocial stress, caused by the perception of those at the lower levels of the workforce that they have less control over their lives than those at the higher levels (Marmot 2004, 2016).

#### *1.2.1.6 Life course explanations*

Last, since the 1990s, longitudinal cohort studies in the UK and USA have developed the life course theory, which has made it possible to reconnect the various existing theories of health inequalities (Giarelli 2009). The concept of cumulative advantage was originally proposed by Merton (Merton 1968). From Merton's idea, many discussions have emerged in which cumulative advantage is seen as a mechanism that generates health inequality over the life course, although the analysis of cumulative processes influencing health have not been addressed empirically in a systematic way (Sarti and Zella 2016) The basic idea refers to the accumulation of advantages or disadvantages during the life course (Blane, Smith, and Bartley 1993). Childhood and adolescence, as well as fetal life, influence health through a series of effects that accumulate and interact with subsequent circumstances to determine the health levels of individuals throughout their lives. In this sense, social health inequalities represent the sedimentation in the body of social experiences that bind individuals to one another in specific contexts of interaction throughout an individual's biographical life (Cardano 2008). It is the cumulative effects throughout life, inherent individual biography, that lead to health advantages/disadvantages and are therefore the causal factors for health inequalities. In fact, causal chains are created which, originating from biopsychic factors and social position, interact and influence choices and lifestyles, psychological conditions (stress) in the ecological context of people's lives. This type of approach helps to explain why, despite the fact that the average health of the population has improved over the years, there are still inequalities in health and why these represent a lasting sociological problem (Giarelli 2009).

#### *1.2.1.7 Ecological explanations*

Ecological theories explain health inequalities by focusing on area-specific characteristics, assuming that environmental, physical, socio-economic conditions and the socio-cultural and historical characteristics of communities influence the health of those who live there.

Since the Roman Age there were historical periods where much attention was paid to health and living places. The Roman Empire gave attention to drinking water and sewer so many infrastructures were built in the cities such as aqueducts, toilets and baths. Over the centuries, urban and architectural

forms have been designed to reduce epidemic risks and spaces have been created to contain health risks and public hygiene (Barberis 2021:320). In the Middle Age quarantine and lazarettos were created to face the plague and in the following centuries disinfestations of public places and the separation of the cemetery from the city were made (Berlinguer 2011). In the Nineteenth Century the modern urban planning was created in industrial unhealthy and overcrowded cities to react to poor water supply, inadequate sanitation and air pollution (Verbeek 2014).

The connection between health and place of living assumed importance initially among those who were interested in public health issues. Meanwhile also some social theorists started to show how social and economic factors external to the individual are able to shape health and individual well-being. The role of place and institution in modelling health and well-being was introduced by Jean Jacque Rousseau (Vlahov 2002).

William Edward Burghardt Du Bois studied an urban and Northern Negro community in Philadelphia in the light of the growth of the City. In his social study published in 1899 he described inter alia the health of "negroes" and he discussed the health statistic of the city drawing attention to the differences between wards (Du Bois 1967). His study was one of the earliest examples of the link between urban life and health conditions. Émile Durkheim not only studied norms and function of a society characterized by the growth of urban living and industrial condition but he described the suicide rates in relation to the density and intensity of group ties in connection with urban and rural areas (Ardigò 1997; Soares 2005; Vlahov 2002).

Also Ferdinand Tönnies thought that the transition rural-urban and the unpredictability of urban life could have an effect on mental and physical health (Tönnies and Treves 1963; Vlahov et al. 2004) Furthermore it is important to recall George Simmel who wrote in an essay in 1903 that the incapacity to react to new sensations with the appropriate energy and an over stimulations of nerves can be due to blasé mentality of metropolitan life (Featherstone and Frisby 1997). Also Albion Woodbury Small, founder of the first Department of Sociology in the United States, reflected on mental health during periods of change. In collaboration with George E. Vincent in the book "An Introduction to the Study of Society", Small observed the urban pathological dimension and problems arising from the lack of a health standard (Cersosimo 2015; Small and Vincent 1894)

According to a medical point of view in the earlier Twentieth Century the attention to social and environmental causes of illness decreased but it started to grown later till today (Costa 2009). Actually, at the beginning of the last Century some authors studying life conditions focused on cities health conditions in America. For instance, although not interested specifically in health the Chicago School has produced some insights in this field. Health was not a central theme at the early stages of the urban sociology. Chicago School's central theme was social integration (Castells 2002) and the

Chicago scholars aimed to document living conditions in Chicago and to discover general rules of social order (Zukin 2011). Despite this, health dimension is a marginal part of the urban inquiries and it can be grounded in a place-based paradigm (Fitzpatrick and LaGory 2003). Scholars of the Chicago School highlight that social environment, where people live and act, can condition individuals' health. In their studies Robert Park, Ernest Burgess, Roderick Mckenzie and Louis Wirth describe consequences of the formation of the city. Tuberculosis, suicide, mental illness, crime affect individuals' life, organization, desires and existence (Cersosimo 2015). Park states that

*"Poverty, disease, and delinquency have frequently been called social diseases. They may be said to measure the extent to which the community has been able to provide an environment in which the individuals which compose it are able to live, or, to state it from the opposite point of view, they measure the extent to which the individuals who compose the community have been able to adapt themselves to the environment which the community provided"* (Park, Burgess, and McKenzie 1969:118).

Nels Anderson in his study about hobos in Chicago wrote a chapter about health based on Municipal lodging houses, jails, hospital and other institutions data. He was conscious that these information do not represent the whole group of homeless but he stated that it was evident that a large proportion of hobos was physically and mentally "defective" (Anderson 1923:125). He analysed physical disability, insanitary living conditions, working conditions, social and political status and alcoholism (Anderson 1923). We can state that he focused not only on medical issues but also on a sort of social determinants of health. It is interesting that he wrote a paragraph about alcoholism because alcohol is still today an important issue for public health. For instance, in 2007 an action plan "Gaining health: encouraging healthy choice" was approved as a consequence of chronic disease prevention and control strategies promoted by the WHO in 2006<sup>1</sup>. Limit alcohol intake is one of the most important risk factor to tackle not communicable illness. Anderson not only describes Hobo's health problems but he also hopes for Municipal provision and philanthropic efforts to continue to face disease and defects and to improve living conditions (Anderson 1923). Policies matter for urban health. Chicago School adopted a new analytic prospective on mental health thanks to Ruth Shonle Cavan (Cersosimo 2015). In her first book on suicide she studied mental illness in correlation with environment and individual condition. She asserted that suicide rates in Chicago were highest where social support organizations were weak (Cavan 1928).

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<sup>1</sup> <http://www.ccm-network.it/pagina.jsp?id=node/846&lingua=english> (06/06/2019)

Since the '60s in Europe the growing interest in health inequalities and social determinants of health increased also the attention given to the importance of places for health. In the Italian context some medical scholars were interested in health connected with environment and society. They are famous all around the world thanks to their contributions to the development of the field. For example Giulio Alfredo Maccacaro understood that it is important to pay attention to social-environmental aspects to overcome degenerative (Bucci and Traglia 2012). Giovanni Berlinguer worked in social medicine and in occupational health and in the Seventieth, he started to publish books concerning urban health. For instance he analysed cordon sanitaire in working class in suburbs of Rome (Berlinguer and Della Seta 1976:327–33) and urban pathologies related to urban planning, living conditions, working conditions, transportation and leisure-time (Berlinguer 1976).

The social determinants of health definition highlight the importance of places where the people live every day such as neighborhood and community. In fact the same report states that:

*"Communities and neighbourhoods that ensure access to basic goods, that are socially cohesive, that are designed to promote good physical and psychological well-being and that are protective of the natural environment are essential for health equity" (CSDH 2008:4).*

In the '80s and in the '90s also urban planners and architects started to investigate how land use decisions and urban design influence public health. As a result of the growing body of evidence it is possible to state that urban design and associated activity patterns represent a public health issue (Verbeek 2014).

Neighbourhood effects studies on health, that have arisen in the last twenty years, have proposed explanations for geographical variation in health related to individuals' characteristics, socio-economic, physical and social environment, housing, health and social services, communities and socio-cultural and historical characteristics (Pemberton and Humphris 2016). Many studies have highlighted the relation between socio-economic position and health outcomes (for more information see Kawachi and Berkman 2000). However, some scholars have stated that the differences in health between deprived and non-deprived neighbourhoods cannot be attributed solely to the different characteristics of the individuals living in those areas, but also to the characteristics of the context where they live (Pearce et al. 2007). During the last few years, many scholars have emphasized that areas of residence are associated with health above and beyond individual level risk factors (Bernard et al. 2007; Diez-Roux, Link, and Northridge 2000; Jones and Duncan 1995; Kaplan 1996; Macintyre, Maciver, and Sooman 1993; Pickett and Pearl 2001). Overall, in literature, most of the studies focus

on establishing the relative importance of compositional and contextual explanations for geographical variation in health (for more information see Macintyre et al. 2002). Compositional explanations focus on the shared characteristics of individuals living in a place. Contextual explanations refer to the existence of ecological peculiarities - typical of certain territorial areas - that affect the health status of the social actors living there. These peculiarities influence health above and beyond the contribution of aggregate individual characteristics. The main focus of these studies is on opportunity structures in the local, physical and social environment (for instance, healthy environments, socio-economic environment, good housing, the availability of health and social services) (Pemberton and Humphris 2016).

The distinction between composition and context has been criticised by some scholars. Some of the main critics are: it is more apparent than real (Macintyre et al. 2002); it is an oversimplification (Bernard et al. 2007:1840; Mascagni 2010:149) and it is somehow artificial (Kawachi and Berkman 2003:11). This distinction is an artificial dichotomy because, as stated by Macintyre and Ellaway, “people create places, and places create people” (Macintyre and Ellaway 2003:26). According to these scholars, both collective social functioning and material infrastructure may influence health (Macintyre et al. 2002).

Furthermore, Macintyre and his colleagues suggest that it exists also a collective explanation (Macintyre 1997; Macintyre et al. 2002) that gives attention to socio-cultural and historical features of communities. It emphasises the importance of shared norms, traditions, values and interests. Moreover, it adds an anthropological perspective to the most common perspectives often used to examine place effects on health - such as socio-economical, psychological and epidemiological. A practical example can be used to understand collective explanation. A low level of health related to a low level of physical activity in a neighbourhood could be explained in more than one way. The area could be populated by people with personal characteristics that predispose them to be physically inactive (compositional effects). In the place there may be few opportunities for physical activity due to the lack of pedestrian or cycle paths (contextual effect). Another reason could be that norms and tradition do not promote physical activity (collective explanation). The explanations are not mutually exclusive but they can work in tandem (Gatrell and Elliott 2015:163). Macintyre and colleagues do not see collective explanation as being separate from contextual ones. However, they think it is time to give attention to features of collective social functioning and practices. In their conceptualisation of collective social functioning and social practices, they include not only social capital and social cohesion but also other features of non-material culture (i.e. ethnic, regional or national identity, religious affiliation, political ideology, shared histories, kinship system) (Macintyre et al. 2002). Starting from Macintyre and colleagues' perspective, Bernard and colleagues (Bernard et al. 2007)

borrow the concepts of neighbourhoods as opportunity structures. These opportunity structures can promote or damage health: they can be physical features, environments supporting healthy lifestyle, services provided, socio-cultural features and the reputation of the area (Macintyre and Ellaway 2003; Macintyre et al. 2002). Spatial patterned health inequalities are due to an unequal distribution of resources. This means not only a difference in health outcomes as variation in a statistical sense, but also a variety of processes that spread resources among individual and families.

Bernard and colleagues have drawn extensively Giddens's approach in relation with health and places (for an overview see Gatrell and Elliott 2015:49–59), introduce Anthony Giddens' structuration theory (Anthony Giddens 1984b) in their conception of neighbourhood. Bernard and colleagues used the idea of dialectical recursive relationship - between structure and agency - to state that "specific neighbourhood structures have strong influence over residents' behaviour, but on the other hand, it is through their practice that resident reify structure" (Bernard et al. 2007:1842). Individuals are active agents in acquiring resources and neighbourhoods are characterized by spatially defined distribution networks that make resources, that can be positive or negative, accessible for producing health. The resources are not equally relevant for all inhabitants because they can have more importance for place-bound population groups. Anyway, inhabitants can acquire resources that can shape their lives trajectory in neighbourhoods including health and social functioning. The paper did not have the aim of explaining how resources, accessed by individuals through the five domains, are transformed into health and health inequalities. (Bernard et al. 2007).

By analysing the relationship between context and disease, Frohlich, Corin and Potvin (Frohlich, Corin, and Potvin 2001) also reflect on the relationship between agencies, practices and social structures by creating the definition of collective lifestyles. Collective lifestyle here is intended as a collective attribute given that individuals are not alone in creating and recreating the social structure through their practices and it moves the focus from the methodological individualism to the study of health and disease contextualised (Frohlich 2000). Collective lifestyle is derived not only from Giddens' Structuration theory, but also from Pierre Bourdieu's theory of social action and Amartya Sen's capability theory. In particular, taking up the concept of capability of Sen (Nussbaum and Sen 1993; Sen 1995), it is stated that to examine inequalities as a function of the context is not sufficient to examine resources, but also "*what people are able to do with resources in their environment*" (Frohlich et al. 2001:792). These authors suggest to introduce in the structuration theory Sen's thinking to better understand what is context, how it is reproduced and how social inequalities in health are spread in different contexts. Moreover, it is necessary not only to describe features of an area (physical, material and psycho-social) but also to understand people's understanding of their local neighbourhoods, resources and people's actions. To understand contexts and how it is related to

disease outcomes it is important to explore the meaning that people attach to health-related behaviours and to the experience of place (Frohlich et al. 2002).

### 1.3 Social Determinants of Health

Research on theories aimed at clarifying health differences has grown at the same time of the studies of social determinants of health. As seen in the second half of the 21st century, there has been an increase in studies on non-medical factors that influence health and produce health inequalities (Braveman et al. 2011). At the same time, attention has been focused on the concept of social determinants of health (SDH) for which there is no single definition. According to Krieger, SDH refer to the specific characteristics and pathways through which health is conditioned by society and which can potentially be modified by informed action. They are causal factors of health that set limits or exert pressure but are not deterministic in the fatalistic sense of the term that is usually associated with the word determinant in medicine (Giarelli 2009; Krieger 2001). In the United States the Center for Disease Control has defined the social determinants of health as:

*“life-enhancing resources, such as food supply, housing, economic and social relationships, transportation, education, and health care, whose distribution across populations effectively determines length and quality of life”* (Brennan Ramirez, Baker, and Metzler 2008:6).

Globally, the most commonly used definition is that of the World Health Organisation, which has refined the definition over the years, as can be seen from the periodic updating of the term in the health promotion glossary which well illustrates the evolution of the term (Nutbeam 1986, 1998; Nutbeam and Muscat 2021; World Health Organization 1998, 2021b). Determinants are a range of personal, social, economic and environmental factors which determine the health status or healthy life expectancy of individuals and populations. They are multiple and interactive conditions that influence health. According to the WHO’s web site, today SDH are defined as:

*“the non-medical factors that influence health outcomes. They are the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life. These forces and systems include economic policies*

*and systems, development agendas, social norms, social policies and political systems. The SDH have an important influence on health inequities - the unfair and avoidable differences in health status seen within and between countries. In countries at all levels of income, health and illness follow a social gradient: the lower the socioeconomic position, the worse the health” (World Health Organization 2021c).*

Between SDH there are income and social protection, education, unemployment and job insecurity, working life conditions, food insecurity, housing, basic amenities and the environment, early childhood development, social inclusion and non-discrimination.

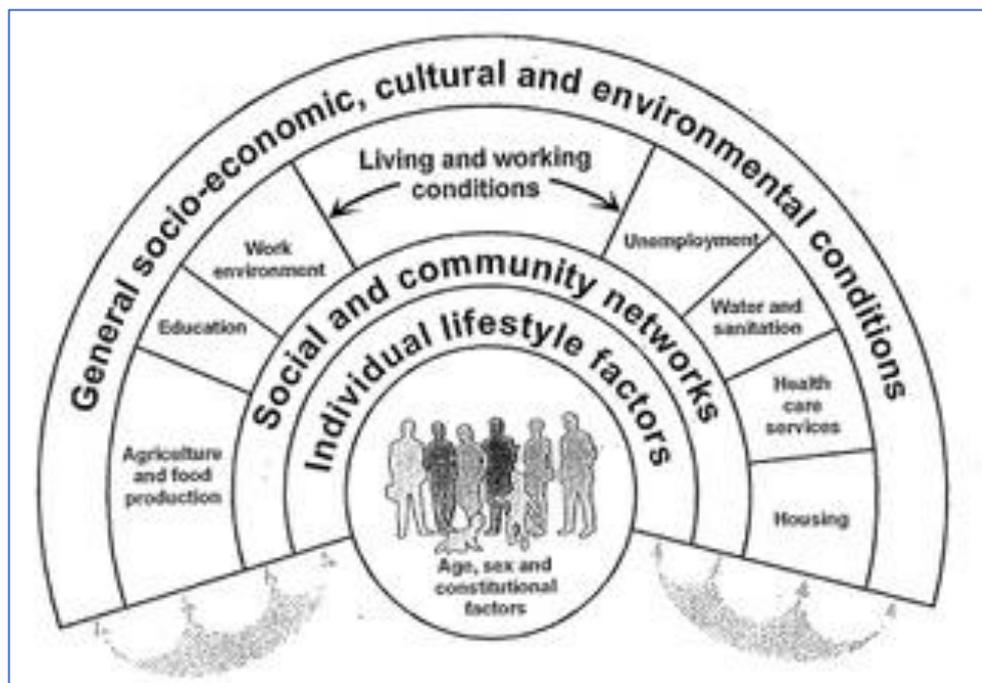
### 1.3.1 Models before 2005

Just as the concept of health determinants has evolved over the years, various conceptual models have been created to explain the social determinants of health graphically or in narrative form. They systematise the key factors, concepts or variables that are studied and the presumed relationships among them. Over the years, many models have been produced to illustrate the relationships between social determinants and health. Thirty-one models have been identified by Shokouhand and colleagues (Hosseini Shokouh et al. 2017). They have been divided according to a historical perspective into three groups: theorised before 1995, between 1995 and 2005 and after 2005. The first group is oriented towards describing the determinants of health and the relationships between them; the second group is focused on classify determinants and their relationship in universal and general models; the last group give more emphasis on reducing health inequalities.

Between models theorised before 1995 there are Williams’ conceptual framework, that focuses mainly on the association between socioeconomic status (SES), socio-psychological factors, medical care and health outcomes (Williams 1990) and Mackenbach’ model. This is a selection and causation model. It explains inequalities of health based on life course approach. There is a sort of chain where childhood environment, cultural factors, biological and psychological factors affect health trough both selection and causation (Mackenbach, Van de Mheen, and Stronks 1994). Both models are very focused on the SES role. In 1991 Margaret Whitehead and Göran Dahlgren proposed a new model of the main influences on health republished in 2007 (Dahlgren and Whitehead 2007b). It is made up of a series of overlapping layers whose shape resembles a rainbow (figure 1). Above all are environmental, cultural and socio-economic conditions. At the next level are the social and material conditions in which people live and work, which are affected by different sectors such as housing, education, health care, agriculture, health services and so on. Then there are the social networks and communities (i.e. the support of families, friends and the community). Even central are individual

factors such as eating, smoking, drinking habits and physical activities. In the middle are fixed factors such as age, genetics and gender over which there is little control. In the model, interactions are emphasised: individual lifestyles are embedded in social norms and networks, and in living and working conditions, which in turn are linked to the broader socio-economic and cultural environment is linked to the working and living conditions, norms and social networks that incorporate individual lifestyles. Determinants of health can be influenced by individual, commercial or political decisions.

Figure 1: The main determinants of health by Dahlgren and Whitehead



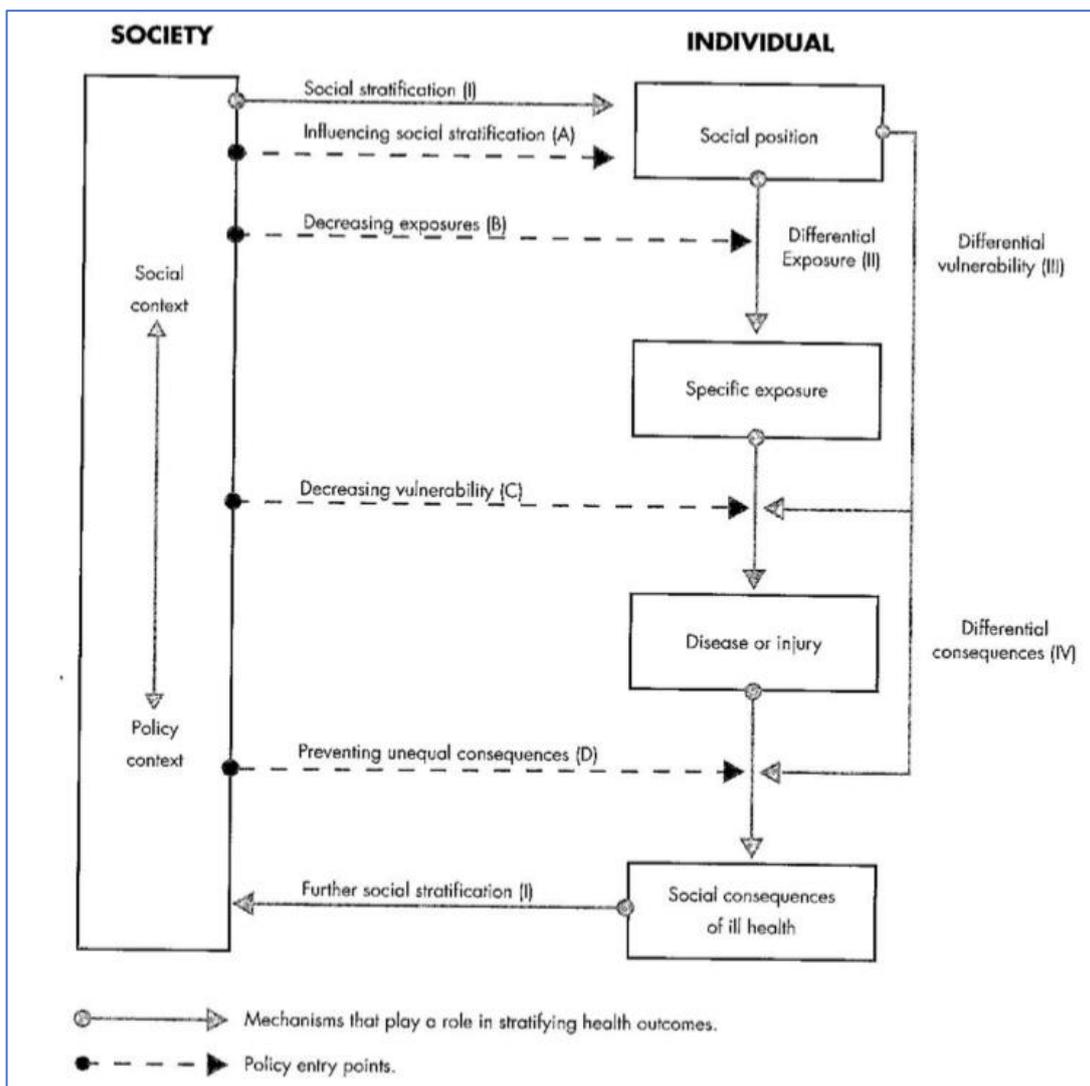
Source: (Dahlgren and Whitehead 2007b)

As Whitehead and Dahlgren themselves later explain, health determinants can also be positive factors, protective factors or risk factors (Dahlgren and Whitehead 2007a). The formers are, for example, economic security, adequate housing and food security. Having control over life outcomes, enjoying good relationships at home and having other emotionally rewarding social relationships are also positive factors (Wilkinson 2005). Protective factors include, for example, vaccinations that eliminate risk or facilitate resistance to disease or having a healthy diet. Social support and a sense of purpose and direction in life or other psychosocial factors are also increasingly recognised as factors that protect health (World Health Organization 2002). Risk factors are those that potentially cause preventable health problems and diseases. They include economic or social risk conditions or environmental elements, such as pollution, or risky lifestyles such as smoking. Whitehead and Dahlgren’s model that will be repeatedly taken up and adapted over the years and is still used as a reference point for scholars of health determinants. It derives from a European concept of the welfare

state where health is considered an individual and community right (Cotichelli 2013). In addition, the model adopts the multi-sectoral vision of health protection contained in the WHO Declaration of Alma Ata (World Health Organization 1978). Not only the health sector, but also other sectors such as agriculture, food, industry, education, construction, public works, communications and other sectors, requires that the efforts of all these sectors should be coordinated (Maciocco 2009).

In 1998, Diderichsen and Hallqvist (Diderichsen and Hallqvist 1998) outlined a model in which they identified four main mechanisms that play a role in generating health inequalities: social stratification, differential exposure, differential susceptibility and differential consequences. It was subsequently adapted by Diderichsen, Evans and Whitehead (Diderichsen, Evans, and Whitehead 2001). The model is oriented not only to classify determinants and their relationships but also to show mechanisms that play a role in stratifying health outcomes and policy interventions.

Figure 2: Framework for elucidating the pathways from the social context to health outcomes and for introducing policy interventions by Diderichsen, Evans, Whitehead

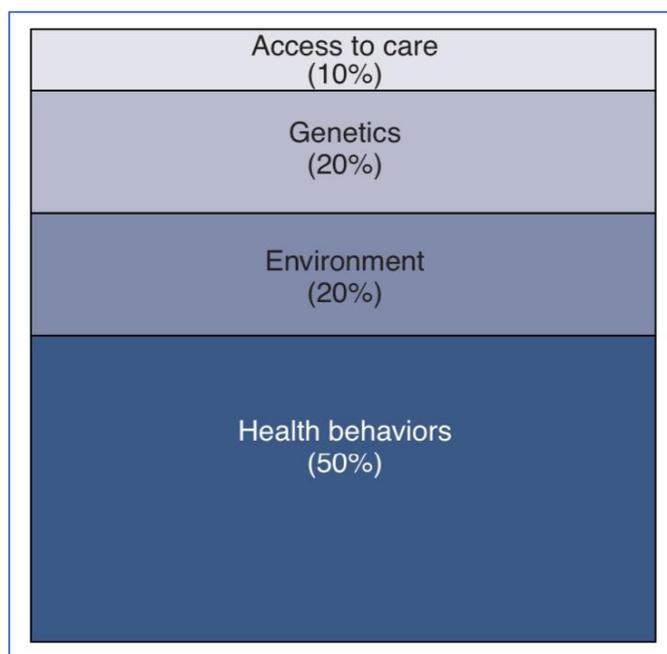


Source: (Diderichsen et al. 2001)

As can be seen in figure 2, the model emphasises how social contexts create social stratification (I) because each individual is assigned a different social position. Depending on the position, one then experiences a different exposure to risk (II) and vulnerability (III), which leads to different consequences in terms of illness and injury depending on the more or less advantageous position held (IV). In addition, the social consequences of illness or injury may further influence social stratification.

While in Europe interest in the causal mechanisms of health inequalities led scholars to develop models on complex health determinants, in America models were more interested in estimating the impact of “broader determinants of health” on population health. As early as the 1970s, some publications had begun to use percentages to weight factors influencing health. (Laframboise 1973) (Lalonde 1974). In 1995, Bunker and colleagues claimed that 57% of health did not depend on medical treatment but on other factors. A few years later Mc Ginnis and colleagues (Ginnis, Williams-Russo, and Knickman 2002) indicated that genetic predisposition is responsible for 30% of premature death, social circumstances for 15%, environmental exposures for 5%, medical treatment for 10% and individual behaviours for 40%. In the same years, The Institute for the Future published a model taken from the Centers for Disease Control and Prevention (figure 3).

*Figure 3: Determinants of Health by Institute for the Future*



Source: (Amara et al. 2003)

In the model were indicated as determinants of health individual behaviours (50% responsible), the environment (20%), genetics (20%) and access to care (10%) (Amara et al. 2003:23). In contrast to European models, the American conceptual framework of health determinants emphasises individual

lifestyles and behaviours. This emphasis is justified by the fact that in the USA individual responsibility for health and disease is greater than the approach commonly used in Europe and is a major factor in influencing people's health status (Giarelli 2009).

### 1.3.2 Models beyond 2005

The year 2005 represents a milestone in the development of the study of social determinants of health. The Director-General of the World Health Organisation focused on the social determinants of health:

*“But interventions aimed at reducing disease and saving lives succeed only when they take the social determinants of health adequately into account. Much is known about these determinants from national and international projects and research, but the knowledge is still too fragmentary. That knowledge needs to be more fully developed and widely shared so that it can be used”* (Lee 2005:1005).

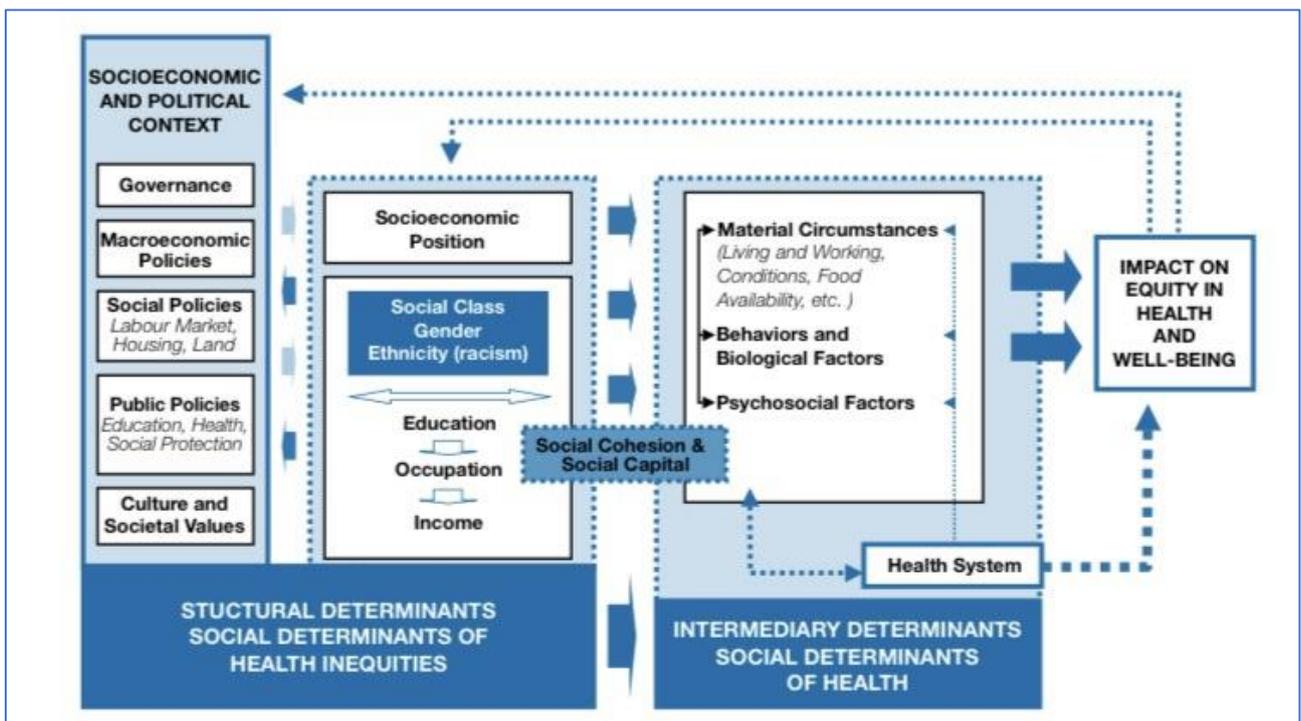
And it was under his leadership that, in the same year, a commission on social determinants of health was created under the aegis of the WHO (CSDH). It was composed of leading figures in politics, research and social action, including the aforementioned Michael Marmot, Giovanni Berlinguer and Amartya Sen. It was set up to systematise existing best practices in order to reorient public health actions and policies to reduce inequalities at all levels. After three years of work, the commission in its final report “Closing the gap in a generation: Health equity through action on the social determinants of health” sets out three principles for action from which it derives three general recommendations for tackling health inequalities (CSDH 2008). It is necessary to:

1. improve the conditions of everyday life within which people are born, grow up, live, work and age;
2. address the unequal distribution of the structural drivers of everyday living conditions (power, money and resources) at global, national and local levels;
3. measure the problem, evaluate action, expand knowledge of the social determinants of health, develop a trained workforce on the issue and raise awareness.

In the course of its work, the CSDH generated a new definition of the social determinants of health and a new model of social determinants of health that describe their relationship and give emphasis on reducing health inequalities (Solar and Irwin 2010). Everyday living conditions and structural determinants are the social determinants of health that are responsible for many of the existing health inequalities. (CSDH 2008:1). In fact, social determinants are "*conditions in which people are born, grow, live, work, and age conditions that together provide the freedom people need to live lives they*

value" (CSDH 2008:26). The new conceptual framework (figure 4) refers not only to factors influencing the health status of individuals and communities but also to those involved in the unequal distribution of health within the population. Many of the insights from Diderichsen's model were taken up into the CSDH framework. Also, following Alma-Ata Declaration, the model gives great importance to intersectoral action on social and environmental health determinants (Solar and Irwin 2006)

Figure 4: Final form of the CSDH conceptual framework



Source: (Solar and Irwin 2010)

The model considers the socio-economics and political context, structural determinants and socioeconomic position and intermediary determinants. Context exerts a powerful influence on how a society distributes resources among its members and consequently on the health opportunities of the population. Among the main elements of context are governance, macroeconomic, social and public policies, and the culture and values of the society. Governance refers to various processes ranging from the definition of needs, patterns of discrimination, civil society participation and accountability/transparency in public administration. Policies include at the economic level fiscal and monetary policies, balance of payments and trade and the underlying labour market structures, and at the social level labour and welfare state policies (social security, health, education, housing). Context also refers to the culture and values of society. To understand how this can affect health, one need only to consider that the social value attributed to health in a given country is reflected in government

priorities, in the amount of resources allocated to the health sector, and in the organisation of health services which can be financed through the community (e.g. through general taxation or social insurance) or individually (e.g. private insurance).

The unequal distribution of resources manifests itself through social stratification in which people are divided into social classes and achieve different positions in the social hierarchy of a society. Socio-economic and political background and socio-economic position are structural determinants of health. They are interlinked with other intermediary determinants (material circumstances, psychosocial, biological and behavioural factors) which are the social determinants of health and which are more directly linked to the onset of disease. And among these, access to the health system and care also plays a role, which can mediate the differential consequences of disease in individual lives. Finally, social capital and social cohesion are placed between the structural and intermediate determinants because they are resources that link the individual and collective spheres and can improve or threaten individual health.

Although the WHO model is the most elaborate and agreed upon by the international community, since its development other countries have continued to develop models on health determinants that are worth mentioning. The first one produced after the commission's work on social determinants of health is the National Institute for Health and Clinical Excellence's (NICE) emerging conceptual framework for public health, created in the UK (Kelly et al. 2009) (figure 5).

Figure 5: NICE conceptual framework



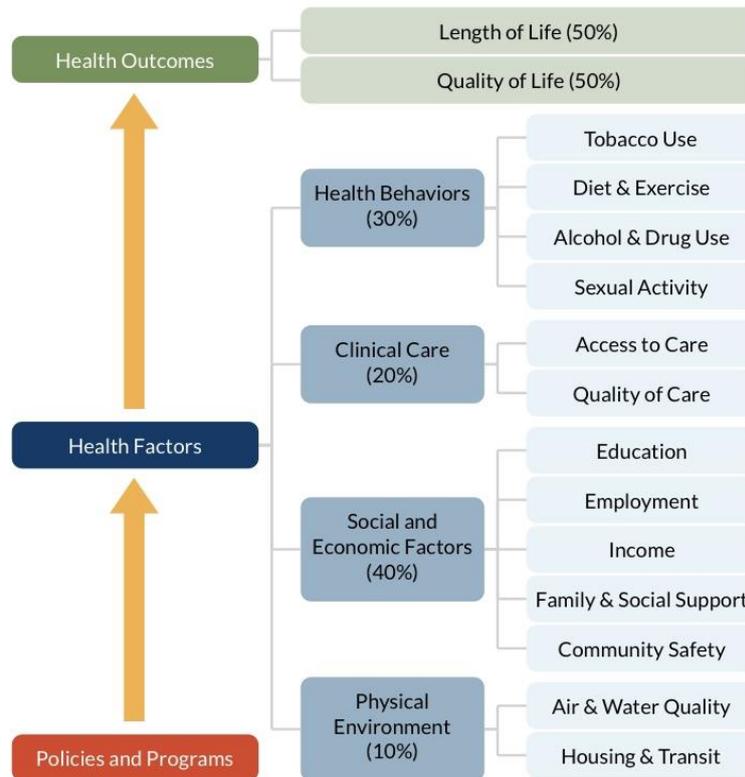
Source: (Kelly et al. 2009)

Underlying the model are the causal mechanisms of disease at the population level, which are analytically separated from the individual ones. Causes of individual diseases involve the interaction between biological, social and related phenomena while explanations of population models involve the same interactions, but also further interacting phenomena. Within the model, the importance of the life course is highlighted more directly than in CSHD. The trajectory through the life course, mediated through the lifeworld, is how structural factors - the vectors - determine health. The lifeworld is where the causal mechanisms of health inequalities operate and where the pathways to disease can be described. Differential experiences of power, exploitation and access to resources manifest themselves in the lifeworld and give rise to discrimination and disadvantage. Similarly, experiences of pain and suffering are located within the lifeworld. Compared to the CSDH model, the model highlights the importance in disease causation of the interaction between agency and structure, as theorised by Giddens (Anthony Giddens 1984b), in the microworlds where people live. This interaction produces societal patterns independent of individual and collective intention or will. As claimed by Kelly and colleagues:

*“Behaviour, although patterned and linked to social structure, is still under some degree of human individual control. Behaviour is not pre-programmed according to social position. In other words, notwithstanding well-defined patterns of behaviour at group level and strong associations between social position and health outcomes for example, this is neither a programming nor a deterministic effect. The social patterns of health and disease are subject to wide degrees of individual and subgroup variation”* (Kelly et al. 2009:17).

In the United States, a few years later, a model of the determinants of health based on the weight of factors was again developed by the Health Institute (University of Wisconsin–Madison), once more highlighting the different approach to public health in the Old and the New Continent (figure 6). The Country Health Rankings model has a practical purpose. Although it refers to the CSDH framework, it deviates from it (Senterfitt et al. 2013). The aim is to create country health rankings (Population Health Institute 2021). These are based on a community health model that emphasises the factors that influence how well and how long people live. More than 30 measures are used, which the creators believe help communities understand how healthy their residents are today (health outcomes) and what will impact their health in the future (health factors).

Figure 6: The Country Health Rankings Model



Source: (Population Health Institute 2021)

Although new models have appeared in the literature that are more or less similar to those produced by the Commission on Health Determinants, such as those just described, or others that attempt to adapt the mechanisms described by the CSDH to the local level (Australian Institute of Health and Welfare 2014), in reality the framework produced by the CSDH still remains the main reference for scholars of health inequalities.

#### 1.4 Covid-19 and health inequalities

After the pandemic caused by Covid-19, it is now possible to extend the discussion on health inequalities also to the impact that the Covid-19 has or will have in the next future on individuals' and collective health. We will not consider here all the effects of the pandemic on health inequalities, since the focus will not be on access to health systems for other problems and illnesses (e.g. dental, cardiovascular, psychological, etc. problems), nor on promotion services for general state of health, but we will pay attention only to the contagion dynamics due to Covid-19.

It is difficult to draw a clear picture of the consequences that Covid-19 are having and will have because the phenomenon is constantly evolving. For example, in Sweden a soft approach without lockdown seemed successful at the beginning of the pandemic, but turned out to be inadequate in the long term, with a high number of deaths. Similar case is about WHO strategies. WHO has changed its strategy on how to deal with the virus several times during last months (Favretto et al. 2021).

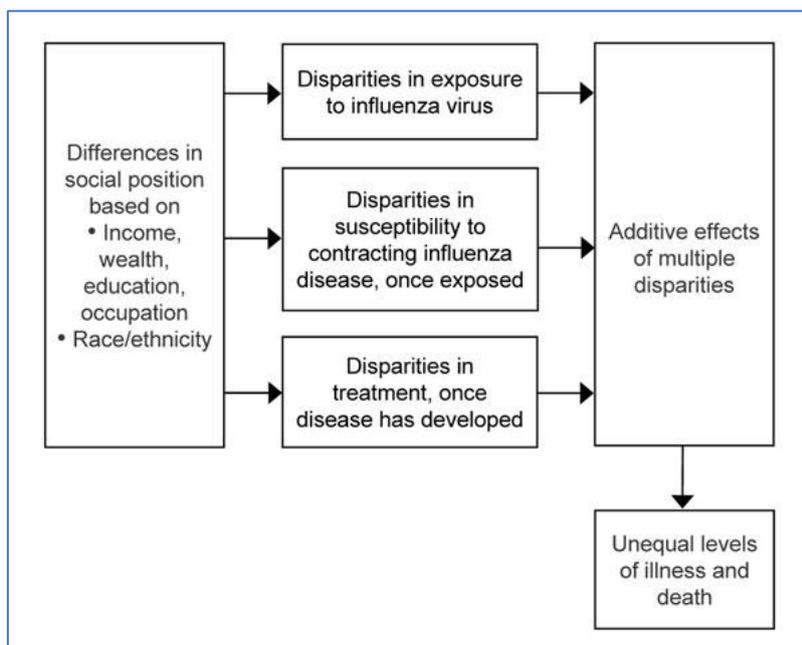
Looking at history, since the Middle Ages there has been a widespread idea that epidemics and pandemics affect rich and poor alike, and yet, as Costa and Marra state, while it is true that the virus looks no one in the face, it is equally true that, when the health profile is unequal, equal control measures for all are not sufficient: those who suffer from chronic diseases have a greater risk of hospitalisation and death due to Covid-19 (Costa and Marra 2021). In 1931, studying data from the 1918 Spanish epidemic Edgar Sydenstricker went on to show that although influenza appeared to affect everyone in the same way, further analysis showed that the lowest economic levels had the highest attack rates (Sydenstricker 1931). Basically, he outlined inequalities by socio-economic class. Several studies have confirmed the presence of social inequalities in relation to the Spanish epidemic not only at the level of socio-economic groups (Bengtsson et al. 2018), but also between urban and rural areas (Chowell et al. 2008), city's neighbourhoods (Mamelund 2006) (Grantz et al. 2016), and high income and low income countries (Murray et al. 2006). Similar evidence was found almost a century later during the 2009 H1N1 virus outbreak (Biggerstaff et al. 2014) (Rutter et al. 2012) (Lowcock et al. 2012) (Charu et al. 2011). Yesterday's and today's pandemics show a surprising continuity when analysing social mechanisms across different eras and cultural contexts (Surrenti 2020). According to Farmer, social inequalities were important in the contours of past disease emergence. He indicates that it is not latitude but socio-economic status that identifies risk groups for tropical infectious diseases (Farmer 1996).

Although infectious diseases have not been a main focus in the evolution of health determinants and inequalities there are several authors in the literature who have pointed out that influenza, tuberculosis, Ebola and other infectious diseases are affected by poverty, ethnicity, social marginalisation, physical environment, and other factors to infectious diseases, including poverty, race, ethnicity, social marginalisation, physical environment, and other factors (Quinn and Kumar 2014).

Before H1N1 epidemic in 2009, Blumenshine and colleagues created a model on social and health disparities in relation to the sources of inequalities in the United States (Blumenshine et al. 2008). This model was designed to plan interventions in the event of natural disasters such as an influenza pandemic and to reduce inequalities (figure 7). The model, which draws on the work of the CSDH, highlights the causes of inequalities in the face of an outbreak due to an airborne disease such as Covid-19. It focuses both on the determinants already considered in the study of inequalities and on

typical aspects of infectious diseases. In particular, it highlights how inequalities relate to exposure, susceptibility to the virus, and disparities in treatment of the disease. These aspects can exacerbate health inequalities.

Figure 7: Possible sources of disparities during a pandemic influenza outbreak



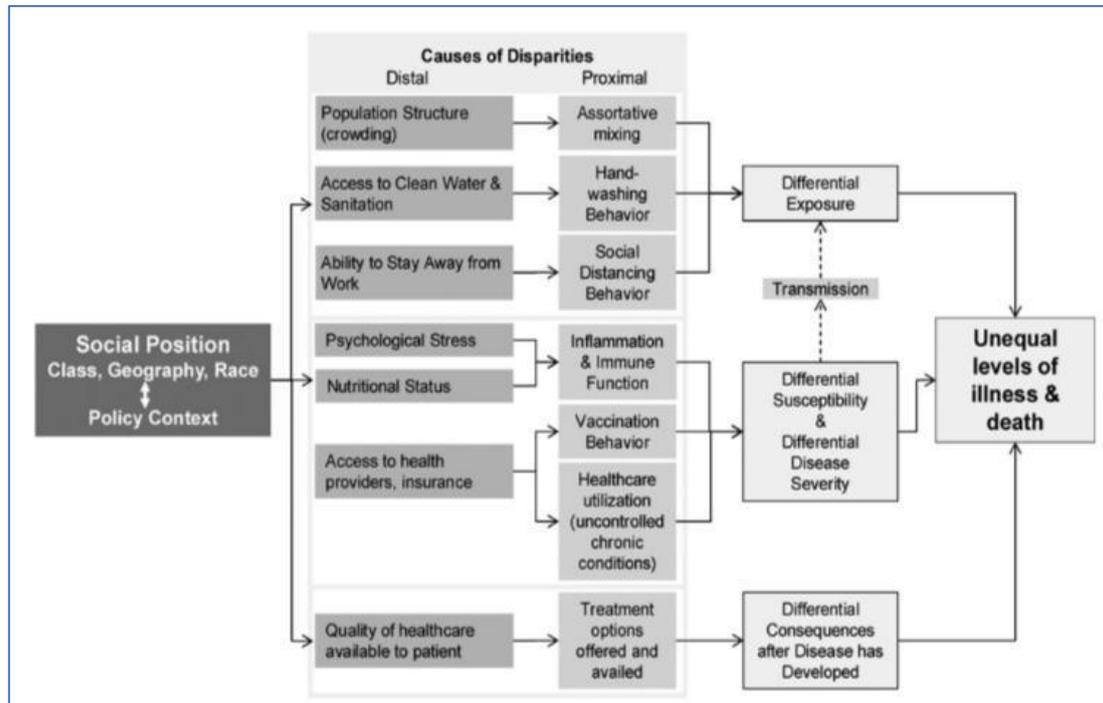
Source: (Blumenshine et al. 2008)

A few years later, this model was revised and supplemented by Sandra Crouse Quinn and Supriya Kumar (Quinn and Kumar 2014) (figure 8). The authors argue that infectious diseases are embedded in a social and political context and therefore social determinants of health and unequal access to resources lead to behavioural disparities among population subgroups. Their model, designed to be applied at the national level in both developed and undeveloped countries, highlights how places and behaviours, such as hand washing, can impact and foster inequalities in disease.

Even today, in the face of a new pandemic, studies are already emerging that confirm the presence of social inequalities in health. Systematising the knowledge that is accumulating on the subject is very complex due to the presence of different approaches and themes. For this reason, we will start to systematise results with a focus on the social determinants of health which, as Bramble and colleagues point out, interact with the syndemic nature of the current pandemic and exacerbate existing health inequalities (Bambra et al. 2020).

There are a number of academics and activists calling for the use of the health determinants approach in relation to Covid-19 to highlight and reduce inequalities (Buse et al. 2020; Paremoer et al. 2021; Prasad et al. 2020; Terraneo 2020).

Figure 8: A mechanistic framework for countries to test the proximal (behavioral and biological) and distal (social and policy) risk factors that could lead to unequal levels of disease and death in an epidemic.

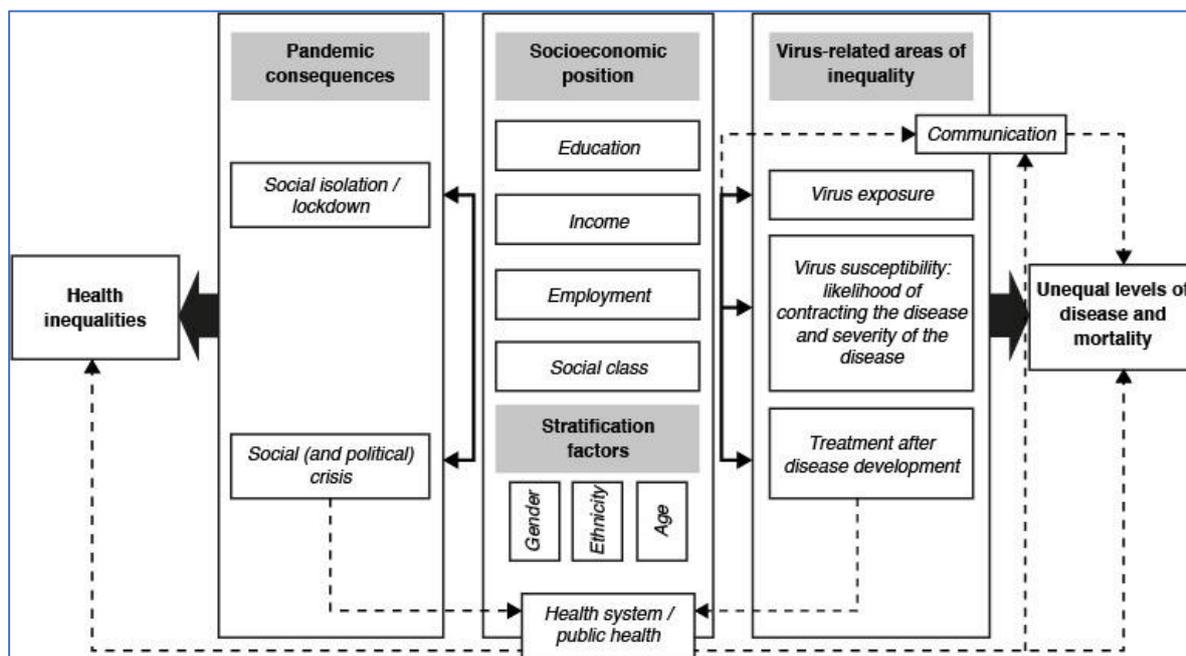


Source: (Quinn and Kumar 2014)

Using a complex, multi-sectoral approach can address the complex issue of the impact of Covid-19 on health and inequalities. The crisis caused by the pandemic cannot be seen as a dichotomy between the medical and social fields. They are two sides of the same coin. People cannot be asked to adhere to public health advice on pandemic control measures if the basic conditions for implementing them are not in place. The social determinants of health play a role in this (Prasad et al. 2020). The pandemic has also made evident that, as already emphasised by the Health in All Policies and HEALTH 2020 of the World Health, health depends on health determinants and health policies (Gugiatti 2020). In a preliminary reflection on the impact that the emergency has had and will have on health inequalities,

Terraneo proposed a framework for interpreting the relationship between possessed resources and inequality based on the perspective of the social determinants of health (Terraneo 2020). The author, inspired by Blumenshine, Quinn and Kumar, focuses in particular on analysing the areas of inequality in the face of the Covid-19 and the consequences of the pandemic (figure 9).

Figure 9: Framework for analysing health inequalities in times of pandemic



Sourced: Translated from (Terraneo 2020)

Compared to previous models, the importance of geography and behaviour is not explicitly included, but the elements that contribute to determine the socio-economic position of individuals are placed at the centre. Education, income, occupation and social class can be amplified or contained by stratification factors (gender, age, ethnicity) that act across the social hierarchy. As the figure shows, on the left are the areas of inequality associated with the virus. This part of the framework is related with levels of disease and mortality. On the right are the health, social and economic consequences of the pandemic that increase health inequalities in a society.

Building on these models, in order to better understand the processes through which inequalities are produced, we will now examine some specific areas of inequality, focusing on socio-economic position and exposure to the virus. Some evidence that has accumulated since the beginning of the pandemic to date with respect to Covid-19 will be introduced as examples. Within the exposition we will include the importance of working place, housing and household, territory, preventive behaviours and risk perception that in the first phase of the epidemic, when vaccination was not available, played a major role in the spread of the virus. To these we will also add the places frequented, the activities carried in leisure time, which have not been taken into account so far, but which, as we shall see, can clearly influence the level of exposure to infection.

#### 1.4.1 Socio-economic position and stratification factors

The position of individuals in the social stratification system can be summarised as their socio-economic position because people reach different positions in the social hierarchy according to their social class, employment status, educational attainment, and income level. Socioeconomic status, in studies of health inequalities, is used more or less interchangeably with social class, social stratum and social or socioeconomic status depending on the theoretical basis of reference (Solar and Irwin 2010). Although in sociology these concepts refer to different aspects of stratification, hierarchy and inequality within a society, they are used interchangeably in health studies because the interest is in using them empirically rather than theoretically (Berkman and Macintyre 1997)(Liberatos, Link, and Kelsey 1988). Solar and Irwin's definition coincides with the elements presented in Terraneo's conceptual framework as both works are based on the same conceptual model of health determinants. The literature suggests that people of higher socio-economic status have a wide range of resources at their disposal for the benefit of their health and therefore have a health advantage. It is not only a question of being able to access greater resources but also of being able to ward off possible threats to one's health. (Willson 2009). Socioeconomic status includes education, income, occupation and social class. Each element reflects the common impacts of a general hierarchical ranking in society but at the same time refers to different pathways and mechanisms through which socio-economic conditions influence health. Education, which is acquired early in life, provides knowledge and non-material resources useful for promoting healthy behaviours and at the same time provides formal qualifications that determine future employment and income and thus contribute to socio-economic status. Income determines the purchasing power of families and individuals by giving them the opportunity to accumulate material resources that can help maintain good health. The main source of income is paid work. Occupation and social class relate people to the social structure, indicate status and power and reflect the material conditions resulting from paid work (Lahelma et al. 2004). Often economists and epidemiologists tend not to consider all the aspects just described and use only income as a proxy for the social position of individuals focusing on changes in income distributions and neglecting the distinction between two different aspects of inequality (attributional and relational). In other cases stratification is treated as one-dimensional, with no distinction between class and status recognised, although sometimes it is precisely status that mediates unequal effects (Goldthorpe 2010). For example, if only income were used, the gradient between socio-economic position and health would be emphasised, but at the same time other elements important for health outcomes would not be considered. Employment is related to power and economic resources, just as education and culture are related to status, prestige and charisma. (Sarti 2018). Instead, the use of multiple indicators to indicate socio-economic position is important to capture the complexity of the pathways and mechanisms through which socioeconomic conditions affect health. The literature on socio-economic status had already amply demonstrated the existence of differences in health

according to social position. Differences in morbidity and mortality between socio-economic groups are evident in different settings around the world. Those in lower socio-economic positions have poorer health.

With the arrival of the pandemic, however, the question arises as to how Covid-19 will change the inequalities that already exist. And many researchers are directing their efforts at defining what and how it is changing. From the beginning of the health emergency, however, it has been clear that the impact of the pandemic fell most heavily on the most vulnerable people along socio-economic occupational, racial and ethnic lines (Johnson, Joyce, and Platt 2021). Lupton e Willis identified the groups that will be most affected by Covid-19. They were already experiencing high levels of socioeconomic disadvantage, marginalisation and low access to health services. In their list they include ethnic and religious minorities such as Indigenous Australians, Roma people in Europe, Black, Asian and minority ethnic groups in the UK, low caste and Muslim people in India, Black Americans and Asian Americans. But the list goes on, even in developed countries such as Sweden and Australia, for people with disabilities and other vulnerable and marginalised groups such as older people, immigrants and prisoners (Lupton and Willis 2021). Socio-economic status determines the ability to have basic elements such as housing, livelihoods, security and access to information, which in turn determine the ability to follow and adhere to public health advice on control measures. Without these elements, even advice to stay at home to avoid Covid-19 infection risks being counterproductive. Think of situations of extreme poverty where not having housing or water available turns into an increased risk of infection. Pre-existing poor health may also increase vulnerability to the virus, making Sars-Cov-2 infection more problematic. Comorbidities such as diabetes and hypertension are often associated with disadvantaged conditions such as poverty and malnutrition (Prasad et al. 2020). We will now see how Covid-19 and social determinants intersect to exacerbate situations that already existed prior to the pandemic and in turn create new disadvantage.

#### *1.4.1.1 Education*

People with a high level of education tend to have better health than those with a low level of education, indicating better physical functioning, high levels of health and low levels of morbidity, mortality and disability. In contrast, a low level of education is associated with high rates of infectious diseases, many chronic non-infectious diseases, a self-perception of poor health, shorter life expectancy and lower survival (Ross and Wu 1995). The differences between having no education, i.e. not knowing how to read and write, or having at least a basic education impact on health can be life-changing. Completing higher education or stopping a year early, on the other hand, has less impact in health. In fact, mortality decreases gradually with years of schooling at low levels. At high

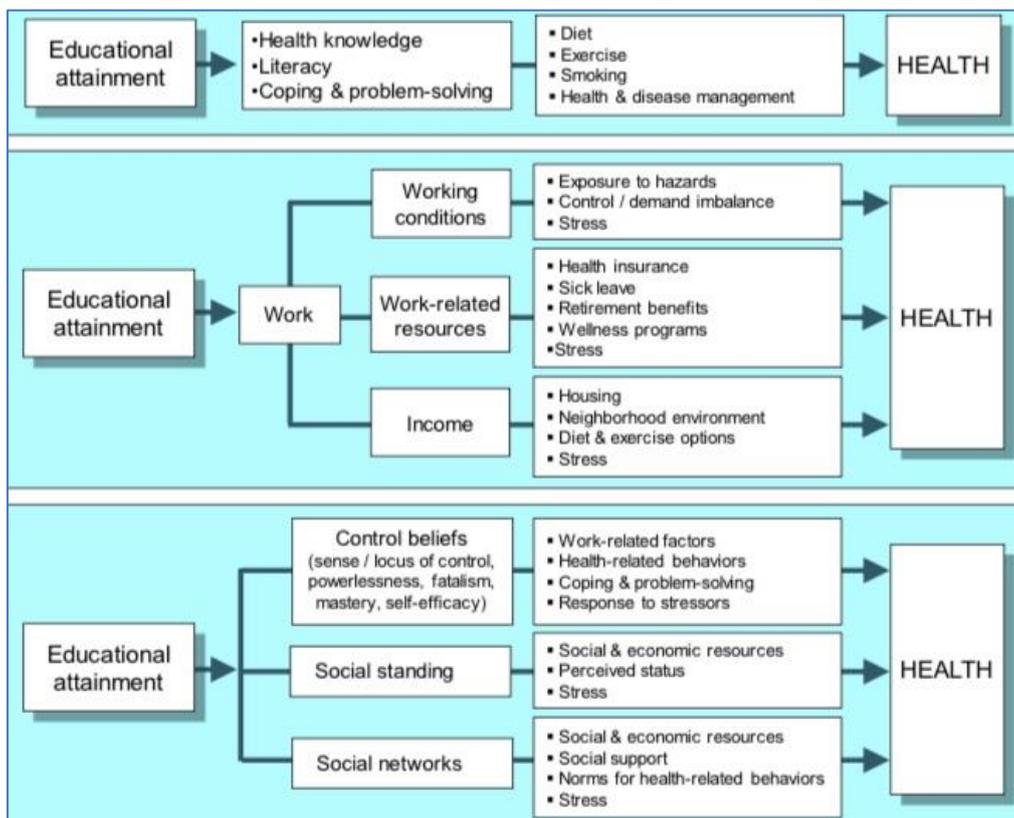
school graduation and general degree level, however, mortality declines but with more discontinuity (Zajacova and Lawrence 2018). It is already well known that education is a cause of health inequality because it influences health behavior as well as structural conditions that impact health, such as living and working conditions (Hoenig and Wenz 2021). People with high educational qualifications are both less likely to experience unemployment and more likely to have a full-time, satisfying job with a high income and, consequently, to have few economic difficulties.

In addition to economic resources, more education is related to the possession of greater socio-psychological resources, social support and personal control. Moreover, good education also manifests itself in the adoption of more appropriate health behaviours (more physical activity, less alcohol use, less smoking and greater access to preventive health care). A high educational attainment can improve health directly or indirectly through work and economic conditions, socio-psychological resources, and health lifestyle (Ross and Wu 1995). On a direct level, it has been found that those who have studied longer have more soft skills and more developed abilities in reading, mathematics and even scientific or health literacy. Literacy, reaction time and problem solving are improved. These are all elements that contribute to determine an individual's health because they can be used to address and understand health priorities, one's own medical care needs, treatment and disease management. Having a good educational background also allows individuals to better navigate health services (Kaplan, Spittel, and David 2015:352-53). It also improves cognitive ability through education and this in turn leads to the adoption of healthier lifestyles. (Cutler and Lleras-Muney 2010). According to Ross and Wu the well-educated people are more likely to make physical exercise, to drink moderately, to receive preventive medical care, and less likely to smoke. In addition, having more education at an indirect level affects a higher probability of having full-time jobs, fulfilling work, high incomes. Simultaneously it decreases low economic hardship and experiences of unemployment. In addition to economic resources, psycho-social resources increase, including a sense of personal control and social support (Ross and Wu 1995). The level of education, defined as the number of years or level of schooling attained by Egerter and colleagues, influences people health through three main interconnected pathways: health knowledge and behaviour, occupation and income, and social and psychological factors (Egerter et al. 2011) as outlined in figure 10.

Although the link between education and health is well established, the relationship between education and Covid-19 is a complex one. Education is playing both a direct and indirect role. Considering direct aspects, there is some divergence in the role played by education in relation to infection, although most studies seem to find a relationship between greater education and a lower chance of contracting Covid-19 or developing a severe form of the disease. In the seroprevalence survey carried out in Italy in June 2020 by Istat and Crocero, it was found that, with the exception

of healthcare workers, an increase in the level of education corresponded to a decrease in the probability of becoming infected (Costa and Marra 2021).

Figure 10: Education and health relationship



Source: (Egerter et al. 2011)

There is an association between higher education and lower risk of Covid-19 severity (Niedzwiedz et al. 2020; Yoshikawa and Asaba 2021). Lack of formal education has also been identified as an important determinant of Covid-19 mortality rates (Goutte, Péran, and Porcher 2020). In fact, disproportionate deaths occurred among individuals with less than a high school level of education (Seligman, Ferranna, and Bloom 2021). The educational qualification also influences the decision to undergo a Covid19 test (Perry et al. 2021).

Although less education appears to be a disadvantage with respect to Covid-19 infection, only part of the inequalities are due to differences in educational qualifications (Costa and Marra 2021). It seems that the education-based inequalities in infection risk are in fact due to what Hoening and Wenz call structural causes such as the inability to practice social distancing at work (Hoening and Wenz 2021). We have seen that education attainment plays a role in determining the work of individuals. Working conditions are linked to working condition, work-related resource and income. And these mechanisms also act indirectly on health in relation to Covid-19. We will address in a moment the analysis of how

employment affects health status due to Covid-19. To summarise, however, we can already anticipate that having economic resources made it possible to live with more serenity the lockdown by allowing people to respect the rule of staying at home. Manual jobs, which require a low level of education, were not only often indicated as essential and continued to be carried out even during the lockdown period, but were often the ones where it was most difficult to work from home or to maintain the distance between people in the workplace. Having a better education therefore made it possible to have privileged occupations during the pandemic. For instance, 45% of high educated people worked from home, compared to 17% with an intermediate level of education and 11% with a low level of education (Hoenig and Wenz 2021). Non-graduates compared to graduates were not only less likely to work from home, they were also more likely to work in sectors that were blocked during the pandemic emergency and had a greater reduction in hours worked. As a result, inequalities between their salaries have also increased (Johnson et al. 2021).

Furthermore, impact of Covid-19 pandemic on education system will most likely also have an impact on education and health in the future. School closures to limit the spread of the disease impacted on more than 80% of students worldwide causing an unprecedented global interruption to education.

Substantial differences have been experienced in the quantity and quality of distance learning (Health 2020). Attending a public or private school, having family support and a home environment conducive to learning are some of the differences observed in educational inequalities. In particular, pupils from poorer areas and families were more likely to miss days of school. (Johnson et al. 2021). Differences such as these can affect health. Schools are related to young's health and wellbeing because they are spaces for social and emotional development, physical exercise, safety. Schools are also a place with a strategic importance for students from poor, violent, or abusive households. Lack of monitoring by schools appears to be implicated in fewer reports of child abuse despite some reports indicating an increase in such situations (Health 2020). Stress, isolation, decreased motivation, lack of digital resources, inadequate home environments, less time spent learning to learn are just some of the problems that the whole education sector has faced in relation to the closures imposed by governments to mitigate the spread of Covid-19 and which will represent future challenges for education itself (Di Pietro et al. 2020) (Schleicher 2020) (Reimers 2021). In fact, Education is not only a determinant of health, it is also a reproducer of inequality between generations through mechanisms such as systematic differences in school resources, quality of instruction, academic opportunities, peer influences, or teacher expectations (Hout 2012; Nash 1990; Walsemann, Gee, and Ro 2013; Zajacova and Lawrence 2018). The negative impact of Covid-19 affects not only basic education, but also higher education is a critical determinant of the economic future (Gaebel and Stoeber 2021; Tarkar 2020). It can already be assumed that the consequences of school closures and distance learning will

play a role in the inequalities we will see in health tomorrow. This will probably affect the mechanisms Egerter mentioned and will be reflected in the health of tomorrow's adults.

#### *1.4.1.2 Income, employment and social class*

According to the World Health Organisation, income and continuity of resources are among the prerequisites for health along with peace, housing, education, food, a stable eco-system, justice and social equity. These are necessary and indispensable conditions for individuals, families and communities to live healthy lives. (WHO 1986). The importance of income for health stems from the fact that it can summarise people's living conditions which can give rise to differences in health.

Income can be seen as a measure of people's social position. It is an indicator that relates to multiple aspects of life such as material resources possessed and opportunities to participate in society, to lead a fulfilling and satisfying life and to control one's own life. And it is in particular the lack of money that negatively influences health. Once a certain threshold of economic well-being is reached, the relationship between income and health is weaker. (Marmot 2002). In his analysis of poverty and health Michael Marmot identifies that poverty is directly linked to consumption and material deprivation, a lack of material resources to use for health such as having a home and good sanitation, nutrition, and access to medical care. Indirect effects of income on health include the erosion of social capital and the level of education that can be attained. Direct effects of income on health include lower mortality, longer life expectancy, and poorer perceptions of health and household wealth. Income is related to a greater mortality (Pickett and Wilkinson 2015) (Bor, Cohen, and Galea 2017). Other relationships between income and health are work and functional limitations, bed days, depressive symptoms and alcoholic behaviour such as average daily consumption of alcohol (Kaplan 1996). Lifestyle and behaviour are in fact influenced through proximal factors in the random chain by material resources (Galobardes et al. 2006). Although short-term influences of income on health can have a negative effect, it is the long-term consequences of income and persistent poverty that are even more important determinants of health (Benzeval and Judge 2001).

However, using income alone to analyse the relationship between social position and health is reductive because it does not allow us to capture the different pathways in the production of heterogeneity in health. Essential heuristic value is also provided by the social position defined through occupational group or unemployment status (Sarti 2018). Position in the occupational hierarchy, grade of employment, has in fact been recognised as a powerful predictor of health (Marmot 2002). Not working has a negative effect on health both in the case of housewives and unemployed people. In the first case, homemaking predicts significantly greater decline in health (Ross and Mirowsky 1995). Unemployment leads to poor living standards, unhealthy behaviour, depression, adverse mental health (Van Der Noordt et al. 2014), poorer general health, somatic

complaints, stress, cardiovascular risk factors, mortality and suicide. Among the unemployed, who experience poverty and financial anxiety, there are more medical consultation, medication consumption and hospital admission (Waddewill and Burton 2006). Generally, those who have a job experience better health. The causes of the positive effects of work are the financial security that comes with it, opportunities to increase one's skills, interaction with others, having meaningful life goals, a purpose and a sense of personal fulfilment. But not all occupations guarantee better health. Having heavy physical work, being exposed to increased stress factors, radiation, vibration, high levels of noise, others harmful substances, polluted air, fatigue increases the risk of occupational or work-related accidents and diseases. So, there may be a negative impact on health. Similarly, non-permanent employment is related with big differences in health risks and salaries (Benach et al. 2004; Costa 2005; Costa et al. 2017; Marmot 2016; Van Der Noordt et al. 2014; Virtanen et al. 2005). These differences in health cannot be attributed solely to income, employment or biological factors, but also to the social class of the individuals (Blaxter 2003). As Sarti points out social class "*is made up of a set of individuals and families occupying a similar position within the power relations underlying the social division of labour and the position assumed in the market, and within the related relational and distributive inequalities*" (Sarti 2018). Among the disadvantaged classes, there are worse health conditions such as a higher incidence of illness and accidents, worse perceived health, but also a higher prevalence of unhealthy practices. Practices, through their lifestyles, prospectively compromise the health of the advantaged classes. Among disadvantaged social classes, smoking, alcohol use and unbalanced diets are more prevalent and affect people's health. (Blaxter 1990; Costa and Cardano, MarioDe Maria 1998; Sarti 2006, 2018; Tomlinson 2003)

Already in the pre-Covid-19 era, it was found that socio-economic disparities related to different incomes shaped social patterns in infectious diseases. In particular, during the H1N1 outbreak, there was different exposure to the virus, different susceptibility to the disease and different access to medical care (Rutter et al. 2012). Even today, in relation to the pandemic we are experiencing, we see similar trends. The Covid-19 pandemic is affecting people from various socio-economic groups, poor and rich, in low-, middle- and high-income countries. But although at first glance the virus seems to pay no attention to social inequalities, a closer look at the data reveals a link between income, employment, social class and health. In the words of Takin and colleagues "*more people in lower socioeconomic quantiles are facing devastating consequences compared to their socioeconomically better off counterparts*" (Takian, Kiani, and Khanjankhani 2020). In general terms, higher income inequalities in a country are associated with more Covid-19 deaths across all age groups due to higher exposure, more comorbidities or poorer access to treatment (Romero Starke et al. 2020) (Sepulveda and Brooker 2021). More transmission and worse health outcomes has observed in poorer populations due to overcrowded housing and work conditions (Ahmed et al. 2020) (Takian et al. 2020). The

income gradient is highlighted not only in Covid-19 mortality but also in hospitalization rates (Avanceña et al. 2021). The urban poor, for example, in addition to facing hunger and starvation, have a high prevalence of co-morbidities and at the same time cannot practice any of the suggested control measures due to lack of housing and water (Prasad et al. 2020). However, mortality, susceptibility and hospitalisation are not the only effects of the pandemic that need to be reported in relation to income. Those with low incomes are more likely to have lost their jobs or to have experienced a drop in economic activity during the lockdown with a consequent reduction in earnings and indirect and direct further prospective on negative health effects (Blundell et al. 2020).

Health and economic risk are different in relation to the segment occupied in the occupational structure (Holst, Fessler, and Niehoff 2021). Health impacts are more severe among workers who are more exposed to social contact due to their occupation (Blundell et al. 2020). We will deal with exposure to the virus in the appropriate section, emphasising that the work performed played a central role in the risk of becoming ill. For the moment, however, we only highlight the ability to work remotely and the case of meat workers, which is emblematic for understanding how the work situation influences the risk from Covid-19. In the context of the pandemic, some jobs were given the privilege of working from home, thus reducing social contacts and the likelihood of contracting Covid-19. This also benefited the health of those who adopted tele-working due to decreased commuting stress, increased time available to engage in daily physical activity, and being able to take better care of their diet due to more home-cooked meals. But, at the same time, “essential” workers have been put back to work due to economic and political demands, putting their health at risk (Kawachi 2020). Essential workers include those working in the food chain. The meat workers, who have always been on the lower rungs of the social ladder, are mostly immigrants and are reluctant to join trade unions or challenge exploitative practices. Since before the pandemic, the situation of housing, communal transport and the physical configuration of the slaughterhouses have made social disagreement almost impossible. This situation was exacerbated by Covid-19. Just think of the fact that they operate in close contact with each other and cannot practice social distancing (Paremoer et al. 2021). These concomitant causes could be called upon to explain why there have been so many Covid-19 outbreaks in this sector worldwide.

Among the labour categories, major difficulties were noted among the self-employed and among precarious workers (Johnson et al. 2021). The Covid-19 containment measures imposed a stop to economic activities, which for many categories meant a greater likelihood of job loss, a reduction or absence of earnings. These workers were not always able to benefit from supportive economic measures such as redundancy benefits (Blundell et al. 2020; Marmot et al. 2020). Precarious workers have not only faced economic problems due to lockdowns or other work restrictions introduced by governments, quarantines imposed for contact with positives or sick leave, but often also experience

a lack of social insurance and less access to health services (Burström and Tao 2020; Paremoer et al. 2021). The crisis triggered by the worldwide outbreak of the virus has highlighted just how important it is to have effective systems in place that allow workers to quickly self-insulate by protecting their health, their jobs and their income (Organisation for Economic Co-operation and Development 2021). The whole situation described above makes it extremely clear that Covid-19 is amplifying pre-existing class inequalities (Holst et al. 2021).

#### *1.4.1.3 Gender*

In sociology, the terms sex and gender are used to distinguish biological identity from gender roles that associate each sex with socially learned expectations and behaviours. (Lombardi 2005:11). Gender interacts with social, economic and biological determinants and has different health outcomes for males and females. In industrialised societies, men die earlier than women even though women have worse health than men. The causes of these differences are generally attributed to biological hazards, acquired risks, reporting bias and different experiences of health care. In reality, however, gender differences are far more complicated when considering morbidity (Macintyre, Hunt, and Sweeting 1996). Differences in health between men and women imply the existence of asymmetrical power relations and traditional cultural patterns operating in the background. They are also an indicator of the impact of inequalities in life experiences.

The social, economic and biological determinants of health are not neutral, but have gender-specific meanings and are linked to different life experiences, different ways of representing and managing everyday life and health (Pilutti et al. 2016). Gender differences were found with respect to mental health, cardiovascular diseases, dementia, respiratory diseases, oncology and in the adoption of healthy behaviours such as smoking, alcohol use, physical activity, diet and body weight (Ricciardi et al. 2016). In addition to gender differences in physical and mental health, differences in social support, health perceptions, health expenditure, use of resources and quality of care have been evident for years (Shumaker and Hill 1991) (Anson et al. 1993) (Owens 2008). Over the decades, evidence has accumulated on gender differences in the vulnerability and impact of specific health conditions. In particular, it has been shown that gender influences how health policies are designed and implemented, how different genders are approached in the health system and how a gender approach needs to be incorporated to achieve better health (Vlassoff and Moreno 2002).

With respect to infectious diseases, there is clear evidence of gender differences, related to the roles men and women play in the family, their status within their community, and cultural factors that may increase or decrease the transmission of infections (Vlassoff 2007). For instance, with regard to vector-borne diseases such as malaria and zika, it has been shown that men, working in higher risk environments such as forestry and mining, are more exposed than women. At the same time, however,

women's responsibility both within their households and in economic production has a profound impact on the incidence of and responses to tropical infectious diseases (Rathgeber and Vlassoff 1993). According to a Canadian study of the Spanish flu pandemic, women's increased risk of falling ill stems from the female duty to care for those who have fallen ill, thus placing them at greater risk of infection by being at the forefront of health care (Godderis and Rossiter, 2013).

The gender perspective also highlights that men and women experience illness, treatment and receive different support from family and care providers. While both men and women who suffer from HIV/AIDS, leprosy, tuberculosis and mental illness are subject to discrimination, women experience a greater impact in terms of marginalisation. In particular, when considering infectious disease due to HIV/AIDS, the effects on women are worse than those experienced by men, especially on an economic level. Whether it is women who fall ill or men, the risk is that the lack of income ends up weighing on women (Vlassoff 2007). Women experience a higher level of responsabilisation than men with respect to the transmission of infectious diseases as was visible during the Zika outbreaks. The focus was not only on the importance of eradicating the vector that transmitted the disease, but also on the expectation that women would have the foresight to avoid infection in order to protect their fetuses (Ribeiro et al., 2018).

The epidemiological situation does not yet allow clear conclusions to be drawn on the influence of gender on the experience of Covid-19 disease because the data are unclear and are influenced by the conditions of access to the test worldwide and the sociological, economic and cultural contexts of the various countries. Also, the relatively short period of observation of cases since the pandemic started does not allow a precise statement on whether Covid-19 carves up men or women more. For example, in Italy at the beginning of the epidemic, men were more affected, but subsequently more infections were reported among women (Luciani and Mannelli 2021). According to the latest updates covid affected male subjects in about 49.4% of male subjects and the remaining 50.6% of female subjects. Among women there is a better immune response, fewer complications and lower mortality, which would seem to be explained by biological and hormonal mechanisms. The long-term consequences of Covid-19, on the other hand, seem to be more common among women between 40 and 50 years of age, while the gender difference decreases with increasing age (Ambrosino et al. 2020; Ministero della Salute 2021).

What is emerging from the literature is that women, by virtue of their work roles, are more exposed to the risk of infection as they represent the majority of those employed in the health and social care sector (Marmot et al. 2020; Paremoer et al. 2021). Among the jobs most frequently performed by female staff that expose women to infection are caretakers, nurses and domestic care providers (McClure et al. 2020). Women are not only more represented in the health sectors, but it also exposes

them to more contagion since they are more present in essential sectors that require physical presence such as food provision and education sectors. (Fullagar and Pavlidis 2021).

The health effects that are under observation are not only related to the direct experience of Covid-19, but also to other health effects. Depression, acute stress and anxiety affect women more than men. The emotional state is also further worsened by phenomena enhanced by the lockdown such as loneliness and violence. The incidence of violent episodes in the family has also increased due to more time spent at home in the company of the abuser and greater difficulty in seeking help (E. Williamson, Lombard, and Brooks-Hay 2020). These situations are worst among women on low incomes and if there are serious economic or job losses in the family because it is employment and financial resources that are protective factors against dependence on violent relationships (Humphreys 2007; Ministero della Salute 2021).

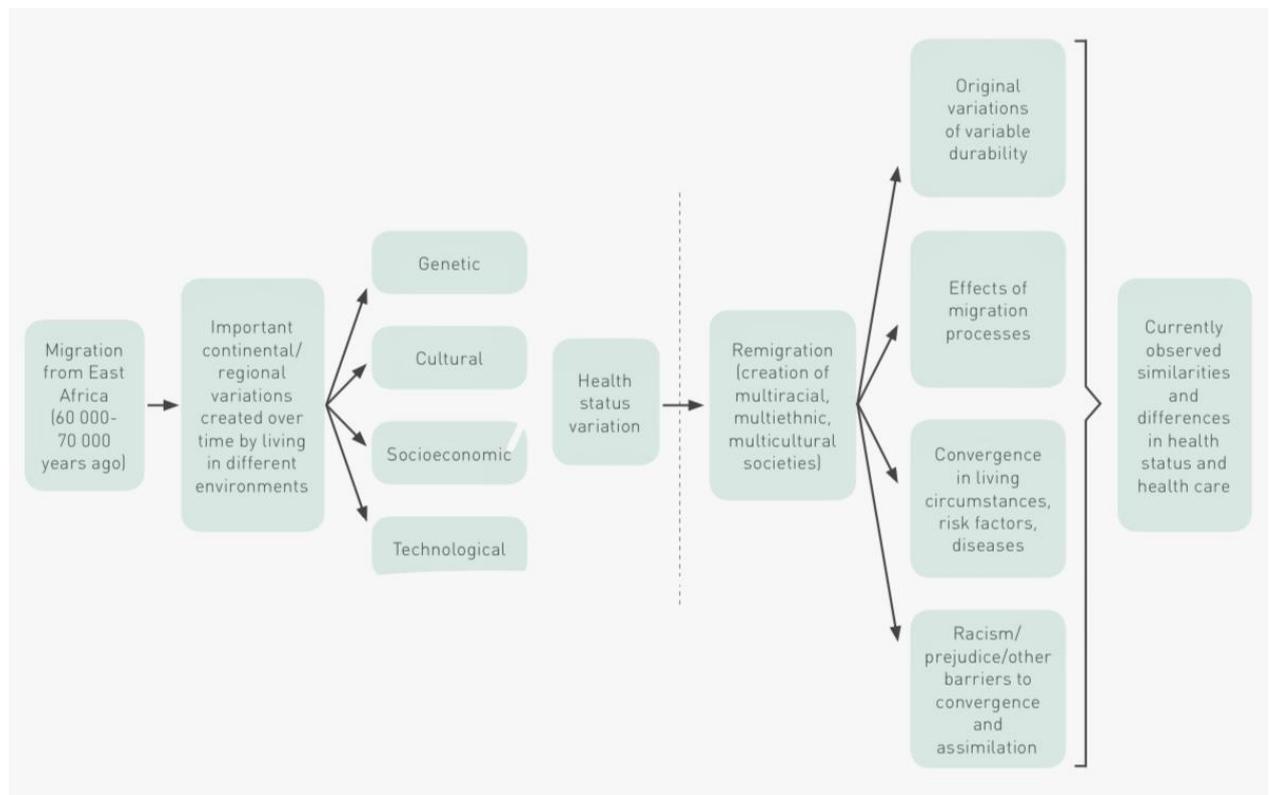
But the gender perspective must also be incorporated in relation to economic and social consequences that have been experienced since the lock-down and which have different consequences according to gender. Many women have lost their casual and precarious jobs, increasing the poverty experienced by women and, consequently, increasing the pressure on housing and food (Fullagar and Pavlidis 2021). Employment opportunities were also severely affected by women's care responsibilities. For example, school closures have forced women to juggle working from home with supervising their children's learning (Lupton and Willis 2021). According to an American study, mothers with young children reduced their working hours four to five times more than fathers due to Covid-19 crisis (Collins et al. 2021). Over time, however, there has been an increase in the amount of time men spend caring for children and this has reduced gender differences, but not eliminated them (Craig 2020) and Covid-19 risks exacerbating these differences again. Managing children or parents is difficult under normal circumstances and the health effects of these burdens are well documented in the literature. Parenting has both positive and negative effects on health. For instance, married mothers experience a greater burden of housework and more marital conflicts, but are less prone to depression than their childless counterparts. On the other hand, no influence on married men's lives due to parenthood is noted (Nomaguchi and Milkie 2003). The risk is that a neoliberal view of motherhood will persist and re-emerge as the dominant model of motherhood in the wake of the pandemic (Güney-Frahm 2020) and that a view of the role of mother as the most important role in a woman's life (Baxter et al. 2015) will be perpetuated due to changes induced by Covid-19.

#### *1.4.1.4 Ethnicity*

The terms migration status, race and ethnicity are widely used in health research and are linked to important differences between groups in health status, health care utilisation and quantity. These differences have been identified as inequitable and in fact represent health inequalities. (Bhopal

2013). Although race and ethnicity are often used synonymously, they actually underlie different concepts. As well described by Bhopal in his book "Migration, ethnicity, race and health in multicultural societies" (2013), the concept of ethnicity is complex and fluid and places emphasis on the socio-cultural characteristics of groups, as opposed to the term race which refers to the physical aspects that differentiate human groups. Ethnicity therefore indicates a group that shares one or more of the following characteristics: sharing a social origin or background; sharing a language or religious tradition; sharing a culture or traditions that are distinctive, maintained across generations and that lead to a sense of identity. Race and ethnicity have assumed particular importance especially in relation to international travel, migration and globalisation and are linked to migration status, nationality and racism. They are central when dealing with health issues (Bhopal 2013). Differences in health status and care generated by migrant status, race or ethnicity are caused by the factors described in figure 11.

Figure 11: Forces that produce variations in health status and health care by migration status, race and ethnicity



Source: (Bhopal 2016)

Ethical or racial groups, often subject to discrimination and exclusion, experience disadvantaged conditions, opportunities and trajectories throughout their lives (Williams et al. 2010). Discriminatory practices linked to racism are found in education, employment, housing, credit markets, health care

and the justice system. Practices in one sector through a series of interconnections tend to reinforce inequalities in other sectors, laws and policies, in turn encouraging discriminatory beliefs, stereotypes and unequal distribution of resources that also result in health disadvantages (Bailey et al. 2017; Egede and Walker 2020; Paradies et al. 2015). In fact, these disadvantages result in lower life expectancy and worse health indicators than the rest of the population (Krieger 2000; Williams 1999). Differences due to ethnicity or race are seen in factors causing health problems, in the problems themselves and in the distribution of diseases (Bhopal 2013). Therefore, ethnicity, along with gender and age, can condition the effects of social position on individuals' health (Terraneo 2020). Evidence gathered since the start of the Covid-19 pandemic indicates that the crisis has had very different impacts on different ethnic groups. On a general level, the crisis has led to members of ethnic or racial groups losing their jobs and they will suffer the economic consequences more than the general population. Moreover, on a more specific level, in the USA more African Americans than whites fall ill and die from Covid-19 because of structural disadvantages such as a higher rate of comorbid illness among these groups than in the general population (Snowden and Graaf 2020). Black-prevalent counties are experiencing higher infection and mortality rates than white-prevalent counties (Yancy 2020). Similar patterns are being seen in the UK where the death rate from Covid-19 is twice as high in black communities as in white ones (Paremoer et al. 2021). Actually, the problem does not only affect groups of African origin. For example, in the US at the beginning of April 2020 it was Latino workers who were affected by Sars-Cov-2 (McClure et al. 2020). In UK several ethnic minority groups have a higher risk of infection (Bhatia 2020; Niedzwiedz et al. 2020). Standardised mortality ratio was two to three times higher for Black, Asian and Minority Ethnic groups (BAME) when compared to the general population (Aldridge et al. 2020). In Norway and Finland, infection has been observed to affect the resident Somali minority to a high degree (Bhatia 2020). In Italy, however, the data seem to indicate a smaller number of foreigners and a shift forward in time of the epidemic curve in the initial phase of the pandemic. These data, however, should not necessarily be read as the absence of disadvantages because they could actually reflect a reduced or delayed access to diagnosis. The hypotheses are that foreigners are less familiar with interfacing with the health services and that, for economic reasons, they tend to undergo fewer diagnoses to avoid isolation and suspension of work. At the same time, in support of the hypothesis of reduced or delayed access to diagnosis, there is a greater risk of hospitalisation observed among foreign cases (Istituto Superiore di Sanità 2021). Increased prevalence of the disease among ethnic groups is in part related to occupational differences. Minority Ethnic groups tend to work in disadvantageous labour market positioning that expose them to a greater risk of contagion (Snowden and Graaf 2020). They are over-represented among essential workers who also worked during the lockdown such as warehouse workers, delivery workers, cleaners (Paremoer et al. 2021). They are more engaged in domestic occupations and social care roles

which are more exposed by definition (Marmot et al. 2020) (U.S. Bureau of Labor Statistics 2020). In England, negative health outcomes in terms of numbers of cases and mortality rates have also been found among BAME staff working in the National Health Service (Bhatia 2020). According to McClure, the stories of the industries involved in the epidemic exemplify racial capitalism. He describes the spread of infection among construction workers, mostly Latinos, and points out that the dominant narrative was that high disease transmission was due to the characteristics of this ethnic group. The causes were multi-generational families, inadequate personal hygiene and low health literacy among Latinos (McClure et al. 2020). However, a deeper analysis reveals that socio-economic conditions do not allow these groups to be absent from work and at the same time the absence of privileges also affects the possibility of adopting safe practices such as the use of spacing to prevent Covid-19 (Yancy 2020).

In addition to occupational exposure, ethnic groups are more likely to be infected because of greater exposure to long-term care residence, disadvantageous housing conditions and higher incarceration rates (Snowden and Graaf 2020). The main transmission sites of Sars-Cov-2 are not only Customs Enforcement detention centres but also Immigration detention centres, further demonstrating the ethnic-based disadvantage (McClure et al. 2020).

With regard to access to care, racial and ethnic differences were already present before the pandemic and were rooted in both cultural differences and deficiencies related to health insurance (Boulware et al. 2003) (Sudano and Baker 2003). This translates not only into less access to treatment, but also to prevention and is very important in the transmission of Covid-19. In the United States, as well as in Italy with respect to foreigners, it has been found that African Americans are diagnosed and treated later due to lower health insurance rates and fewer testing opportunities. It is precisely the areas of residence of African Americans that have the fewest testing sites (Egede and Walker 2020). It is likely that access to testing is also conditioned by the fear of positive screening that could affect ethnic groups employment and income.

The disadvantages of ethnic groups are not only in terms of exposure and vulnerability to infection. The racism that afflicts minority groups is often part of social responses to disease outbreaks (Lupton and Willis 2021). It worsens the persistent situation of disadvantage as already seen during the Ebola epidemic which exacerbated the stigmatisation of Africans (Monson 2017; Roy et al. 2020). The rejection of certain nationalities or ethnicity or race also occurred in the aftermath of the Covid-19 pandemic (Habibi et al. 2020). Asians or mongoloid looking were seen as carriers of the virus and discrimination against them spread throughout the world (Chan and Montt Strabucchi 2020; Haokip 2021). Some political speeches even supported a racist view of Sars-Cov-2, which was dubbed the 'Wuhan virus' by former secretary of state Pompeo (Jaipragas 2020), associating the Chinese city with the disease in a negative light and fuelling negative stereotypes, and nationalism and xenophobia

(Dovidio et al. 2010). And racism is not only affecting people whose features are oriental. For example in Europe Anti-Roma racism is spiraling during Covid-19 epidemic (Matache and Bhabha 2020). Racism has a negative impact on health and the risk is that the health of ethnic groups will deteriorate further unless action is taken on the forms of racism that are emerging in this pandemic. Mental and physical health of ethnic and racial groups are affected by racism. The risk is that psychosocial stressors will increase and that these will not only worsen health but also lead to altered behavioural patterns that increase health risks. (Williams, Lawrence, and Davis 2019).

#### *1.4.1.5 Age*

Each stage of life is characterised by different health needs, and increasing age is often a predisposing factor for disease (Beaglehole et al. 1993:86). The risk of developing illnesses increases with age. Ageing is typically accompanied by an increase in non-communicable diseases such as cardiovascular disease, diabetes, cancer, chronic obstructive pulmonary disease and musculoskeletal problems, Alzheimer's disease and other neurodegenerative diseases. The high burden in both economic and health terms is caused by the long duration of these diseases, the decreasing quality of life and the costs of treatment. Although some of these diseases cannot be effectively predicted, it cannot be said that health problems are an inevitable consequence of ageing. Having a healthy lifestyle by adopting healthy behaviours such as being physically active, eating a healthy diet and not smoking, or undergoing screening for early detection of diseases such as breast or colorectal cancer can help you to age healthily. An active life can not only prevent diseases such as diabetes or musculoskeletal problems, it can also help prevent depression (Epicentro 2021).

During previous epidemics, such as the Spanish epidemic, people over 60 had been less susceptible to the disease, but mortality was predominant in this age group (Beveridge 1991). An increased vulnerability of the elderly in terms of mortality rates was also found in other more recent epidemics such as Asian cholera and severe acute respiratory syndrome (SARS) (Banerjee, D'Cruz, and Sathyanarayana Rao 2020). Similarly, during the Covid-19 pandemic there is a higher mortality among the elderly than in the rest of the population (Verity et al., 2020). In the pre-Covid-19 literature it was already known that morbidity and mortality caused by infectious diseases generally increase with age (Bijkerk et al. 2010) because immune system is less well able to cope with infections (Pawelec et al. 1998). The elderly are patients at high risk for developing rapid progressive clinical deterioration following Sars-Cov-2 infection. This is related to the fact that the elderly, due to immunosenescence and a greater presence of comorbidities, are more likely to develop life-threatening respiratory failure with multisystem involvement (Perrotta et al. 2020). However, the pandemic does not only affect older age groups in terms of vulnerability and mortality due to Covid-19. Elderly people are predisposed to the pandemic threat due to a number of vulnerabilities. Firstly,

they are vulnerable because of their fragility related to age and biological characteristics. Second, due to a higher incidence of chronic diseases and co-morbidities they require more physical support and health care from the outset. This implies that they are more in need of direct care and physical distance cannot always be guaranteed. It increases their risk of contracting Covid-19 due to the contacts they are forced to have with non-cohabitants. If they then contract the Sars-Cov-2 infection we have seen that they often have worse outcomes. Dependence on others either in terms of health or for the day-to-day running of the home also risks subjecting older people to additional stress due to the fear of contracting the virus. At the same time the need to reduce the number of contacts with other people has exacerbated situations of loneliness, neglect, isolation, and poor nutrition. and this can lead to depressive disorders, insomnia, and chronic stress (Banerjee et al. 2020). The change in lifestyle due to the pandemic also exposes the elderly to negative health consequences. They not only experience psychological problems, but also a deterioration in their physical capacities (Şevgin, Alptekin, and Şevgin 2021). Preventive measures are also more difficult for the elderly. The infodemic could also make more complex to understand precautionary measures. A misunderstanding can led to decreasing preventive behaviour and increasing drug consumption. Also, sensory problems such as vision and hearing difficulties and impaired cognitive abilities (memory, processing speed, thinking and language), that worsen with age, may lead them to not understanding and implementing the precautionary instructions (Banerjee et al. 2020).

Age-related mortality due to Covid-19 and the difficulties just described of older people risk amplifying the already existing ageism. Ageism is a systematic stereotyping and discrimination against people because they are old. Just as racism and sexism distinguish people on the basis of skin or gender, ageism categorises older people as rigid, old-fashioned and senile. This way of perceiving older people creates a disconnect with the younger generation who identify older people as different from them and simultaneously stop identifying with elders as human beings. (Cohen 2001). Ageism have consequences for health and well-being of older adults (Kornadt et al. 2021). The consequences of ageism favours the exclusion of older adults, their social isolation and increased levels of psychosocial distress (Rahman and Jahan 2020). The pandemic is reinforcing a homogeneous view of older adults as vulnerable, increasing ageism and stigmatising older people. (Swift and Chasteen 2021). Mikton and colleagues describes discrimination in access to health care and inadequate protection of the elderly in nursing homes as examples of this pandemic-related phenomenon. These are also associated with stereotypical media portrayals that pit generations against each other (Mikton et al. 2021). Some people, adopting ageist attitudes, in fact believe that the pandemic is a problem of the elderly (Fraser et al. 2020). It is true that mortality in young adults is lower than that reported for older adults on Covid-19, but 25% of 18–34-year-old were hospitalised, 27% required intensive care and 10% mechanical ventilation. Covid-19 is therefore not only a health hazard for older people

(Cunningham et al. 2021). This can create a false sense of trust in young people regarding their safety and lead them to ignore preventive measures. Certainly, the Covid-19 due to the age specificities linked to the current health emergency is weighing particularly heavily on adults and the elderly, but the consequences risk falling on everyone and widening the generation gap.

#### 1.4.2 Exposure to the virus

When considering airborne diseases, the spread of the virus can occur either through direct contact or possibly indirect contact. Differential exposure refers to different living and working conditions (Lüdecke and Von Dem Knesebeck 2020). There are numerous places where contagion can occur. These include homes, healthcare facilities, schools, workplaces, public transport and other places where people gather for social, commercial or entertainment purposes. The type of occupation, the crowdedness of homes, the characteristics of the place where one lives and the preventive behaviour adopted can lead to a higher level of individual exposure, contributing to disparities between groups with different socio-economic positions (Blumenshine et al. 2008). Studies prior to Covid-19 had identified three types of exposure factors to infectious diseases such as influenza: structural, work-related and others that made distance between people impractical. Among the former working, living in a metro area, living in an apartment building, number of adults in household, number of children under eighteen years of age in household were considered. Work-related factors include not receiving an income in case of absence from work, no sick leave, fear of losing one's job in case of absence, difficulty in staying home from work for seven or ten days, and not being able to work from home and having to work in attendance. Other measures of inability to cope with physical distance between people are difficulty in finding a kindergarten and difficulty in avoiding public transport (Quinn et al. 2011). Geographical and living situation and family size were also considered (Quinn and Kumar 2014).

But it is not only the characteristics of one's family or job that influence the risk of exposure to virus such as Covid-19. A UK government document indicates as factors involved in exposure, in addition to the workplaces mentioned above, the ability to self-isolate, family size and also the number of people in any given space, the use of preventive behaviours in any given environment including hygiene measures, physical distance between people and room ventilation. Exposure time and proximity with an infected individual also play a role. Exposure to the virus and its transmission can occur in any environment and represent an ongoing risk (EMG – Transmission Group 2021). The places you go to and the activities you perform also play an important role, as each of them can be associated with a different risk of infection (Texas Medical Association 2020). Behaviour, life style and perceived risk are also factors that make it easier or more difficult to become infected. According

to currently available literature, we now look at the main factors that have contributed to a differentiation in exposure between groups in Covid-19 pandemic.

#### *1.4.2.1 Work related exposure*

Even before the pandemic reached Europe and the first secondary cases with local transmission were recorded, scientists in Asia were already starting to talk about how occupation and work environments were elements to be taken into account in the spread of the disease. The emerging problems of healthcare workers, who are highly exposed to the risk of infection, and the case of the crew on board of the Diamond Princess ship were mentioned in an editorial on occupational risks for Covid-19 infection in February 2020 (Koh 2020). Studies that consider the relationship between exposure and workplace mainly describe an association between the two. The difficulties in describing the phenomenon are related to the fact that the virus can be contacted anywhere and not only in the workplace. Closures of some activities have affected the spread and there is a lack of data to analyse for comparison between sectors and time periods. Measures to protect against infection are not applied uniformly across work sites, and data on this are not always available (EMG – Transmission Group 2021). Despite this, contemporary literature indicates that work environments playing a central role in the spread of the disease (McClure et al. 2020) and therefore occupation influences the level of exposure to the virus Sars-Cov-2.

For this reason, those who can work from home have the opportunity to avoid physical proximity to other people or direct contact with the public. During the lockdown people working in certain occupations and specific roles had a higher risk of being infected, hospitalised or dying prematurely. In particular, there was a difference between those who had to attend a workplace and those who worked from home (EMG – Transmission Group 2021). Working from home reduced exposure to the virus by decreasing the likelihood of contracting the disease even after lockdown. Occupations that do not allow working from home are low-income jobs in service sectors, such as health or social care, transport, cleaning and hospitality (Burström and Tao 2020). In contrast, those with higher levels of education and higher earnings are more likely to be able to work from home. Among the non-privileged who have to travel to the office or other work sites to carry out their tasks, the under-25s, men and ethnic minorities are more represented (Blundell et al. 2020).

The sector of employment is a determining factor for exposure. Hazards, working conditions and site organisation vary greatly and affect exposure to the virus. For example, occupations that involve greater physical proximity to other people for prolonged periods tend to have higher Covid-19 infection and mortality rate. Spatial layout, lack of personal protective equipment, ventilation, anti-contamination protocols or compliance with them may be factors contributing to exposure (EMG – Transmission Group 2021). As already mentioned, the meat sector has been identified by several

studies as high risk. It is an environment where congregate work is standard and several major outbreaks are occurring worldwide (Dyal et al. 2020; Günther et al. 2020; Paremoer et al. 2021; Steinberg et al. 2020). The whole agri-food chain and its workers (farmers, meat packers, supermarket chain employees and food delivery workers) showed extreme vulnerability and its workers were treated as expendable (McClure et al. 2020) More cases of Covid-19 have also been reported in the catering sector than in other workplaces, and in Italy it has been found to be the second most prevalent work sector. Only the healthcare sector recorded a higher number of people infected with the virus (Sabbadini 2020).

A high prevalence of illness among healthcare workers has also been identified in other research conducted in different countries (Magnusson et al. 2021; Marmot et al. 2020; Zhang 2021). The higher exposure of people working in healthcare is also confirmed by the fact that people working in patient-facing roles are much more likely to be the first case in their family than those who do not work with patients (EMG - Transmission Group 2021). In construction sector, higher sickness and hospitalisation rates have been reported in the USA than in the general public. This sector particularly employs workers of Latin American origin. The cause of high rates was commonly blamed on the multi-generational Latino family structure, the low literacy of this ethnic group and their poor personal hygiene. In reality, however, it was discovered that there was no access to personal protective equipment in the workplace. In addition, guidelines to prevent the spread of the virus in the workplace (e.g. respect for spacing and hygiene care) were not applied and there was no supervisory mechanism to monitor compliance with the recommendations (McClure et al. 2020). In Ontario, in Canada, the sectors most affected by Covid-19 disease are manufacturing, agriculture, transportation and warehousing (Murti et al. 2021). In California, USA excess mortality was higher among food/agriculture, transportation/logistics, facilities, and manufacturing workers than in other groups (Burdorf, Porru, and Rugulies 2021).

The greater frequency of social contacts and relationships at work increases the risk of infection. Working face-to-face with the public increases the risk of falling ill, as found in Italy in the Sars-Cov-2 seroprevalence survey by ISTAT and the Red Cross (Costa and Marra 2021). Also working in multi-occupancy housing environments exposes people to a higher risk of illness. Numerous clusters and epidemic outbreaks have been recorded in health care institutions and long-term care facilities, homeless shelters, customs enforcement detention centres and other centres hosting migrants (Cevik et al. 2021; McClure et al. 2020)

According to data from the UK Office for National Statistics all health professions are highly exposed to the virus. Workers in some professions that have close proximity to regular others but are less exposed to the disease include cooks and hairdressers. Their exposure to the virus was initially reduced thanks to the closures imposed by the government in the first phase of the emergency.

Working in education involves slightly less exposure to Covid-19 disease and proximity to others. Those who do not work near people, such as artists, marketing professionals and drivers of agricultural machinery, have a lower risk of falling ill (Office for National Statistics 2021).

The professions with a significantly higher risk of covid mortality in England were found to be care workers, nursing assistants, nurses, security guards, cleaners and domestics, taxi drivers, chauffeurs, bus and coach drivers, van drivers, vehicle mechanics, shopkeepers, proprietors, book-keepers, retail assistant, postal workers and couriers, elementary construction, elementary storage and food, drink and tobacco operatives. Among workers whose job requires spatial proximity to others, such as security guards, care and home care workers, taxi drivers and drivers had the highest mortality rates (Marmot et al. 2020:18). Covid-19 mortality affects less skilled professions more among both women and men (Marmot et al. 2020:17). Not only in UK but also in Sweden, occupations such as taxi and bus drivers had elevated mortality risk due to Covid-19 compared with others workers. In both countries teachers had lower mortality rates and for low-skilled individuals, an occupation with high exposure can be particularly deadly. (Billingsley et al. 2020).

As we have seen, both non health care occupations and health care occupations are vulnerable and exposed to the virus (Zhang 2021). Although the phenomenon does not only affect health professionals, as this is the professional category for which there is more literature available, we would like to stress that the health effects of Covid-19 are not only related to the development of the viral disease but that the crisis has brought and will bring other health consequences as well. The concept of risky work had already been associated with the fields of health and healthcare based on studies derived from the sociology of risk and work (Gale et al. 2016). This was amplified in the context of the pandemic even though some elements had emerged during previous epidemics. During the Middle East Respiratory Syndrome outbreak, health workers due to inadequate testing and lack of personal protective equipment contracted and transmitted the disease to those around them (Ahmed et al. 2020). Fear and stress due to the risk of being vectors of the disease negatively affected the mental health of health workers (Maunder et al. 2003). These were also compounded by uncertainty and stigmatisation that affected both health workers and patients. The stigma experienced during the SARS epidemic led to health workers being treated differently from other people simply because they worked in a hospital (Nickell et al. 2004).

There are also long-term health repercussions such as burnout, psychological stress and post-traumatic stress (Maunder et al. 2003, 2006). The latter in particular can develop following situations such as the one experienced in the province of Bergamo in Italy when the Covid-19 pandemic was dispatched. Health workers found themselves having to decide who to assist and who not to assist due to a shortage of materials and personnel. The risk is that health workers may have traumatic, moral and even life-threatening outcomes from past events, as has already happened with other

professional groups (V. Williamson et al. 2020). Similar consequences are being seen today in relation to Covid-19. At the beginning of the Covid-19 pandemic, health workers had to deal with tasks such as care, surveillance, contact tracing, and monitoring quarantine and isolation, along with their regular tasks, often without being provided with adequate personal protective equipment (Paremoer et al. 2021). Workers who cared for those sickened by Covid-19 developed a higher risk of symptoms of depression, anxiety, insomnia and distress (Lai et al. 2020). Stress was also caused by fear of inflicting Covid-19 on family and colleagues or by family care issues. Dealing with possible quarantines of oneself or one's family, and having to combine a heavy workload with a family load at a time when schools were closed, was a source of concern for health professionals (Riaz et al. 2020) (Shanafelt, Ripp, and Trockel 2020). However, studies emphasise how occupational exposure to the virus also plays a role in other areas of health workers' lives. Although the continuing evolution of the pandemic does not yet allow the occupational risk of each occupation to be precisely defined, what is clear from the studies currently available is that Covid-19 transmission is very much linked to work environments. Few studies that have already been published compare the various epidemic waves and this limits the overview of the problem (Magnusson et al. 2021). Certainly, what is not changing is that the disadvantaged positions at work are also the most exposed to the virus and are contracting the virus more than the more advantaged positions.

#### *1.4.2.2 Housing and household*

Home is an expression of a way of life that results from the material, social and cultural context in which one is embedded. Sociologically, home and place of residence influence the course of life in terms of health, education and opportunities. The address of residence is a bearer of inequalities (Sartoretti 2019). Having housing, availability of water, proper hygiene, have always been important elements in preventing disease transmission. We will not focus on situations of extreme poverty or homelessness to talk about inequalities in this work, but we will try to frame the problem of housing as a place of exposure to Covid-19 in situations of lower deprivation where, however, the differences due to different socio-economic positions are noticeable. Understanding what is going on and the prevention adopted in the home has sociological implications because, even in developed countries, not everyone can enjoy the same resources in relation to their home.

At the beginning of the health crisis, during the lockdown, housing was an important element in determining people's health and well-being. Having to spend a lot of time indoors added stress to the inhabitants. In particular, renters, social renters and ethnic groups were most affected by home confinement in terms of wellbeing. Inequalities were exacerbated in this context (Marmot et al. 2020). Living in small houses, flats or larger houses with gardens, typical of higher socio-economic positions, enabled people to live differently during the lockdown (Fullagar and Pavlidis 2021).

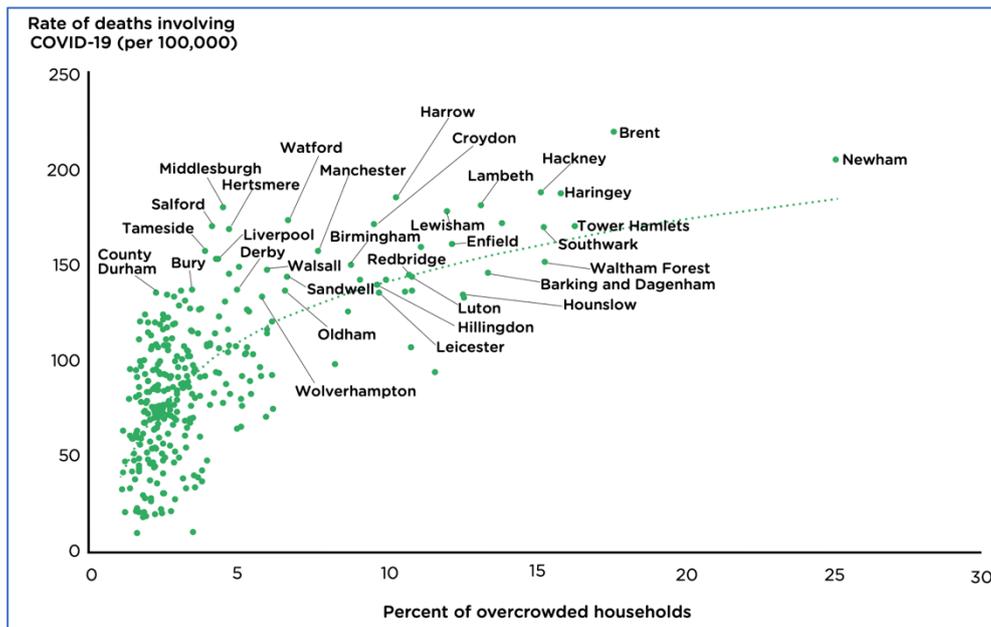
Housing was an important element in determining people's health and well-being. Housing conditions and family status influenced how lockdown was addressed. A Portuguese survey found that some categories were materially and subjectively more vulnerable. These include multi-generational families and families with minor children, such as single parents and couples (Gouveia, Ramos, and Wall 2021). Also, with regard to isolation and quarantine, having an uncrowded house with several rooms allows for better adherence to the instructions to avoid infection.

In fact, the role of the home in exposure to airborne infections such as Covid-19 was known well before the arrival of the current pandemic. Numerous epidemiological studies and analyses have been carried out to check, for example, how influenza is transmitted within the house. Close contacts between individuals sharing the same living space promote the transmission of infectious diseases. (Cauchemez et al. 2004; Longini et al. 1982). Indoor transmission of human-transmitted viral diseases have focused on social aspects such as the presence of children (van Boven et al. 2010) and characteristics of family structure (Endo et al. 2019). In essence, the home is central in predicting the evolution of the epidemic. In particular, household size and number of dependent children in the house plays an important role in predicting the evolution of airborne diseases outbreaks. Also, household is an important target for preventive interventions (House and Keeling 2009).

Although in the recent literature on Covid-19 and exposure to the virus in the home, strictly epidemiological studies predominate (Dattner et al. 2021) (Reukers et al. 2021) (Li et al. 2021), studies analysing the problem that pay attention to social inequalities and health inequalities are also emerging. During the Covid-19 pandemic, household quality, number of inhabitants living in the household and area of residence are all likely to indicate the presence of social inequalities in infection (Costa and Marra 2021). The risk of infection transmission to household contacts is 10 times higher than to other contacts. In particular, domestic transmission affects adults more than children (Lei et al. 2020). In Italy too, according to the national survey on seroprevalence by Istat and the Red Cross, there was a very high level of intrafamilial transmission. 41.7% declared having had positive contacts with the virus among cohabiting family members and 15.9% with non-cohabiting family members. Despite this, the same survey shows that if protective measures are used inside the home, the risk of transmitting the disease is lowered, as was the case for 60% of those who had cohabiting relatives with Covid-19 (Sabbadini 2020).

Overcrowded housing is associated with both poor physical and mental health. In addition crowding and the presence of multigenerational families may increase exposure to Covid-19 virus and associated mortality (Burström and Tao 2020; Marmot et al. 2020). In England, Marmot and colleagues have shown that there is a relationship between the presence of crowded houses in the area and Covid-19 mortality as seen in figure 12.

Figure 12: Age-standardised Covid-19 mortality rates and percent of overcrowded households, local authorities in England, deaths occurring between March and July 2020



Source: (Marmot et al. 2020:16)

The intergenerational sharing of residences typical of Latin countries such as Spain and Italy has been mentioned as a possible reason for the spread of Covid-19 in two of the most affected countries in Europe in the early months of the pandemic (Sendra et al. 2021). In fact, the age composition of households affects exposure to infection and the spread of the disease (Giangreco 2020). In England, a correlation has been found between multigenerational and large families and increased risk of infection and/or mortality even when controlling for deprivation and other factors. However, it was observed that South Asian ethnic groups, but not other ethnic groups, have a family composition that explains the additional risk of Covid-19 infection and mortality. (Ethnicity sub-group of the Scientific Advisory Group for Emergencies (SAGE) 2020). In larger families there are not only more opportunities for transmission in the home but they also usually have larger social networks, which amplifies the risk of coming into contact with the virus. If the space inside the house is limited (amount of space in relation to the number of occupants, shared rooms) it is more difficult to isolate Covid-19 patients. Shared areas such as bathrooms and kitchens, which are used by everyone, also increase the chance of contracting covid by touching surfaces and handles infected by the virus-positive cohabitant. Lack of ventilation and poor housing quality also play an important role in virus transmission. In the first case, the risk of aerosol transmission increases. Reduced air exchange can be due to external noise and pollution, security of the living area, and avoidance of internal heat loss. In winter, less airing of the house may be necessary to ensure thermal comfort and reduce energy

consumption. To this can be added the lack of knowledge about the usefulness of this hygienic practice. On the other hand, the presence of cold, dampness and mould, and therefore poor quality of housing, can exacerbate persistent health conditions and increase the survival of the Sars-Cov-2 virus. These situations are often present in older homes and in the mainly private rental sector. Tenants have less control over the physical environment of the home even if they want to improve the conditions of their own home (Scientific Pandemic Influenza Group on Behaviours, Environmental and Modelling Group, and SAGE 2020).

Data on the role of the household and families in Covid-19 exposure are still evolving. Certainly, belonging to disadvantaged socio-economic positions, ethnic groups or large families have an impact on Covid-19 transmission in the home. Many aspects are still to be clarified in relation to transmission linked to the care of frail persons in the home. What does emerge, however, is that many infections occur in this setting and that prevention in the home is of key importance in limiting the spread of Covid-19.

#### 1.4.2.3 Leisure activities

All places are potential sites where infection can occur although the risk of contagion and exposure vary according to the social settings considered (Ooi et al. 2021). The UK government has identified all risk factors associated with virus transmission that affect exposure to Covid-19 in different places (figure 13).

Figure 13: Risk Factors with respect to place and transmission

Factors associated with risk of transmission	Lowest risk of transmission	Highest risk of transmission
<b>Environmental factors</b>		
<b>Proximity</b>	Always maintain >2m	Regular close interaction < 1m
<b>Duration</b>	A few minutes or less	Several hours
<b>Occupant density</b>	People spaced out, large space	People closely packed, small space
<b>Shared air</b>	Outdoors, well ventilated indoor	Indoors with poor ventilation, recirculated air
<b>Environmental conditions</b>	Normal indoor temperatures, humidity and fresh air	Low temperature, low humidity
<b>Viral emission</b>	Passive activity, face coverings	Aerobic activity, singing, loud talking, no face coverings
<b>Shared surfaces</b>	Rarely touch shared surfaces, good cleaning	Regular touching shared surfaces, infrequent cleaning
<b>Human factors</b>		
<b>Contact frequency</b>	Case isolation, infrequent contact	Daily, regular contact
<b>Networked</b>	Contacts maintained within a small bubble	Shared space with multiple strangers
<b>Hygiene behaviours</b>	Regular hand hygiene, use of face coverings	Poor hand hygiene, no face coverings
<b>Occupational factors</b>	Small network, not public facing	Care/health sector, public facing, long working hours
<b>Socio-economic factors</b>	Work from home, able to isolate	Poverty, crowded housing, inability to isolate for both space and financial reasons

Source: (EMG – Transmission Group 2021)

The greater the physical proximity, the more time spent in a space, the number of people present, and the less hygiene and appropriate environmental conditions, the greater the likelihood of contracting the virus in any given environment even during leisure time. Individuals especially in their free time relate to each other.

During leisure time, people can connect and network with others. Socialisation and social cohesion are therefore opportunities created through participation in leisure activities (Roberson Jr and Pelclova 2014). Having relationships with others, as we have already seen, is an element that can facilitate the spread of contagion because of the proximity of people. In fact, the prevention guidelines for Covid-19 indicate giving up habitual leisure and group gatherings with friends, family and colleagues (Lupton and Willis 2021:6).

The risk is that leisure time becomes an element facilitating contagion. Leisure activities are in fact also identified by Shushtari as intermediary social determinants that influence adherence to prevention guidelines and, consequently, we would add, as an element that can influence exposure to the Covid-19 virus (Shushtari et al. 2021).

The literature investigating the risk of Covid-19 infection in relation to the various activities and places people frequent in their free time is still underdeveloped and is very fragmented. What is certain is that several typical leisure contexts have been closed both during the lockdown and in the subsequent period due to governmental choices to avoid the spread of the contagion.

In Italy, on 8 March 2020, the DPCM decreed the closure of cinemas, theatres, museums, pubs, discos, bingo halls, gyms, swimming pools and sports centres. Reopened in the late spring-summer of that year, many of these venues had alternating periods of opening and closing depending on the pandemic epidemiological trend.

A scheme produced by the Texas medical association summarises the level of exposure to Covid-19 according to activities and locations (figure 14). The various activities have a different potential for infection risk depending on their proximity to others, the time of exposure, compliance with safety guidelines, whether they are carried out outdoors or indoors, and the level of personal risk. Crowded and indoor places represent an increased risk of disease.

The limits introduced by governments and the conditioning resulting from the pandemic may have changed people's leisure habits. Many articles already published focus on leisure time during the lockdown and describe how people used the time available in their homes (Anderson 2020; de la Barre et al. 2020; Stodolska 2021). The health crisis even after the lockdown has increased home-based and online activities, accentuating already existing inequalities (Sivan 2020). The virtual activities that have increased mainly concern meeting chats and shopping platforms. Less interest was found in virtual leisure activities (Paköz, Sözer, and Doğan 2021).

Figure 14: Risk during Covid-19



Source: (Texas Medical Association 2020)

Volunteering and acts of help have increased, but at the same time there has been an increase in the demand for psychological support and a shift to home-based activities (Sivan 2020). Some leisure venues were considered to be more at risk than others, especially in relation to the availability of outdoor or indoor spaces. For example, gyms and other exercise facilities were considered high-risk places for transmission because they are closed environments where close contact between users and trainers occurs and shared equipment is exchanged (Amagasa et al. 2020). Other places, however,

were chosen as a place to visit by more people after the pandemic began because they are outdoors such as parks and natural spaces (Baek et al. 2021). Leisure locations have in fact changed since the outbreak of the pandemic. In Canada, for example, it was found that during the pandemic 9% of respondents to a questionnaire indicated that avoiding bars, pubs, nightclubs and lounges was one of the most important measures to reduce the spread of the virus. 63% of respondents rarely or never visited these sites after the arrival of the pandemic. Those who find it most difficult to avoid these places are older people and residents of two large cities (Calgary and Edmonton) (Lang et al. 2021). In contrast, in a survey on preventive behaviour by Covid-19 it was found that rural dwellers are less likely to avoid dinners in restaurants or bars (Callaghan et al. 2021).

The perception of risk has a positive effect on the choice of natural places, places where the spaces between strangers are large and the areas are disinfected. In contrast, a negative effect was found between risk perception and the choice of crowded places. Age and gender affect the choice of places to visit in leisure time (Baysaikhhan et al. 2021). In Germany, it was found that young people have more difficulty avoiding crowded places, while women avoid such situations more often (Lüdecke and Von Dem Knesebeck 2020). The pandemic has also generated a new interest in using public spaces close to home for leisure use. A new sociable space is developing in many neighbourhoods through the transformation of streets, car parks and pavements into places for active living and neighbourhood sociability (Mehta 2020). A shift of leisure activities from huge, crowded spaces such as large squares and shopping centres to small-scale public spaces within walking distance is likely to occur (Paköz et al. 2021).

Only few articles analysed demographic and socio-economic characteristics in relation to the choice of places to visit in leisure time in the pandemic era. Nevertheless, it is well known in the literature that leisure time is part of a lifestyle. Leisure activities vary depending on social status, lifestyle and relation to leisure time needs (Blahoslav, Stašová, and Junová 2020). It is not known at present whether those who frequent riskier places have particular characteristics or whether the choices are equally spread among people. Elgar and colleagues point out that social contextual factors may influence tolerance of prolonged interruptions to social and cultural activities. These factors may therefore influence the choices of which places and activities to attend in one's free time (Elgar, Stefaniak, and Wohl 2020). In the literature on health behaviour it has been seen that people in disadvantaged socio-economic positions tend to engage in worse health behaviour than others (Blaxter 1990; Lucchini and Sarti 2009). There are many explanation for this difference such as Bourdieu's habitus (Bourdieu 1984), health lifestyle theory (Cockerham 2005) collective lifestyles (Frohlich 2000; Frohlich et al. 2002; Frohlich, Corin, and Potvin 2001), and ties of proximity (Fowler, Christakis, and Kahneman 2010; Sarti 2018). At the moment, however, it is not possible to know

whether the choice of frequenting more at-risk places or of sociability habits at risk of contagion is a reflection of different social life styles and social inequalities.

#### *1.4.2.4 Territorial variations*

Just a few months after the emergence of the Sars-Cov-2 coronavirus, the first inequalities in exposure to the virus were already beginning to emerge. As Bamba and colleagues point out, in April 2020, data collected in Spain by the Catalan government showed that infection rates were six or seven times higher in the most deprived areas. At the same time in the US, the health gradient was seen in preliminary tests in Illinois and in test results in New York City (Bambra et al. 2020). It is clear that territorial health inequalities produce a variable map of the social distribution of health risks (Barberis 2021:320). Maps can show not only the social distribution of health risks but also can help to understand how communicable diseases spread. The territorial approach to the study of disease spread was used as early as the 19th century when Snow was able to demonstrate that cholera spread where human relations were possible and because of a water pump. He was able to identify the water pump as responsible for the epidemic thanks to the testimonies of the inhabitants and the comparison between the mapping of the cases and the water pumps present on site (Parkes 2013; Snow 1855). Maps are used to describe Covid-19 spread in the world, at national or sub-national territorial scales. Not all people are exposed to contagion in the same way and epidemiological models tend to consider the population as homogeneous and undifferentiated so that each subject has the same probability of coming into contact with another infected subject (Squazzoni 2020). In reality, the dynamics of contagion must be considered within a complex model of relationships and could be better explained thanks to the use of socio-epidemiological variables and variables that detect the territorial dimension of contagion (Bianco 2020). As Bianco argues, mapping outbreaks and identifying the social factors related to them (e.g., place of residence, income, education, work, lifestyles, consumption styles, housing density, healthiness of the home) is essential to understand the chains of contagion, but also to formulate effective policies to get out of the coronavirus emergency. It can be considered that social determinants of health have also played a decisive role in the transmission of this new interhuman transmitted infectious disease: the role of lifestyles and consumption, social relationships and the territory in which one lives are central in this situation, but there are still many open questions about the geography and social networks involved in the epidemic.

Predicting the course and geographical spread of an infectious disease is extremely complex, but it is already widely recognized in the literature that the characteristics of places and space can also have a connection with the conditions that favours contagion (Haining 2003; Ma 2000). As the phenomenon is new, there are still few published studies that analyse the spatial dimension of Covid-19 at the local level, with the majority of them focused on a national or regional scale. Besides, many

articles are based on Chinese cases, probably because since the virus appeared in China first the data to describe it were available earlier (see for example Huang, Liu, and Ding 2020; Kang et al. 2020; Yang et al. 2020). In USA the Surgo Foundation is studying the spread of the virus in communities with different levels of vulnerability. The researchers have created the Covid-19 Community Vulnerability Index and state that some communities are more vulnerable than others because they have a limited ability not only to delay, treat or mitigate transmission of Covid-19 disease but also to reduce its social and economic impacts. Also interesting is the study published in *Frontiers in Sociology* that identified a relationship between poverty and Covid-19 in the United States, especially in the first weeks of the pandemic, both in terms of sick people and deaths. The deaths are also associated not only with poverty but also with urban counties. Although the most affluent counties reported more confirmed cases of the virus in the following weeks, the authors attribute this change in the trend to a lack of resources to test for coronavirus positivity (Finch and Hernández Finch 2020). Likewise in Africa there seems to be a problem of underestimation of contagions due to lack of testing (Adepoju 2020). In general there is a concern that Covid-19 is hitting vulnerable people in rich countries (Benassi 2020b, 2020a) and underdeveloped or developing countries hardest (Alwazir 2020; Chiriboga et al. 2020; Mancino 2020). In light of these considerations even in Italy several research groups are focusing on the Covid-19, highlighting the importance of social variables to understand the phenomenon using a territorial approach (Casti et al. 2020; Colleoni et al. 2020; Corica and De Vito 2020a). Excluding the research in progress at the ATS Metropolitan City of Milan (Corica and De Vito 2020a), the other studies are based on data that fail to go beyond the municipal detail, not allowing to fully grasp the socio-spatial implications of the phenomenon. In fact, the use of larger spatial units risks not to capture where the specific problems are located (Anthony C. Gatrell and Elliott 2015:67). As a matter of fact, Italy represents an interesting case to be studied to verify some possible inequalities in the diffusion of Covid-19. In a nation whose Constitution focuses on the fight against inequalities (Article 3) and on the right to health (Article 32), has the pandemic affected the most vulnerable? Has the disease spread to the poorest areas of the nation? In truth, at the start of the epidemic, the Regions most affected in Italy were Lombardy, Emilia Romagna and Veneto. Until the end of March they were the regions with the highest rate of infections. On 24 February 2020, 172 cases were diagnosed in Lombardy, 33 in Veneto and 18 in Emilia Romagna and, one month later, on 28 March, 39.415 cases were recorded in Lombardy, 12.383 in Emilia Romagna and 7.930 in Veneto. In September 2020 these three regions together with Piedmont hold the record for the number of Covid-19 cases (Dipartimento della protezione Civile 2020). They represent the most industrialized and wealthiest areas of the nation. The Italian case is also emblematic for the areas affected by the epidemic. Historically, cities were characterized by features linked to poor health. It is well known that urbanization provides more opportunity for contact between people and exposure

to illness and therefore has great implications for the transmission of infectious disease. For example recently, in 2003, the emerging infectious disease the SARS was first recognized outside of a major city, in a food market in south of China, and it was brought to a major city, and then it was spread to other major cities around the world such as Toronto (Neiderud 2015; Reyes et al. 2013). According to the United Nations, urban centres are the epicentre of the pandemics of Covid-19 due to population density and global and local interconnection (Guterres 2020). Although much attention is paid to cities, the most recent literature has begun to highlight how the contemporary process of extensive urbanization, due to the transformation of metropolitan edges, has increased the vulnerability of suburban and peri-urban areas to infectious diseases (Connolly et al. 2020). In Italy, the Covid-19 pandemic did not affect metropolitan cities such as Milan, as one would have expected, but spread mainly in suburban and peri-urban areas as showed in some articles that refer to these territories affected by Covid-19 as peripheral areas (Biglieri et al. 2020) or, as supported by Arturo Lanzani, Middle Italy (Pasqui 2020). Lanzani recognizes the existence in Italy of an extended, ramified and plural urbanization and within this picture he recognizes some figures of the inhabited area in which the urbanized process takes different forms. And it is in his description of the different forms that he combines the names of the provinces most affected by Covid-19 (i.e. Cremona, Verona, Vicenza, Parma, Reggio Emilia, Bergamo and the Milanese urban region, Padua, Venice, Treviso) with terms such as sprawl and peri-urbanisation (Lanzani 2015:36–42). And it is precisely in researches about Veneto, one of the regions most affected by Covid-19, that the term "diffuse city" was used initially (Indovina, Matassoni, and Savino 1990). It is indicating low-intensity urbanization (Indovina 2009) and it is one of the terms that seeks to capture the new urban form. Contemporary urbanism is characterized by the dispersion of residences and activities, the loss of relevance of borders and the presence of flows of people from outside and inside the diffuse city. In addition, the peri-urban, a prevalent settlement in the diffuse city, is also characterized by the presence of urban ways of life (Vicari Haddock 2013:23–24). These peculiar lifestyles probably played a decisive role in the spread of the epidemic in Italy. The role played by the city's contemporary morphology in the Covid-19 diffusion is to be explored in depth, but it can already be said that in Italy it was of decisive importance. Compact city and diffuse city must be considered as two sides of the same coin, but they have multiplied and fragmented lifestyles that in the diffuse city are characterized by residential dispersion and dependence on the car (Mela 2009). To understand how these two contexts could have played a role in the spread of Covid-19 it is appropriate to recall also Tönnies' concepts of society and community (Tönnies 2014) which should be interpreted in a milder way in this context. It is hypothesized that in peri-urban areas in the meeting places people can daily meet and often interact with people who already know each other and with whom they share the same style of sociality. This may have favoured the spread of the virus if we think that bars and bowling alleys have been

mentioned several times as possible places of infection in recent months. In addition to this, it has already been found that rural residents have a higher prevalence of unhealthy behaviour in relation to preventive behaviour for cardio-vascular diseases and therefore it is not surprising that they adopt less prevention even in the face of an infectious disease (Mao and Wu 2007).

#### *1.4.2.5 Preventive behaviours*

The World Health Organization outlined a number of precautionary measures to reduce the spread of Covid-19 disease (World Health Organization 2021a). In general, it is necessary to maintain physical distance, wear a mask, clean hands, avoid crowded places, keep rooms well ventilated and cough into a handkerchief or folded elbow. Many of the rules for the prevention of Covid-19 correspond to good basic hygiene. These hygiene rules, which have been the subject of health education<sup>2</sup> since the 1950s, became central to communication to the masses with the arrival of the pandemic. It is important to clean your hands regularly and thoroughly with an alcohol-based hand rub (using hand sanitiser) or wash them with soap and water to eliminate germs and viruses that may be on your hands. Considering that hands can be a vehicle for transmission of Sars-Cov-2, it is advisable to avoid touching the eyes, nose and mouth. This contact, in the case of contaminated hands, may favour the penetration of the virus into the body and subsequent infection. The need to cover the mouth and nose when sneezing or coughing with a handkerchief or bent elbow is another general rule of respiratory hygiene. Handkerchiefs used for this purpose should be disposable and discarded immediately. Washing hands immediately is also a good rule. These tips were already recognised as basic before Covid-19 because they help to prevent various respiratory diseases such as flu and colds. Another basic hygiene measure concerns the need to clean and disinfect surfaces, especially those that are touched regularly, such as door handles, taps and telephone screens. There is much confusion about the type of cleaning required.

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<sup>2</sup> Health education has been defined since the 1950s. Alessandro Seppilli, then Professor of Hygiene at the University of Perugia and founder of the Experimental (Research) Centre for Health Promotion and Health Education (CeSPES) of the same University, in the concluding lecture given at the 1st Summer Course of Health Education in Perugia in 1958 emphasised that health education deals with hygiene topics and must teach how to avoid many illnesses or reduce their severity. "Health education is a social intervention, which tends to consciously and durably change behaviour towards health problems. It presupposes knowledge of the cultural heritage of the learner group and the focusing of its subjective interests, and requires the removal of resistance to the intervention from the group itself" (Seppilli 2014). The definition and role of health education has also evolved over the years due to an improved understanding of social and socio-ecological influences on health. In 1998, the World Health Organization's glossary of health promotion defined health education, which goes beyond health education, as "the set of consciously constructed learning opportunities that include some form of communication aimed at improving health literacy, including increasing knowledge and developing life skills that contribute to the health of the individual and the community" (Nutbeam 1986). Although it is not explicitly stated, because today's health education does not only deal with hygiene issues, communication and hygiene rules are still an important topic in this area. It is worth mentioning that health education has influenced the emergence and evolution of health promotion (Carroll and Hills 2015). Health promotion was defined in 1986 in the Ottawa Charter as "a process that enables people to exercise greater control over their own health and to improve it" (WHO 1986). The two areas, although different, have many common elements and both can play a key role in preventing the spread of the Covid-19 pandemic.

Lesser-known precautionary measures, rarely applied by the general population before the outbreak of the health emergency, were also introduced. Among these is physical distance between people. It is important to maintain a distance of at least one meter between one person and another to reduce the risk of infection. A greater distance is recommended especially when indoors. Indoor spaces without an air supply are less safe because they facilitate the spread of the virus, especially if they are small or crowded. These types of situations should be avoided whenever possible. In any case, it is recommended to increase the amount of 'natural ventilation' when indoors by simply opening a window.

The WHO indicates that wearing masks to cover the airway should be the norm when in the presence of other people. Scientific evidence indicates that covering the nose and mouth is effective in reducing transmission of Covid-19-like diseases, such as influenza and seasonal coronaviruses, if the mask is worn by infected persons and uninfected persons who may come into contact with the virus. Epidemiological data indicate that widespread use of masks may indeed also play an important role in the prevention of Covid-19 (Chou et al. 2020). Since the beginning of the epidemic, the population has been using different types of masks, ranging from home-made masks with all types of fabric to surgical masks and professional masks with high filtering capacity. Each mask has different characteristics and studies are still underway to understand the effectiveness of using masks in reducing the spread of Covid-19. Here are the main differences between the masks on the market. Filtering face masks (ffp2 or ffp3) serve to protect the wearer from external agents (e.g. transmission of infections by droplets and aerosols). They are personal protective equipment (PPE)<sup>3</sup> and are used by healthcare professionals when required by their job in accordance with the risk assessment document. Surgical masks aim to prevent the wearer from contaminating the environment. They limit the transmission of infectious agents and are medical devices. Community masks include every other mask on the market including fabric mask. They can be produced under the responsibility of the manufacturer who must guarantee the safety of the product (e.g. materials used are not irritating, not harmful to health and not highly flammable). They are not medical devices or personal protective equipment. They are a hygienic measure to reduce the spread of the virus (Ministero della Salute 2020b). As shown by a recent study on the fitted filtration efficiency of different types of masks also home-made masks, including scarves and similar, have their own filtering capacity (especially when combined with the use of a nose bridge), but this is still less than that provided by surgical masks and ffp2 or higher (Clapp et al. 2020). At the beginning of the pandemic, it was difficult for people to

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<sup>3</sup> According to Legislative Decree 81/08 (Article 74) Personal protective equipment is understood to be any equipment intended to be worn and held by the employer for the purpose of protecting him against one or more risks likely to threaten safety or health at work, as well as any completion or accessory intended for this purpose (Presidente della Repubblica 2008).

obtain surgical or higher-performance masks due to a shortage of the product; today, when all the various types of masks can be purchased on the market, different choices can be observed among people. Hands should be cleaned before putting on the mask as well as before and after taking it off or in any situation where hands touch the mask. The mask should be changed daily and, if made of fabric, washed every evening. If the mask is used again, it should be stored in a plastic bag. Masks with valves should not be used. We will see in the data discussion which kind of mask individuals used during September-October 2020.

Finally, in order to prevent the spread of the disease, it is recommended that you stay at home and self-isolate even minor symptoms (e.g. cough, headache, slight fever), which are also common with other diseases, until you recover. In case of respiratory difficulties, call for medical assistance by telephone and follow the instructions of the local health authorities. The preventive measures covered by major communication campaigns around the world are essentially three: keeping your distance, wearing a mask and sanitising your hands. Behavioural measures were the only way to reduce the spread of the virus within the population before vaccination was introduced in the various countries about a year after the outbreak of the new disease. They have been implemented globally, proving to be a tool capable of effectively slowing down the epidemiological curve of Covid-19 (Hunter et al. 2021; Noone et al. 2020).

Preventive behaviour can be divided into two categories: true preventive and avoidant. The former include mask wearing, hand washing and other hygiene behaviours. Avoidant refers to avoiding crowds, public transport and adhering to isolation and quarantine guidelines (Bish and Michie 2010). For ease of reference, however, we will often refer to both as preventive behaviours because they are in any case infection-preventing behaviours and it is not relevant at present to make a division between the two groups in this paper. Quinn and Kumar, as visible in the diagram presented at the beginning of the section Covid-19 and health inequalities, highlight preventive behaviour as the proximate cause of inequalities in virus exposure. (Quinn and Kumar 2014). In the literature prior to Covid-19, in relation to other epidemics, certain demographic elements were found to be decisive in the adoption of preventive behaviour. Older age, females, more educated, non-white and risk perception were associated with greater adherence to preventive behaviours during the SARS epidemic and H1N1 influenza (Bish and Michie 2010; Fung and Cairncross 2007; Jones and Salathé 2009; Lau et al. 2003; Leung et al. 2003, 2004, 2005; Moran and Del Valle 2016; Quah and Hin-Peng 2004; Tang and Wong 2003). Similar insights are also derived from studies of preventive behaviour in animal vector-related epidemics where adherence to preventive behaviour varied significantly according to the social visibility of preventive actions (Raude et al. 2019). Obviously, research in the context of Covid-19 is emerging even if it can draw on findings from previous outbreaks where

aspects of social distancing have been less well studied (Noone et al. 2020). However, initial studies show that Covid-19 pandemic is characterised by socio-economic inequality in the use of preventive measures (Kollamparambil and Oyenubi 2021).

In general, studies conducted in different countries around the world seem to indicate good adherence to preventive measures. In two studies conducted in France and Belgium, adherence to Covid-19 measures was high regardless of the perceived risk of being infected or of someone close becoming infected (Van Loenhout et al. 2021; Raude et al. 2020). In Ireland qualitative interviews conducted on physical distance identified high overall adherence, but also variability between socio-demographic groups (Durand et al. 2021). In Italy, the differences are mainly found in the use of the mask outdoors where the sensitivity of the individual and the presence of regulations imposing the use of this device, there are differences between groups with different socio-demographic characteristics. With regard to the use of facial protection in public transport and in public places, no differences in age, gender or social conditions are found. In general, however, Italian citizens show responsible adherence to the indications on the use of face masks (Gruppo Tecnico Nazionale PASSI e PASSI d'Argento 2021). In Hungary it was found that 18% of the participants in a survey on preventive behaviour do not implement any preventive behaviour or have limited adherence to the public health recommendations. Hand washing outside the home is practised by 69% of respondents, hand sanitising gel is used by 44.4%, physical distance between people by about 39.6%, and a mask is the least used measure to prevent the spread of the virus (20.3%) (Urbán, Paksi, et al. 2021). Higher percentages of adherents to preventive behaviour were found in two different studies in Canada. In one study it was found that physically distancing (73%), masking (65%) and staying home while sick (67%) were very common (Lang et al. 2021). Higher percentages of adherents to preventive behaviour were found in two different studies in Canada. In one study it was found that physically distancing (73%), masking (65%) and staying home while sick (67%) were very common. In the other, adherence to physical distancing and handwashing was greater than 85% (Blair et al. 2021). In South Africa, two studies found that more than 90% of participants had changed their behaviour to avoid contracting or spreading the virus, but still a significant proportion of people did not use masks despite being required to do so, and often the changes involved the use of strategies that have a low impact on avoiding infection (Burger et al. 2020; Kollamparambil and Oyenubi 2021). According to Burger and colleagues, only 35% reported using high-impact behaviours such as avoiding clustering, maintaining physical distance and wearing a mask. In Asia, too, the use of preventive measures seems to be widespread. In South Korea, most participants in the survey wore face masks, used hand hygiene and kept their distance from other people (Lee, Kang, and You 2021). In China, there is a discrepancy between the use of prevention inside and outside the home. The former is adopted by few people

(32.9%), while the latter is more common (71.2%) (Ye et al. 2021). The Chinese study by Ye and colleagues is the only one that clearly distinguishes between prevention inside and outside the home. This difference is very interesting because, as we have seen, the household is one of the sites where infection occurs most. In a survey in Indonesia, however, it was found that only 32% used masks while physical distance or other hygienic measures were used by 75% of the respondents (Chavarría et al. 2021).

The articles reviewed are mostly conducted at local or national level and since there are few comparisons between states. A study that makes a cross-country comparison was conducted between Finland and the USA (Sedgwick et al. 2021). For example, no differences were found between Finns and Americans in handwashing (56% vs 55%, respectively), but social distancing is practised less by Finns and more by Americans (35% vs 54%). As Sedgwick and colleagues point out, the results of the survey cannot be generalised and, consequently, we cannot speak of general cross-cultural differences. However, the data show that transnational differences are relatively unimportant, but the topic certainly merits further investigation. An international survey was conducted in English, French, Spanish, German, Italian, Portuguese and Mandarin in 70 countries. It found that Italian and Mandarin-speaking participants were most likely to adopt preventive behaviours, whereas German-speaking participants were least likely. Furthermore, English speakers were found to be less inclined to adopt preventive behaviour than Italian, Spanish and French speakers (Clark et al. 2020). In general, variations in preventive behaviour may be linked to social contextual factors (Elgar et al. 2020). The aspects considered in the various studies analysed were age, gender, education, ethnic group, occupation, income, household, territory and risk perception.

### 1. Age

A number of studies have found an increased focus on preventive behaviour among older people, especially in Europe. French (Raude et al. 2020), Italian (Gruppo Tecnico Nazionale PASSI e PASSI d'Argento 2021) and Hungarian (Urbán, Paksi, et al. 2021) surveys show that a higher age is associated with a lower adherence to preventive behaviour. The lower adherence of younger people was also identified through qualitative interviews in Ireland (Durand et al. 2021). In contrast, in a German survey the relationship between the age of the respondents and the change in individual behaviour was found to be weak and inconsistent. According to the data collected at higher age it decreases the probability of using disinfectants and increases the use of interpersonal distance or the reduction of personal contacts. No association was found with the use of a face mask or hand washing (Lüdecke and Von Dem Knesebeck 2020). A international cross-sectional survey also did not find a correlation between engagement behaviours and age (Clark et al. 2020). Different results also emerged in Canada and China, where young people were more concerned

about prevention (Blair et al. 2021; Ye et al. 2021). In China, young people between the ages of 10 and 20 were the most attentive to prevention both inside and outside the home although taking precautions at home was significantly lower than outside. The middle age gets contradictory results. Young adults were found to be least likely to take precautions in Indonesia while in South Africa they had the best adherence to mask use, hand washing and physical distance between people (Chavarría et al. 2021; Kollamparambil and Oyenubi 2021). Although more studies point to older age as a determinant of better prevention, there are still few results to make a generalisation. Considering that European studies indicate older people as being more concerned about prevention than studies conducted in other areas of the world, it would also be interesting to understand whether these differences are related to cultural differences.

## 2. Gender

All the studies analysed show a higher adherence to preventive behaviour by women. (Capraro and Barcelo 2020; Clark et al. 2020; Durand et al. 2021; Galasso et al. 2020; Gruppo Tecnico Nazionale PASSI e PASSI d'Argento 2021; Mondal et al. 2021; Raude et al. 2020; Urbán, Paksi, et al. 2021). The only exceptions noted were the wearing of masks in the German study by Lüdecke and colleagues in which being female was not associated with higher odds of protective behaviour. In each case the probability of not adhering to any behaviour was lower for women (Lüdecke and Von Dem Knesebeck 2020). In South Africa, they also noted men are less likely to use disinfectants and handwashing but more likely to use interpersonal distancing (Kollamparambil and Oyenubi 2021).

## 3. Education

Most results indicate an association between educational attainment and adoption of preventive behaviour. More education is associated with greater compliance with precautionary measures (Ye et al. 2021). Most results indicate an association between educational attainment and adoption of preventive behaviour. More education is associated with greater compliance with precautionary measures. In the USA a possible explanation is attributed to the delayed effects of communication on risk factors for contracting Covid-19 (Mondal et al. 2021).. In Canada, inequalities due to education are linked to the lower possibility of those with low educational qualifications to work from home (Blair et al. 2021). Lower educational qualifications are associated with higher odds of taking no measures at all in Germany and Hungary (Lüdecke and Von Dem Knesebeck 2020; Urbán, Paksi, et al. 2021) The difference in education in South Africa, found for all behaviours except handwashing, weighs most heavily on mask use in the early phase of the pandemic. The difference between more and less educated became smaller in the later phase, indicating a popularity of this measure that outweighed the differences found initially. (Kollamparambil and Oyenubi 2021). In Germany too, the effect of education was not as noticeable as in other countries.

In fact, more than three quarters of the survey participants in all education groups adopted social distancing and hand hygiene (Hoenig and Wenz 2021). Chavarría and colleagues found no differences in behaviour in Indonesia due to education. The rationale associated with this finding is that education is less important if the measures are easy to implement, such as hand washing, but could play a role in performing the behaviours correctly. For example, but not found in the survey, hand washing with soap and water may not take place for 30 seconds as recommended (Chavarría et al. 2021).

#### 4. Ethnicity and immigration status

Only three studies considered ethnicity in relation to preventive behaviour during the pandemic. In the USA, African Americans have been found to be more likely to adopt preventive behaviours (Mondal et al. 2021). Also in South Africa, it has been found that black Africans tend to use handwashing more and that ethnicity contributes to the use of distancing (Kollamparambil and Oyenubi 2021). British BAMEs are more likely to adopt preventive behaviours than white British BAMEs, probably for reasons related to trust in science, personal risk perception and epidemiological data indicating a greater likelihood of falling ill among ethnic groups. BAME people may adhere more to the behaviour precisely because they are trying to protect themselves and others (Breakwell, Fino, and Jaspal 2021). Blair and colleagues looked at immigrant status and found inequalities with respect to spacing and handwashing. Immigrants tended to be less likely to respect spacing and less likely to use handwashing was attributed to working outside the home. But even if this factor were removed, according to the authors, a difference by immigration status would remain (Blair et al. 2021).

#### 5. Occupational status

Occupational status has not been given much consideration in studies published so far to assess adherence to preventive measures. Ye and colleagues found in China that students and those employed as office workers tend to adhere more to preventive behaviour outside the home (Ye et al. 2021). Similarly, a significant positive association was found between employees and the use of face masks (Kollamparambil and Oyenubi 2021). In contrast, Blair and colleagues point to low adherence to preventive measures, particularly the use of interpersonal distance and hand washing, which is attributable to working outside the home, although even among the unemployed hand hygiene is not practised by a particularly higher proportion of people (Blair et al. 2021).

#### 6. Income

Income and wealth do not seem to have a unique association with the adoption of preventive behaviour, although higher income seems to correspond to a higher level of prevention in most of the studies that looked at the economic status of the respondents. For example, the use of physical distancing between people and the use of hand sanitisers are practised more among the rich than

among the poor in South Africa (Kollamparambil and Oyenubi 2021). Family income has also been found to play an effective role in preventive behaviour in China. Having a low household income decreases the adoption of prevention in the home. In contrast, having a high household income increases the likelihood of adopting an appropriate level of prevention to prevent Covid-19. However, this has a relative impact on vulnerable groups such as the over 60s and the unemployed. In this case, although there is the stimulating effect of high household income, vulnerable people are at risk of being marginalised and adopting inadequate preventive behaviour as a consequence (Ye et al. 2021). Divergences on the effect of income and economic wealth were found especially in relation to the use of the face mask. In Indonesia, its use is higher among individuals living in households with above-median wealth (Chavarría et al. 2021). Also, in South Africa at the beginning of the pandemic the use of this device was concentrated among the economically affluent. During the second wave, however, differences in the use of this precaution between the affluent and the non-affluent became insignificant. Probably in the second phase of the epidemic the use of the mask has spread across income groups (Kollamparambil and Oyenubi 2021). In Italy, however, a national survey found that people with more financial difficulties were more likely to use face masks (Gruppo Tecnico Nazionale PASSI e PASSI d'Argento 2021).

#### 7. Household

A larger household is associated with greater use of the precautionary measure of handwashing (Kollamparambil and Oyenubi 2021). Also, household size has a statistically significant relationship only with the use of disinfectants. The remaining preventive behaviour analysed in the same study, however, was not found to be influenced by family size. (Lüdecke and Von Dem Knesebeck 2020). On the other hand, small families in China (1-3 persons) are the ones in which prevention in the home is most widely implemented (Ye et al. 2021). Thus, no clear pattern can be observed with regard to family size. However, it was found that if no cohabitee in the household has conditions that put them at risk of developing a severe form of Covid-19, the likelihood of not adopting preventive behaviour increases (Urbán, Paksi, et al. 2021).

#### 8. Territory

In the USA, research was conducted into whether preventive behaviour varied between rural and urban areas. It was found that people living in rural areas were less likely to take preventive measures. In particular, they are less likely to wear a mask in public and to sanitise homes and workplaces (Callaghan et al. 2021). An increased focus on preventive behaviour in urban areas was also found in Indonesia and South Africa (Chavarría et al. 2021; Kollamparambil and Oyenubi 2021). Especially among South Africans, the use of hand sanitisers is increasing among city dwellers. In China, too, urban dwellers pay more attention to both indoor and outdoor prevention (Ye et al. 2021). The studies all agree that in urban areas the focus on prevention is greater. Beyond

this trend, the presence of strong neighbourhood effects for social distancing has also been identified. Maintaining distance cannot be done unilaterally by an individual. This practice has the nature of a public good and requires the cooperation of other individuals to be implemented. Non-adherence therefore has a negative effect on the practice of treble prevention strategies (Kollamparambil and Oyenubi 2021).

## 9. Risk perception

Previous studies on infectious diseases, e.g. HIV/AIDS, have shown that behaviour is influenced by one's own perceived risk in relation to health hazards (Clifton et al. 2016; Kahle et al. 2018). Also in connection with the Ebola epidemic, it was found that the perception of risk is able to influence health behaviour both positively and negatively. A higher perception is associated with preventive and avoidant behaviour (Carlucci, D'Ambrosio, and Balsamo 2020). In fact, risk perceptions is a core concepts in most theories of health behavior such as Protection Motivation Theory (Rogers 1975), the Health Belief model (Rosenstock 1974) and Theory of Planned Behavior (Ajzen 1991). In relation to Covid-19, Risk perception may explain different adherence levels to preventive behaviours (Urbán, Király, and Demetrovics 2021). Yıldırım and colleagues demonstrated that perceived risk is a significant predictor of preventive behaviour. Together with demographic variables such as age, gender and level of education, it explains a significant amount of variance in preventive behaviour. The authors also found that women's self-risk perception (SRP) was greater than that of men (Yıldırım, Geçer, and Akgül 2021). Blair and colleagues also consider that one's personal risk assessment is a determinant of preventive behavioural changes (Blair et al. 2021). Indeed, fear and risk of Covid-19 infection are strongly associated with and predict Covid-19 preventive behaviour (Khosravi 2020). An underestimation of the risk of infection is reflected in an underinvestment in preventive behaviour. Believing that one has a significantly lower probability of contracting the virus or a lack of awareness of the risk of infection play a role in this (Burger et al. 2020). Instead, Clark indicates that that perceiving oneself as vulnerable to Covid-19 may not be a reliable predictor of health precautionary behaviour and compliance (Clark et al. 2020). Self-perception of risk can also be influenced by past experiences, personality traits, emotional state, ideological and belief systems, identity processes and many other factors (Breakwell et al. 2021). Despite this, according to a comparative study between ten countries in Europe, America and Asia, Covid-19 risk perception is significantly correlated with the adoption of preventive health behaviours in all ten nations (Dryhurst et al. 2020). In South Africa, adults in their 40s and 50s and the poor underestimate their risk of contracting Covid-19. Individuals with high household incomes are almost twice as likely to believe that they will contract Covid-19 as those with lower incomes (Burger et al. 2020). Furthermore, Kollamparambil and colleagues indicate that risk perception increases among higher income groups as well as

among educated and older respondents in South Africa. At the level of ethnic groups, the black South African population tends to perceive a significantly lower personal risk than non-blacks. The gap between the black and non-black categories is probably due to the fact that among non-blacks with lower poverty rates there is an over-assessment of risk and at the same time the black African population with a higher poverty rate has an optimism bias. Those living in rural areas reported a significantly lower risk than those in urban areas. This may be caused by a cognitive assessment based on the lower population density compared to urban areas. The idea is that there is less interaction with the outside world and that this reduces the likelihood of acquiring the “*imported virus*” (Kollamparambil and Oyenubi 2021). Overall, during the first wave of Covid-19, 33% of respondents said they felt at risk, while during the second wave 50% said they felt at risk. However, in a sample of Italian respondents aged 18-69 years in a national survey of healthcare providers, 49% felt that they were very (or fairly) likely to fall ill with Covid-19 for themselves or their family members. The risk is perceived more by individuals aged 18-34, perhaps due to the knowledge that they have more social contacts and greater work exposure, by women and among those reporting economic difficulties. Finally, there is no clear link between risk and taking preventive measures (Gruppo Tecnico Nazionale PASSI e PASSI d'Argento 2021) and having had the disease or having tested positive reduces the perceived risk of the disease (Van Loenhout et al. 2021).

We can then conclude that the characteristics that increase exposure to infection due to lower adherence to preventive behaviour are the following: younger age, being male, having a low education, being an immigrant, working in close contact with others, not having cohabitants at high risk of Covid-19 complications, living in a rural area and having a low perception of infection risk. In the next chapters we will describe the field research conducted in 2020 to analyse various elements that may lead to a different exposure to the virus.

## 2 RESEARCH DESIGN

### 2.1 Statement of the problem

Covid-19 disease is an emerging problem that is unprecedented in contemporary history. Scholars around the world have focused on analysing different aspects of the problem since the pandemic began. These have included health inequalities, that are, in other words, unnecessary, avoidable, unfair and unequal differences, which do not depend on biological variation but are due, among other reasons, to lack of choice in lifestyle and working conditions (Whitehead 1992). Different levels of illness and death, if not linked to strictly biological factors but to non-medical factors, are health inequalities. And the non-medical factors that cause these differences, as we have already seen, are the social determinants of health (SDH) (Braveman et al. 2011; CSDH 2008; Nutbeam 1986, 1998; Nutbeam and Muscat 2021; World Health Organization 1998, 2021b, 2021c). As seen in the literature review, the role of health determinants in determining virus-related inequalities has already emerged from the first studies conducted (Ahmed et al. 2020; Bambra et al. 2020; Blundell et al. 2020; Costa and Marra 2021; Fullagar and Pavlidis 2021; Gugiatti 2020; Hoenig and Wenz 2021; Holst et al. 2021; Johnson et al. 2021; Lupton and Willis 2021; Marmot et al. 2020; Prasad et al. 2020; Takian et al. 2020). One of the aspects considered in the literature, which is more important for the purposes of this work, is the diversity of exposure to the virus. Having a different exposure to the virus in fact influences health outcomes because it can facilitate or limit contagion (Blumenshine et al. 2008; Quinn and Kumar 2014; Terraneo 2020). Greater exposure obviously predisposes to a greater likelihood of developing the disease and leads to unequal levels of illness. This paper will not consider differences in disease severity or treatment when infected, although these also relate to health inequalities, but will focus on exposure as the first element in the causal chain leading to differences in health outcomes. As the virus is new to the world everyone is susceptible to the virus, but in reality, exposure to infection is different.

We have seen from the emerging literature that exposure is influenced not only by socio-economic position and stratification factors but also, among other things, by leisure activities, preventive behaviour adopted and the characteristics of the area in which one lives.

With regard to leisure time, we do not believe that the choice to go to certain places is totally free from conditioning because, as Giddens points out in his notion of routinisation (Anthony Giddens 1984a), everyday activities are continually produced and reproduced. Routine is an integral part of the continuity of the agent's personality, of institutions, of society. Activities are thus influenced by the habitual pattern of reflexive control that individuals maintain in circumstances and in living

together. As already seen in relation to lifestyles (Blahoslav et al. 2020) and healthy behaviours (Blaxter 1990; Lucchini and Sarti 2009), also in relation to Covid-19, there may be social characteristics that lead individuals to frequent places that are more or less at risk and thus expose them differently to infection (Bayrsaikhan et al. 2021; Callaghan et al. 2021; Lang et al. 2021; Lüdecke and Von Dem Knesebeck 2020). Also, sociability choices may be a reflection of different lifestyles and social inequalities. Sociability is implicated in exposure to the virus because interacting with people who do not live together can encourage the spread of the virus. The choice of places for leisure and meeting non-cohabitants may also play a role in exposure to the virus (Ooi et al. 2021). Places that are less crowded and outdoors can reduce the risk of infection (EMG – Transmission Group 2021; Weed and Foad 2020) whereas places where people eat and drink such as homes, restaurants, bar, or sport and entertainment facilities can facilitate it (Bayrsaikhan et al. 2021). People especially worry about being infected in places with high public traffic such restaurants, shops or public transport (Gerhold 2020). In fact, when this study was designed, there were few studies on where the infection really took place and the little information was only available through the media, which indicated that crowded places or places where non-residents met were risky. Even today, there are few studies that make comparisons between places of infection (Menichella 2021). This is probably due to the fact that medically it can happen anywhere. However, Maddock and colleagues have highlighted the fact that different leisure activities have different risks of contagion and those who participate in one activity or another tend to have different social characteristics (Maddock and Suess 2021). What Oldenburg (Oldenburg 1999) calls first and third places (homes and restaurants, bars, breweries...) seem to be at higher risk of infection (Bayrsaikhan et al. 2021), whereas outdoor places seem to be at lower risk (Bulfone et al. 2021). In households and public places such as third places the distribution of age groups and contacts between people leads to an easier spread of the disease in these two environments (Liu et al. 2020). Because the pandemic seems to have changed people's habits in order to reduce the risk of falling ill, there might be some categories that attend places of sociability at risk in their leisure time more than others and thus expose themselves more to contagion. There are no studies conducted in Italy that examine who frequents the places most at risk in the midst of a pandemic (closed environments where people eat and drink together with non-cohabitants), analysing the social characteristics of those who, as a result, expose themselves to greater levels of contagion.

The second aspect leading to a different level of exposure that we will focus on is preventive behaviour. These are proximate factors in the disparities in exposure to the virus as demonstrated in the literature review (Quinn and Kumar 2014). Wearing a face mask, taking care with hand hygiene, keeping a distance between people, using preventive criteria for deciding which places to visit are measures that can reduce exposure to the virus and thus the development of the disease. However,

the distribution of these measures is not the same for everyone. The importance of investigating how these preventive measures are distributed in the population has been highlighted in several studies. (Regmi and Lwin 2021; Webb Hooper, Nápoles, and Pérez-Stable 2020; West et al. 2020). In Italy, the first published data on the use of preventive behaviour was published in 2021 and focuses only on mask use (Gruppo Tecnico Nazionale PASSI e PASSI d'Argento 2021). It does not take into account that not all masks have different filtering capacities and that this implies both a different personal protection and a different ability to avoid spreading the virus to others. Tracking the use of spacing and hand hygiene is also currently under-reported. Understanding who is using the different prevention measures is important to understand both who is exposing themselves most to infection and whether these people share certain social characteristics.

Finally, it is important to reflect on the territory because several authors have noted that the contagion in Italy has mainly affected peri-urban areas (Biglieri et al. 2020; Boschi et al. 2021; Casti et al. 2020; Colleoni et al. 2020; Corica and De Vito 2020a; Martellucci et al. 2020; Mugnai and Bilato 2020). Those living in less urban areas tend to take fewer preventive measures (Callaghan et al. 2021; Chavarría et al. 2021; Kollamparambil and Oyenubi 2021; Ye et al. 2021), while there is conflicting data in the literature on who has more difficulty avoiding the most risky leisure places (Callaghan et al. 2021; Lang et al. 2021; Maddock and Suess 2021). Data on the spread of the virus in Italy comparing the various administrative territories are published daily (Dipartimento della Protezione Civile 2021), but there is a lack of studies analysing whether there are differences in these territories with regard to the two aspects considered in this research: sociability and prevention.

The places one frequents in one's free time together with the preventive behaviours adopted and the area where one lives are believed to play an important role in limiting exposure and therefore the spread of the virus. These aspects were fundamental before the introduction of mass vaccination in Italy in December 2020 because only reduced exposure could limit the spread of the virus. But even today, despite having a vaccine available to all thanks to the National Health System, which reduces infections and the severity of the disease among the vaccinated, the lack of attention in behaviour continues to encourage the spread of the infection.

Since the phenomenon is new and the literature on the subject is still underdeveloped, it is therefore necessary to expand knowledge to see whether non-medical factors can be identified in these areas that cause unnecessary, avoidable, unfair and unequal differences that may lead to different health outcomes. The study of socio-economic characteristics that expose people to the virus is not only useful to check for inequalities, but also to be able to define groups at risk and intervene on the causes of inequalities (Lüdecke and Von Dem Knesebeck 2020).

In fact, knowing whether there are differences between those who socialise in the first and third places and those who do not in the middle of a pandemic, between those who use prevention and those who

do not take precautions, whether those who live in urban or rural areas have a higher risk of exposure to the disease is useful both to understand whether there are inequalities in exposure and to have elements to use for communication campaigns and health promotion projects aimed at reducing possible contagions (Maddock and Suess 2021; Vicarelli 2021).

## 2.2 Purpose of the study

When a researcher finds himself examining new groups, processes, activities, situations, but is convinced that there are elements to be discovered within them, he dedicates himself to exploration. The Covid-19 is a new phenomenon whose implications are to be studied and deepened certainly on the basis of past theories and findings but anchored to the novelty of the situation. It is therefore a phenomenon to be explored. In the words of Stebbins

*“[...] exploration is not an obscure, mysterious process available only to a small coterie of insightful intellectual adventurers. On the contrary, anyone with the will to explore can do it, and I am convinced that social science theory would profit enormously were more of its researchers inclined to work in the field of discovery.”* (Stebbins 2001:14).

The present work is part of a quantitative research approach (Corbetta 1999). As this work was conducted in the early stages of the pandemic, the aim is to explore people's behaviour in relation to the prevention measures taken and their exposure to the virus in their leisure time. Indeed, observing and measuring human behaviour is part of a post-positivist worldview. This derives from the twentieth-century positivist tradition and is oriented towards objectively observing and measuring reality. (Creswell and Creswell 2020:25–37). As argued by Phillips and Burbules, knowledge of phenomena in fact takes shape through data, evidence collected from participants in investigations and rational considerations by the researcher (Phillips and Burbules 2000).

This work was designed during a period of profound change due to Covid-19 characterised by the need to stay away and the restrictions on personal travel introduced by the Italian government to address Covid-19 pandemics. As people's habits and behaviours, according to the literature reviewed, are conditioned by social position and structural factors, we are interested in exploring the behaviours in terms of socialisation and adherence to prevention that expose people to the risk of Covid-19. Of particular interest are comparative analyses between groups based on gender, age, socio-economic

position (education, employment, profession) and area in which one lives (province of residence and size of cities).

As the situation is unprecedented, the present work is an exploratory study.

Differences between the various groups are expected to lead to different exposure to the virus, which in turn leads to different levels of disease, thus forming the basis for virus-related health inequalities. A survey will be used to test the existence of different socialization habits and preventive behaviours among people and territorial differences in these aspects.

### 2.3 Research questions and hypothesis

The starting hypothesis is that, as suggested by the literature, there are health inequalities due to different exposure to Covid-19 virus. The different exposure derives, among other reasons, by frequency of risky places and different preventive behaviour adopted. Socio-economic position, stratifying factors (gender and age) and area in which one lives are some of the causes of these different habits and behaviours.

In light of the literature reviewed and the evolution of the pandemic as reported in the media we aimed at answering the following questions:

1. Where does one get Covid-19?
2. Are there differences in the characteristics of people who frequent places that expose them most to infection in their leisure time?
3. Are there differences in the characteristics of those who use prevention to avoid exposure to Covid-19?
4. Which subgroups of individuals share the same preventive behaviors?

The research hypotheses are:

1. People fall ill mainly in workplaces, home and leisure places (places where they eat and drink with non-cohabitants).
2. The categories that frequent places at risk more in their leisure time (homes, restaurants, bars, and other convivial places where people drink and eat together) are the same categories that are less attentive to prevention according to previous prevention literature (men, young people, less educated, workers, less qualified professions, those living in rural areas).
3. There are differences in the use of prevention. Men, young people, less education, less qualified professions, people living in peri-urban/rural areas use fewer preventive measures. There is less prevention at home.

4. There are subgroups of individuals who share the same preventive behaviours and probably differ according to the characteristics outlined above.

## 2.4 Research Methods

### 2.4.1 Data collection

#### 2.4.1.1 Questionnaire development

Although aware of the advantage and disadvantages of an online questionnaire (Wright 2005), in an age of mobility restrictions and the need to be isolated, an online survey seemed the most appropriate way to investigate the desired aspects.

Since the topic was new and there were no validated questionnaires to investigate the survey topics, it was decided to construct an ad hoc questionnaire called "Covid-19 and places frequented".

We started by analysing already available questionnaires oriented to investigate people's behaviour and habits in relation to Covid-19. First, a literature review was carried out using Web of Science using "Covid-19" and "questionnaire" or "survey" as key words. Most of the studies published about 6 months after the declaration of the pandemic concerned were related to psychological impacts, knowledge and attitudes or lockdown aspects. Three studies were identified that dealt with Covid-19 prevention. The first included questions on behaviours such as disinfecting things and avoiding coughing around people which were reductive to the aspects they wanted to investigate (Taghrir, Borazjani, and Shiraly 2020). The second focused on the behaviour of 57 Macanese who returned by charter flight from Wuhan when the outbreak was still contained and tested negative after the 14-day quarantine imposed by their government. The use of masks was investigated, along with hygiene practices and number of meal gatherings per month (Lio et al. 2020). The third question included one on hand washing at work (Papagiannis et al. 2020).

Also, an online search was conducted using the Google search engine and the keywords Covid-19 and questionnaire or survey. The first 10 pages of results were analysed for relevance to the research project. The content of the results had little relevance to the topic of interest. Many results were related to aspects of Covid-19 that were not of interest for the research: health status, other epidemiological aspects (medication taken, symptoms, seroprevalence), employee safety, impacts of the blockade, eating habits and stress.

In addition, a number of questionnaires circulating in the months leading up to October 2020 were identified, prepared from reliable sources for international panel surveys. Some surveys were oriented towards investigating aspects not relevant to the objective of this research, such as government

authority, legitimacy during the pandemic, belief in conspiracy and compliance with government regulations (European Social Survey 2020), living conditions during the lockdown (FORS Swiss Centre of Expertise in the Social Sciences 2020). Some had common points of interest, but were developed in a different way to that desired for the creation of the questionnaire for this survey. For example, Understanding Society, the UK longitudinal household study, collected data on household composition, coronavirus disease, long-term health management, loneliness and employment. (Understanding Society UK Household Longitudinal Study 2020). The questionnaire prepared by Sozio-ökonomischen Faktoren und Folgen der Verbreitung des Coronavirus in Deutschland (SOEP) had some irrelevant questions. However, there were some questions on behaviour, health, social life, networks and social cohesion that were used as a starting point for the construction of the ad hoc questionnaire (Sozio-ökonomischen Faktoren und Folgen der Verbreitung des Coronavirus in Deutschland 2020). The SHARE Survey of Health, Ageing and Retirement in Europe Covid-19 (SHARE Survey of Health Ageing and Retirement in Europe 2020) not only asked specific questions about health behaviour and the practice of safety measures (e.g. social distance by wearing a mask), but there was also an Italian version of the questionnaire. However, there were two main limitations of this questionnaire: the target population was over 50 years old and it was constructed to collect data during lockdown. Questions on behaviour are therefore not adequate to investigate prevention at a stage when it was possible to encounter non-cohabitants.

Through a google search (key words “prevention” or “mask” or “social distance” and “Covid-19”) aimed at finding questionnaires on preventive behaviour, a number of questionnaires produced by university organisations or other research groups were identified. The most interesting for this research were two questionnaires on the use of the mask: “PreventEpidemics.org” by Vital Strategies e Johns Hopkins Bloomberg School of Public Health (Vital Strategies 2020), and Washington University in St. Louis “Covid-19 Social Distancing Survey” (Washington University in St. Louis 2020).

A number of Italian-language questionnaires used in surveys by various national agencies to study Covid-19 were also examined: “Sars-Cov-2 seroprevalence survey”. (Istituto Nazionale di Statistica 2020b), “Epidemiological survey of Sars-CoV-2 positive health workers” (Istituto Superiore di Sanità 2020b), “Health workers exposure risk assessment and management in the context of Covid-19 virus” (Italian version) (World Health Organization 2020a), and “ Covid-19: Risk perception and prevention” (IRCCS Ospedale San Raffaele 2020).

In the surveys analysed, little importance was attached to the behaviour of daily life and the places frequented. These elements had to be considered because they were linked to the transmission of diseases. It was therefore decided to analyse the multi-purpose surveys of the National Institute of

Statistics (ISTAT) to see how the Institute detected some of these concepts. As part of the integrated system of social surveys (Multiscope Household Surveys), in 2015 ISTAT carried out the survey "Citizens and Leisure" (CTL) (Istituto Nazionale di Statistica 2019). Section 11 of the questionnaire analyses relationships with people and investigates the places frequented and the activities carried out. Section 23 explores the use of time for oneself and for others and in particular the activities carried out in one's free time. This articulation was considered to be of particular interest for the purpose of this work. ISTAT questionnaires from the population census were also analysed to identify any previously used questions that might be useful for this research. (Istituto Nazionale di Statistica 2009).

The questionnaire "Covid-19 and places frequented" was constructed on the basis of the objectives of the research project, by including questions taken entirely from or modified in the questionnaires analysed. In particular, for the places visited in leisure time, questions from the National Statistical Office survey "Citizens and Leisure (CTL)" were used (Istituto Nazionale di Statistica 2019). The question on encounters with non-cohabitants was borrowed from the Understanding Society questionnaire. The questions on risk perception and disease are taken from the San Raffaele, Vital Strategies and Understanding Society questionnaires (IRCCS Ospedale San Raffaele 2020; Understanding Society UK Household Longitudinal Study 2020; Vital Strategies 2020). Questions on preventive behaviour were taken from the Vital strategies questionnaire and "Covid-19 Social Distancing Survey" (Vital Strategies 2020; Washington University in St. Louis 2020). Socio-demographic data were collected using questions from the questionnaire used by ISTAT for the census. Recommendations of the "Effective Communication in Outbreak Management: development of an evidence-based tool for Europe" recommendations (ECOM 2015) have been taken into account when drafting the questionnaire (Istituto Nazionale di Statistica 2009). Rules on wording outlined by Corbetta were also taken into account when formulating the questions not taken from existing questionnaires such as the question on risk perception in different territorial contexts (Corbetta 1999:174–223)

The questionnaire "Covid-19 and places frequented" is divided into seven sections:

1. Places and activities attended before the end of October 2020
2. Interpersonal relationships before the end of October 2020
3. Activities, places and covid-19 risk
4. Behaviour
5. Covid-19 disease
6. Housing situation
7. Socio-demographic information

Each section is constructed to investigate different aspects in relation to the Covid-19 pandemic. Most are closed-ended questions with ordered choices. In two cases partial closed questions were formulated in which the respondent was asked to compare the possible answers and select one, or write “other”. This possibility was left because no studies were found in the literature which had already examined places considered to be at risk. Therefore, we wanted to see if places emerged that were not considered in the formulation of the questionnaire. In reality the option often was used more to deepen a concept often already included in the options provided and did not provide useful elements for the analysis. Three matrices were used to merge questions whose answer categories were the same. Multiple-choice format was used to detect the preventive criteria used to choose the places to go, the places and activities considered to be at risk of Covid-19, the urban dimension considered to be most at risk of Covid-19, the face masks used, the preventive measures adopted inside and outside house.

In order to make questionnaire more appropriate to the situation, after having outlined the overall structure, we proceeded with the drafting of several drafts shared with scholars on the subject of inequalities and tested the modifications made each time. The version finally adopted (annex 1), although still subject to change, represents the best compromise between the need to get out quickly to capture the situation in a precise historical context: the beginning of the second wave of Covid-19.

#### *2.4.1.2 Recruitment strategy*

The online questionnaire, created using the LimeSurvey© online survey tool, was distributed from November to December 2020 through various internet channels to reach as many people as possible. Social networks such as Facebook and Instagram were the main channels used. In Italy, according to data from the Italian Communications Guarantee Authority, there were 43 million Italians connected to the internet on an average day in June 2020 on a population of about 60 million inhabitants (including infants and over 90s). According to the audience of the main social networks by unique users, Italians on Facebook were 36.9 million in June 2020. (AGCOM Osservatorio sulle Comunicazioni 2020). Given the spread of Facebook in Italy, it was felt that through its use it was possible to reach many people with different characteristics. Using Facebook has been shown in pandemic context to be an effective and efficient way to collect data even though there is lower uptake by men in participating in the survey which needs to be addressed by adopting appropriate additional strategies to engage men (Ali et al. 2020).

To engage people Facebook groups based on the membership of a certain territory (e.g., You know you are from “City/Town name” if...) were used because they are likely to include people from

different social groups who live in the same territory. Permission was sought to publicise the research to all groups in the Italian provincial capitals, reaching at least one group in each territory. Not knowing whether the questionnaire would have a good response rate, it was initially distributed throughout Italy. Later, some provinces were then chosen where the questionnaire could be disseminated in a more capillary because they had responded in an important way since the beginning of the dissemination of the questionnaire. All the facebook groups of the municipalities used in the summer of 2020 by ISTAT and the Ministry of Health for the survey on the seroprevalence of the Sars-Cov-2 virus infection in Italy (Istituto Nazionale di Statistica 2020b) of the Lombardy, Veneto e Trentino regions were contacted. In order to be able to publish the research in the groups, it is necessary that the registration of one's profile with the administrator of the group is approved and, in many cases, that the news one wants to publish once part of the group is also approved. There was a good willingness on the part of the administrators to encourage the dissemination of the questionnaire. Some groups which do not accept people who are not resident in their territory or which, although they have a territorial basis, have a specific topic (e.g., exchange/sale of objects in a territory) granted an exception to the researcher allowing her to join the group and highlighted the link to the questionnaire. In few cases, it was not possible to enter the groups or contact the group administrators. In tandem a local online newspaper spread the initiative through its web pages and several local associations were involved to disseminate the questionnaire among the categories that less were participating in the survey (men and over 65 years old). Elderly people's associations such as AUSER or sports clubs or vespa clubs or sport clubs were involved for this purpose. The associations dedicated to elderly people printed paper copies of the questionnaire and handed them out to their members, who then entered them in the Limesurvey portal in order to favour the adhesion of the over people not connected to Internet. This combination of approaches aimed at ensuring maximum variation in the sample in terms of key demographic and socioeconomic factors.

Given the good participation of the participants, it was then decided to limit the study to five provinces in order to better compare any territorial differences.

The choice fell on two provinces in Lombardy (Bergamo and Monza e Brianza), two in Veneto (Padua and Treviso) and Trentino. Although a detailed discussion of the socio-economic characteristics of these provinces is beyond the scope of this manuscript, the economic, social and environmental indicators of the Fair and Sustainable Welfare (Bes) information framework implemented and developed by ISTAT since 2010 confirm the well-being of these Italian provinces (National Institute of Statistics 2019). Bergamo and Padua are the provinces with the largest number of inhabitants, Monza-Brianza and Treviso have a similar number of inhabitants while Trentino is the least numerous province (Table 1).

Table 1: Population, area and population density

	Province				
	Bergamo	Trento	Treviso	Padua	Monza and Brianza
Population	1,108,126	545,425	883,522	933,700	870,193
Area (km)	2,754.86	6206,87	2,479.8	2,144.12	405.41
Density	401	87	355	435	2,146

Source: (Istituto Nazionale di Statistica 2020a).

There is a territorial difference based on the urban and rural classification of these territories. The Lombard provinces analysed are mainly urban while those in Veneto have an intermediate degree of urbanisation. Trentino has a lower degree of urbanisation than the previous ones (Istituto Nazionale di Statistica 2017). At the health level, the health systems of the provinces considered and that of the Autonomous Province of Trento guarantee the application and respect of the Essential Levels of Care (LEA) guaranteeing the universalism of the levels of care (Vicarelli 2021:26). Although the five provinces involved in the survey are similar even if with a different distribution of urban and rural areas, these territories had two markedly different epidemics. In the provinces of Lombardy and Trentino during the first wave there was an exponential development of the infections with a rapid rise in the epidemic curve followed by a slow descent of the peak. In Veneto, on the other hand, the curve was flatter (Boschi et al. 2021). Bergamo was the fourth Italian province in the top ten for the incidence rate of Covid-19 in the first six months of the pandemic. According to the analysis, the worst performers were Cremona, Piacenza and Lodi, which are the group of provinces with the highest incidence per Covid-19 population. Bergamo and Monza-Brianza, which we will simply call Monza, are in the second group with the highest incidence. Next is the group to which Trentino belongs. Finally, there is the group to which Padua and Treviso belong (Martellucci et al. 2020). The difference between Veneto and Lombardy has been traced from the outset to the presence of two different health care systems (Mugnai and Bilato 2020). The first is configured as one more attentive to territorial medicine, with a community policy while the second as "hospital-centric", with an individual, curative and hospital policy (Busilacchi and Toth 2021) (Vicarelli 2021). Certainly, territorial management with extensive use of testing contributed to slowing the Covid-19 pandemic in Veneto, but other differences may also have contributed to the different outcome (Mugnai and Bilato 2020) (Gabutti et al. 2021). As of 31 October 2020, the incidence in the different provinces was 1.7% in Bergamo, 2.1% in Monza, 1.7% in Trentino, 1.2% in Padua and 1.3% in the province of Treviso (Dipartimento della Protezione Civile 2021). The differences found in the territory with

respect to urban rural distribution (Istituto Nazionale di Statistica 2017), the spatial proximity of Monza and Bergamo to the metropolis of Milan and the different spread of the Covid-19 pandemic during the first wave and a high response rate to the survey of the inhabitants of these provinces are the reasons why it was decided to carry out the analysis of the data collected in these areas. The idea, as seen in the literature, is that peri-urban areas are more likely to adopt risky leisure and behavioural habits. Since Trento, Treviso and Padua have a lower degree of urbanisation than Bergamo and Monza, it is considered important to compare these provinces.

#### 2.4.1.3 Sample

The analysed sample consisted of 5305 cases and 78.6% of the respondents stated that they were women. They identify with the male gender 21.3% while 0.2% declared not to identify themselves in a binary definition. The respondents are aged between 16 and 89 years and are divided into the different age groups as visible in table 2. The most represented age group is therefore the one between 30 and 60 years old, in coherence with the users of social networks.

*Table 2: Respondent age groups*

		Frequency	Valid percentage
Age groups	Under 18 years old	14	0.3
	18-29 years	769	14.5
	30-39 years	1235	23.3
	40-49 years	1470	27.7
	50-59 years	1120	21.1
	60-69 years	578	10.9
	70-79 years	111	2.1
	80 e più years	8	0.2
	Total	5305	100.0

In the sample, 13.2% had eighth grade diploma or no qualification at all, 51.9% had a high school diploma, 29.1% had a degree and 5.8% had a postgraduate qualification (doctorate or master). Only six people did not want to indicate their educational qualification (0.1%).

Residents of Lombardy represent 25.7% of the sample, Venetians represent 66.6% and Trentino 7.7%. 542 questionnaires were collected in Bergamo (10.2% of the sample), 819 in Monza (15.4%), 545 in Padua (10.3%), 2988 in Treviso (56.3%) and 411 in Trento (7.7%). Almost half of the respondents (48.9%) live in municipalities with less than 10,000 inhabitants while 25.8% live in towns with between 10,000 and 20,000 inhabitants. 17.8% stated that they live in municipalities between 20,001 and 50,000 residents. In larger municipalities 7.4% of the respondents live: 3.9%

reside in towns with more than 50,000 to 100,000 residents and 3.5% in urban centres with more than 100,000 residents.

At the level of occupational status, 71.9% are employed, capital income holders are 0.3%, pensioners represent 8.9% of the sample, and housewives/househusbands 9.2%. 5.1% are unemployed while students are 4.7% of the respondents. Among the employed, the most common occupations are executive in office work and skilled in commercial activities and services. 183 people did not want to indicate their profession (3.4%). Three occupational groups are the least represented: Armed forces (0.5%), Plant operator, stationary and mobile machinery workers and vehicle drivers (1.2%) and Legislator, entrepreneur, senior management (2.6%). Executive profession in office work is the most represented group in the sample (28.8%) followed by Skilled occupation in commercial and service activities (20.3%) and Intellectual, scientific and highly specialised profession (17.9%). Among workers, 43% of those employed have a job in contact with the public while 12% of the sample are or have been health workers. A complete overview of variables considered, including socio-demographic ones, is displayed in annex 2.

#### 2.4.2 Data analysis procedure

As a consequence of the research questions, descriptive statistics will be used to enable the reader to orientate himself with respect to the historical moment in time when the data were collected and to explore new phenomena arising from the pandemic situation. Data on places of infection, respondents' perceptions of the risk of infection in different urban and non-urban areas and perceptions of activities and places at risk will be analysed. The objective is to understand where people get sick and what is the perception of respondents.

Frequenting eating and drinking places that are indoors and crowded increases the likelihood of exposure to the virus. To verify the existence of different habits in frequenting leisure places for sociability with non-cohabitants according to the social characteristics of the respondents and the territory in which they live, the data on the frequency of the different places and the perception of crowding will be analysed. In order to reduce the number of variables about dating and sociability places and thus make the results more readable, factor analysis (principal component method) will be used to extract a reduced number of factors summarising the variables used. The factor scores will be obtained using regression method that transforms the variables into standardised scores (De Lillo et al. 2007:91–129). Factor scores and the variable perception of crowding in places frequented will be analysed. The independent variables considered will be gender, age, level of education, occupation, self-risk perception, province and size of the municipality of residence. Comparison between two

groups will be performed using Student's t-test or one-way analysis of variance (ANOVA) will be used to compare more than two groups based on the distribution of variables. After performing the ANOVA and obtaining a significant F-statistic, the Scheffe test will be performed as post hoc because it offers the advantage of performing complex comparisons that involve comparing more than one pair of means simultaneously (Soliani 2008:89–94).

In order to identify differences in the characteristics of those who use prevention to avoid exposure to Covid-19, as the topic is new, a descriptive analysis of preventive behaviours (face masks used, prevention in and out of the home and preventive criteria adopted to choose places to visit in leisure time) will be conducted initially. We will then focus on mask use as an element in assessing the presence of social differences in the use of prevention because it is the preventive behaviour that is most important in preventing the spread of the disease as demonstrated by the government's decision to mandate the use of surgical masks or FFP2 in some settings (DPCM 7 August 2020; DL 7 October 2020, n. 125; DL 24 December 2021, n. 221). The different face masks used will be taken into account and a typology will be created based on the effectiveness of the masks used. Each type will be given a score indicating the level of preventive effectiveness. To assess social differences in prevention based on the face mask used, t-test, ANOVA and Sheffe test will be used. Gender, age, educational qualifications, occupation, profession, self-risk perception, province and size of the municipality of residence will be used as independent variables (annex 3).

To create a profile based on the preventive behaviours adopted by the survey participants, a TwoStep Cluster Analysis (TSCA) will be used. TSCA was developed by Chiu, Fang, Chen, Wang and Jeris and presented at the 7th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining 2001. It was created to analyse large datasets and to use a mix of quantitative and qualitative variables. (Bacher, Wenzig, and Vogler 2004). TSCA is an exploratory tool designed to reveal natural clusters within a dataset that would not otherwise be evident. (IBM Corporation 2016b). The procedure uses a measure of likelihood distance. It assumes that the variables in the cluster model are independent and that the categorical variables have a multimodal distribution. Even if the independence and distributional assumptions are violated, the procedure is robust. (IBM Corporation 2016a). The TSCA is widely used in different fields and is often used to analyse various health issues, to differentiate respondents according to behavioural variables and to differentiate patients according to demographic and territorial characteristics. (Tkaczynski 2017:113). For example, TSCA has been applied to analyse health behaviours such as eating habits (Honkanen 2010; Hu, Woods, and Bastin 2009), also in relation to changes induced by the pandemic (Russo et al. 2021), drug use (Fleury et al. 2014; Mason and Korpela 2008), physical activity (Rundle-Thiele et al. 2015) and individual differences in the face of the Covid-19 pandemic (Bernabe-Valero et al. 2021).

TSCA is widely used in studies on health behaviour, it is largely effective in the analysis of large datasets and can use both continuous and categorical variables. Furthermore, as the problem of Covid-19 prevention is a new topic and there is no consolidated data on preventive behaviour used yet, it was decided to use TSCA with the aim of finding this number of profiles. For the selection of the best cluster division, the BIC method will be used because it is reliable in large samples. In order to maximise intra-group cohesion and inter-group separation based on the level of prevention implemented by the respondents the choice of variables to be used among those present in the database was made using the importance of the predictor in the formation of the clusters.

The categorical variables used for the cluster are:

- use of the mask in the home in the presence of non-cohabitants
- distance of at least one metre from non-cohabitants in the house
- ventilating the room in the presence of non-cohabiting persons
- no encounters with non-residents in the house

The continuous variables used for the cluster are:

- number of preventive behaviours adopted outside the home;
- number of preventive criteria adopted when choosing public places to go to during leisure time.

Categorical variables are all dichotomous. Continuous variables range from -1 to 5. A higher number of criteria used is considered to correspond to a higher level of prevention both inside the home, outside the home and in choosing leisure places.

The composition of the clusters will then be investigated explored in terms of masks used, nose coverage, self-risk perception, gender, age, level of education, occupation, profession, work in health care, province of residence, city size of residence, characteristics of cohabitants, Covid-19 patients to identify differences in the behaviours adopted. The Pearson Chi-Square will be used to highlight significant differences.

Statistical analysis will be performed using the SPSS 27 statistical package (SPSS©, Chicago, IL, USA). To increase the reliability of the analysis, we will set the significance level at 0.05.

The possibility of using weighting cases option to assign weight to the cases in the dataset has been assessed. Some tests were carried out both with and without weights. In both cases, a substantial similarity between the results of the statistical analyses was noted. For this reason, it was decided to provide a representation of the data without the use of weights, maintaining a realistic view of the sample since non-probabilistic sampling does not allow an inference to be made about the entire universe, but only about the sample under investigation. However, it is possible to carry out explorations that will allow research to progress in areas of pandemic that have not yet been explored in depth.

## 2.5 Ethical issues

This research complies with the principles outlined in the code of ethics of the Italian Sociological Association (Associazione Italiana di Sociologia 2013). Participants were required to sign a written informed consent to participate in the study. Failure to do so prevented them from completing the questionnaire. The participants provided their written informed consent to participate in this study according to the regulations in force. To ensure the privacy of respondents, neither the IP address nor the referrer URL were recorded. There is no way of tracing the identity of the person who completed the questionnaire. In order to participate in the interviews, participants were also asked to sign an informed consent form and to give their willingness to be registered. Without these two preconditions the interview could not proceed. No one refused to take part in the research. Participation was voluntary and free from coercion or pressure. Confidentiality and anonymity were respected.

## 3 RESULTS

### 3.1 Contagion and places

The introductory descriptive analysis is intended to enable the reader to orientate himself with regard to the historical moment in time when the data were collected. The pandemic continues to evolve and the different epidemic waves are being characterised differently.

During the first wave of the pandemic (February-June 2020) there was a very rapid increase in the epidemic curve, while in the second wave (September 2020) the curve increased less rapidly (Battiston 2020). The first wave mainly involved healthcare workers and residents in nursing homes (Chirico et al. 2021; Chirico and Nucera 2020), also because the lockdown had limited population movement. During the first wave of the pandemic (February-June 2020) there was a very rapid increase in the epidemic curve of hospitalised persons, while in the second wave (September 2020) the curve increased less rapidly. The first wave mainly involved healthcare workers and residents in nursing homes, partly because the lockdown had limited the movement of the population. The second wave, on the other hand, thanks also to the availability of personal protective equipment (PPE) not always available in the first wave for healthcare workers (Catania et al. 2021; Felice et al. 2020) and the reopening of economic activities and schools, started to be more widespread in the general population from the beginning (Chirico et al. 2021). Between the first and second waves a number of rules introduced to limit the spread of the disease were relaxed. During the summer, the ban on leaving the municipality of residence except for special needs, the night curfew, a maximum number of four non-cohabiting persons sitting at the same table in bars and restaurants, and the requirement to wear a mask outdoors were lifted. During the summer, the number of cases remained constant and then began to rise again during the period in which this questionnaire was administered. In fact, in late August and early September, infection data began to indicate that we were at the beginning of the second pandemic wave, which would lead to Italy being divided into zones of different colours according to the pandemic situation. Lombardy, Trentino and Veneto, the regions in the provinces examined in this paper, would enter the yellow zone towards the end of the year, imposing restrictions on travel and meetings with non-residents. The data we will now describe were collected at a stage when little was known about the phenomenon.

The literature on the subject was still scarce and consisted mainly of articles focusing on the medical aspects of the problem and on considerations with a few data describing the situation of health inequalities and inequalities of exposure to the virus. For this reason, it was necessary to collect data

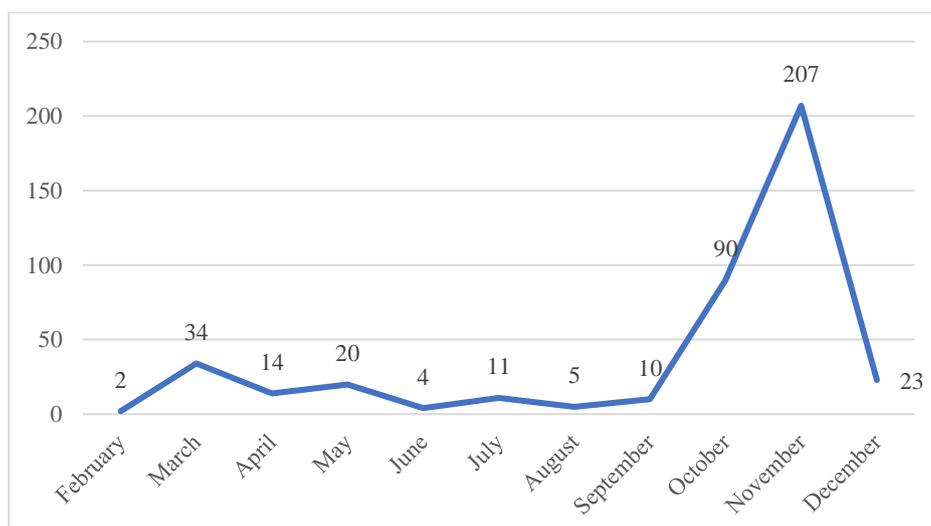
to describe the spread of the virus with a non-medical view of the problem by focusing on people's social characteristics, preventive behaviour and perception of risk. In this part, we will focus in particular on the description of contagion, in particular on places of contagion, perception of places and urban dimensions at risk of contagion and self-risk perception according to the opinion of the respondents. This exploratory part will make it possible to describe the pandemic situation and the perceptions of ordinary people and then to better reflect on the habits detected through the questionnaire with regard to leisure time and preventive behaviour adopted.

### 3.1.1 Places of contagion

In the sample 81.1% respondents directly knew someone who had become ill with Covid-19 and 20.1% had directly experienced quarantine or isolation due to the risk of infection. Symptoms related to Covid-19 such as fever, cough, difficulty in breathing, altered taste and smell, runny nose, sore throat and diarrhoea were experienced by 18.1% of respondents.

About half of the sample (49.2%) had undergone diagnostic tests for Covid-19 by December 2020 and 7.9% tested positive for the virus (418 people). 0.2% were still waiting for the test results on the date the questionnaire was completed. The administration of the questionnaire was suspended at Christmas 2020 and the lower number of positives found in December may be due to the lack of technical time to develop the infection, undergo the test and receive the result. The analysis of the epidemiological curve constructed with the data collected from the questionnaire clearly identifies two epidemic peaks: March and November 2020 (figure 15), as in fact happened in reality on the basis of the data provided by the Civil Protection Department (Dipartimento della Protezione Civile 2021).

Figure 15: Covid-19 cases in sample



No gender differences were found among the Covid-19 when analysing the percentages of positives, while the influence of the age variable was evident: as age increases, the number of sick people decreases. Young people under 30 (9.6%) fell ill more than adults (8.2%) and the over 60s (4.3%). High-school graduates (8.6%) fell ill more than university graduates (7.7%) and those with an eighth-grade education (5.6%). Among the professional categories, the employed (8.7%) have come into contact with the virus more than the other groups. Students are the next category with the highest percentage (7.6%). Capital income recipients also had a similar percentage, but the figure is influenced by the size of the category (13 people in total, of whom one was infected with Covid-19). 6.8% of homemakers and only 3.4% of pensioners tested positive. Among workers, the highest number of sufferers is recorded among the armed forces (table 3). All lower-skilled occupations have higher rates than the other groups, except for the group of plant operators, fixed and mobile machinery operators and vehicle drivers. These are jobs that are often carried out alone and lead an individual to spend working hours without contact with other people. This certainly exposes one to less risk of contagion than other occupations that interface with users and customers constantly, such as craftsmen or shop assistants.

Table 3: Covid-19 cases and profession

	Legislator, entrepreneur, senior management	Intellectual, scientific and highly specialised profession	Technical profession	Executive profession in office work	Skilled occupation in commercial and service activities	Craftsman, skilled worker and farmer	Plant operator, stationary and mobile machinery workers and vehicle drivers	Unskilled occupation (in commerce, services, domestic, leisure and cultural activities, agriculture, animal husbandry,	Armed forces	Total
No Covid-19 cases	90	595	387	958	664	309	43	246	20	3312
	94.7%	91.8%	91.9%	91.7%	90.2%	90.6%	95.6%	90.4%	87.0%	91.3%
Covid-19 cases	5	53	34	87	72	32	2	26	3	314
	5.3%	8.2%	8.1%	8.3%	9.8%	9.4%	4.4%	9.6%	13.0%	8.7%
Total	95	648	421	1045	736	341	45	272	23	3626
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

At the territorial level, the respondents in the Veneto region had a lower percentage of positive Covid-19 than in the other provinces. In Treviso 6.3% of the sample declared to have contracted Covid-19, in Padua 7.7%, in Monza 10%, in Bergamo 10.1% and in Trento 12.4%. In reality, the percentages do not correspond to those recorded in the five provinces analysed. The incidence of disease in 2020

was 2.5% in Bergamo, 4% in Trento, 5.6% in Treviso and 3%, 5% in Padua and 5.5% in Monza (Dipartimento della Protezione Civile 2021).

According to the questionnaire data, larger towns are more affected (9.4%), although municipalities with fewer than 10,000 inhabitants do not have a lower percentage of Covid-19 test positives (8.2%). Similar lower percentages are recorded among the inhabitants of towns with between 10,000 and 20,000 inhabitants (7.4%) and between 20,001 and 50,000 (7.6%). The municipalities where there are the fewest sick people among the respondents are those between 50,000 and 100,000 (4.9%).

At the population level, no relationship emerged between the number of cohabitants and the number of Covid-19 positives. In the sample 46% of Covid-19 cases do not know where the infection occurred. This percentage is consistent with data from epidemiological surveys conducted during the same period in Italy (Signorelli et al. 2020). This undoubtedly demonstrates a difficulty in reconstructing the places of contagion, but it nevertheless makes it possible to analyse the settings most at risk of contagion. According to the answers of the sample under analysis, the places most at risk are homes (43.9%) and workplaces (37.2%). Important sites of contagion in the autumn of 2020 were also third places (bars, taverns restaurants and similar public places 6.7%) and healthcare settings such as hospitals (4.5%). The other places considered played a less important role and in total accounted for 7.6% of the settings where the virus circulated. These included schools and universities, residential communities, sports facilities, community centres, shopping venues, beauty salons, hotels, city halls and public and private transport. Women fall ill more than men at home (46.7% and 32.6%) while the opposite occurs in the workplace (35.6% and 44.2%) and in the residual category other (6.7% and 11.6%). The difference by age is statistically significant. At home the over 30s fell ill more (46.7% under 60 and 46.2% over) than the young (31.7%). In the workplace, under-30s and adults up to the age of 60 (39%) contracted the virus in equal proportions, while the percentage fell among older people (7.7%). In hospitals, as age increases, the number of people contracting the virus increases (0% among young people; 5.3% among adults and 7.7% among the elderly). The under-30s fall ill more in third places (17.1%), but this setting is also important for the over-60s (15.4%). Adults, on the other hand, get infected less in bars and restaurants (3.6%). Middle-aged people are also less likely to fall ill in the other places considered (5.3%). The elderly, who in 23.1% of cases contracted the virus in these situations, and young people, on the other hand, stated that they fell ill more in these places (12.2%).

As the education increases, there is an increase in cases in the workplace (25% with the third grade, 36.2% with the diploma and 41.3% with the degree). Graduates tend to have higher percentages at home (45.7%) and in third places (8.7%) than those with lower degrees (43.8% and 0%) or higher degrees (41.3% and 5%). Those with the lowest educational qualifications contracted the virus in

hospitals (12.5%) and other places (18.8%) more than the other groups. High school graduates and university graduates were infected 2.4% and 6.3% in health facilities and 7.1% and 6.3% in other settings. At the level of occupational status, differences are noted. The employed fall ill more than the other categories at work. At home, the infection affects homemakers more (62.5%) and similarly employed people (43.5%), unemployed people (37.5%) and pensioners (40%). Students contracted the virus less at home (33.3%), but they were the category that fell ill the most because they frequented third places (33.3%) and other places (33.3%). Just as noted in the analysis of age, third places proved to be at risk of infection especially for the younger and older categories. Pensioners contracted the virus in this setting in 40% of cases. Workplaces were indicated as the setting of contagion mainly by technical professions (table 4). Intellectuals, tradesmen, service providers and craftsmen also contracted the virus in significant proportions at their place of work.

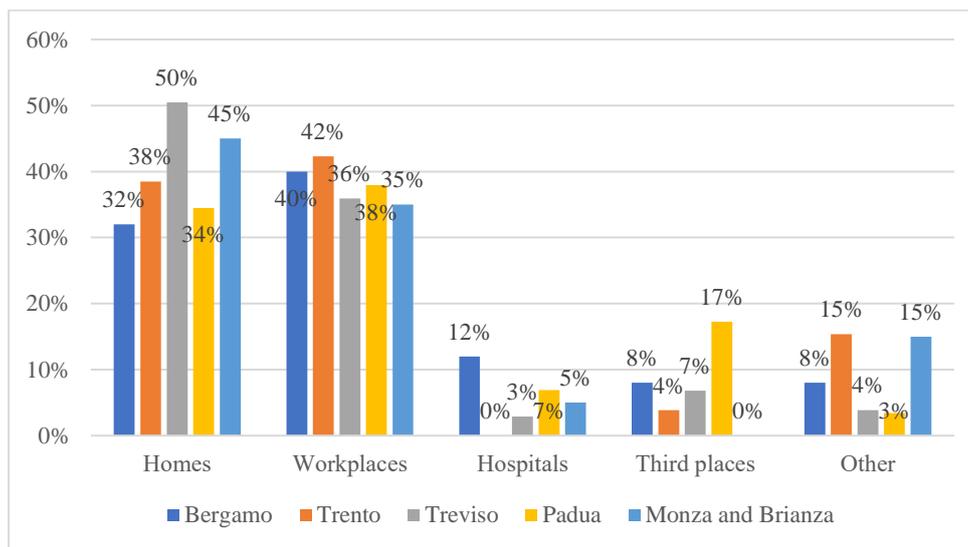
Table 4: Exposure locations and profession

	Legislator, entrepreneur, senior management	Intellectual, scientific and highly specialized profession	Technical profession	Executive profession in office work	Skilled occupation in commercial and service activities	Craftsman, skilled worker and farmer	Plant operator, stationary and mobile machinery workers and vehicle drivers	Unskilled occupation (in commerce, services, domestic, leisure and cultural activities, agriculture, animal husbandry,	Armed forces	Total
Homes	1	11	5	23	20	8	1	7	0	76
	50,0%	33,3%	29,4%	50,0%	43,5%	47,1%	100,0%	63,6%	0,0%	
Workplaces	0	18	11	13	22	8	0	3	1	76
	0,0%	54,5%	64,7%	28,3%	47,8%	47,1%	0,0%	27,3%	100,0%	
Hospitals	1	0	0	2	0	0	0	1	0	4
	50,0%	0,0%	0,0%	4,3%	0,0%	0,0%	0,0%	9,1%	0,0%	
Third places	0	2	0	5	2	0	0	0	0	9
	0,0%	6,1%	0,0%	10,9%	4,3%	0,0%	0,0%	0,0%	0,0%	
Other	0	2	1	3	2	1	0	0	0	9
	0,0%	6,1%	5,9%	6,5%	4,3%	5,9%	0,0%	0,0%	0,0%	
Total	2	33	17	46	46	17	1	11	1	174

Among Covid-19 cases, those who work in contact with the public fell ill at work in 52% of cases, while those who do not interface with users or clients in 25% of cases. In addition, healthcare workers contracted the virus at work in 61.2% of cases compared with 30.5% of those who were not.

At the territorial level there is no relationship between the size of the municipality of residence and the place of infection. In spite of this, the provinces of Veneto are characterised by a higher percentage of Covid-19 who declared to have fallen ill at home, especially in Treviso, and in third places (figure 16).

Figure 16: Exposure locations and province of residence



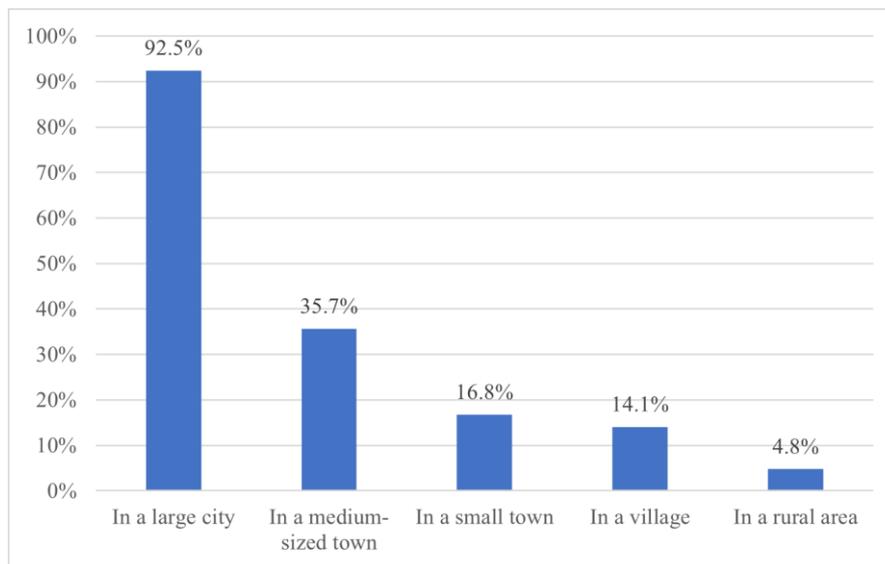
Respondents from Trentino have high percentages in both workplace and other types of contagion. The Lombardy provinces also have high values of this type. In all provinces, homes and workplaces are the most important sites where infection occurs. Third places, albeit with territorial differences, are still an important place where contagion occurs. Given that occupational exposure is related to structural conditions that cannot always be changed by individuals, as we shall see it is important to focus on places where individual choices can facilitate or make exposure to contagion more difficult.

### 3.1.2 Respondents' perception of urban risk perception

A multi-answer question asked respondents' perceptions of the risk of falling ill with Covid-19 in relation to the size of the context: large, medium or small city, village and rural area. Among the respondents, 62.3% indicated only one answer, 23% indicated two dimensions, 4.8% three, 4.9% four and 4% indicated all possible dimensions. 62.3% indicated only one answer, 23% indicated two dimensions, 4.8% three, 4.9% four and 4% indicated all possible dimensions. The latter probably did not think that urban form affected the spread of infection. Only 1.1% did not indicate any preference. It is mainly those living in cities with more than 100,000 inhabitants who consider more than one

option at the same time. In fact, the majority of the survey participants consider only one urban form to be more at risk. As can be seen in figure 17, according to almost all respondents, 92.4%, large cities are an environment that facilitates contagion. The percentage of respondents who consider other urban forms to be at risk, on the other hand, is much lower and tends to decrease as the population concentration decreases. It therefore appears that areas with a greater concentration of people are perceived to be more at risk than areas with a lower concentration of people.

Figure 17: Perceived risk in different territorial contexts



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

Although there are no particular differences according to the socio-demographic characteristics of the respondents, as can be seen in table 5, it is noticeable that women take more into account the possible contagion in rural areas or where the population density is lower than men. When analysing the answers by age group a difference can be seen when analysing the percentages of those who think that medium-sized cities are at risk. The over 60s indicated this option more than the others. Those with higher education also selected this option more. However, no major differences can be noted in the perception of risk in the different territorial contexts. The perception is therefore evenly distributed among the respondents according to gender, age and qualification. And everyone is inclined to believe that large cities are more at risk. As we will explain later, this may be due to a number of factors, but certainly media attention may have influenced the general perception since great importance was attached to large cities being affected by the disease (AGI 2020; Chen and Chen 2020; Dardari 2020; Wahba 2020).

Table 5: Perceived risk in different territorial contexts and socio-demographic characteristics of respondents

		Gender		Age			Qualification			
		Male	Female	<30 years old	30-59 years old	>60 years	Eighth grade	High school diploma	Graduate degree	
Territorial contexts	In a large city	N	1051	3791	723	3483	643	624	2516	1703
		%	94.0%	92.0%	92.7%	92.2%	93.6%	90.4%	92.7%	92.8%
	In a medium-sized town	N	426	1442	274	1318	279	215	990	665
		%	38.1%	35.0%	35.1%	34.9%	40.6%	31.2%	36.5%	36.2%
	In a small town	N	163	715	140	627	112	107	462	309
		%	14.6%	17.4%	17.9%	16.6%	16.3%	15.5%	17.0%	16.8%
	In a village	N	116	621	116	530	92	107	364	266
		%	10.4%	15.1%	14.9%	14.0%	13.4%	15.5%	13.4%	14.5%
	In a rural area	N	41	210	42	188	21	34	136	80
		%	3.7%	5.1%	5.4%	5.0%	3.1%	4.9%	5.0%	4.4%
	Total	N	1118	4119	780	3778	687	690	2714	1835
		%	100%	100%	100%	100%	100%	100%	100%	100%

Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

Territorial differences are also found as shown in the table 6.

Table 6: Perceived risk in different territorial contexts and municipality population a province of residence

		Municipality of residence population					Province of residence					
		< 10.000 abitanti	10.000-20.000 abitanti	20.001-50.000 abitanti	50.001-100.000 abitanti	> 100.000 abitanti	Bergamo	Trento	Treviso	Padua	Monza and Brianza	
Territorial contexts	In a large city	N	2319	1241	848	182	162	487	382	2722	498	760
		%	92.4%	93.7%	92.7%	89.7%	90.0%	90.9%	94.1%	92.2%	92.2%	93.8%
	In a medium-sized town	N	890	458	349	72	68	182	160	1042	188	299
		%	35.5%	34.6%	38.1%	35.5%	37.8%	34.0%	39.4%	35.3%	34.8%	36.9%
	In a small town	N	418	205	143	41	51	87	90	473	84	145
		%	16.7%	15.5%	15.6%	20.2%	28.3%	16.2%	22.2%	16.0%	15.6%	17.9%
	In a village	N	359	162	113	36	50	75	89	392	76	106
		%	14.3%	12.2%	12.3%	17.7%	27.8%	14.0%	21.9%	13.3%	14.1%	13.1%
	In a rural area	N	117	62	35	13	17	26	30	130	31	34
		%	4.7%	4.7%	3.8%	6.4%	9.4%	4.9%	7.4%	4.4%	5.7%	4.2%
	Total	N	2510	1325	915	203	180	536	406	2953	540	810
		%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

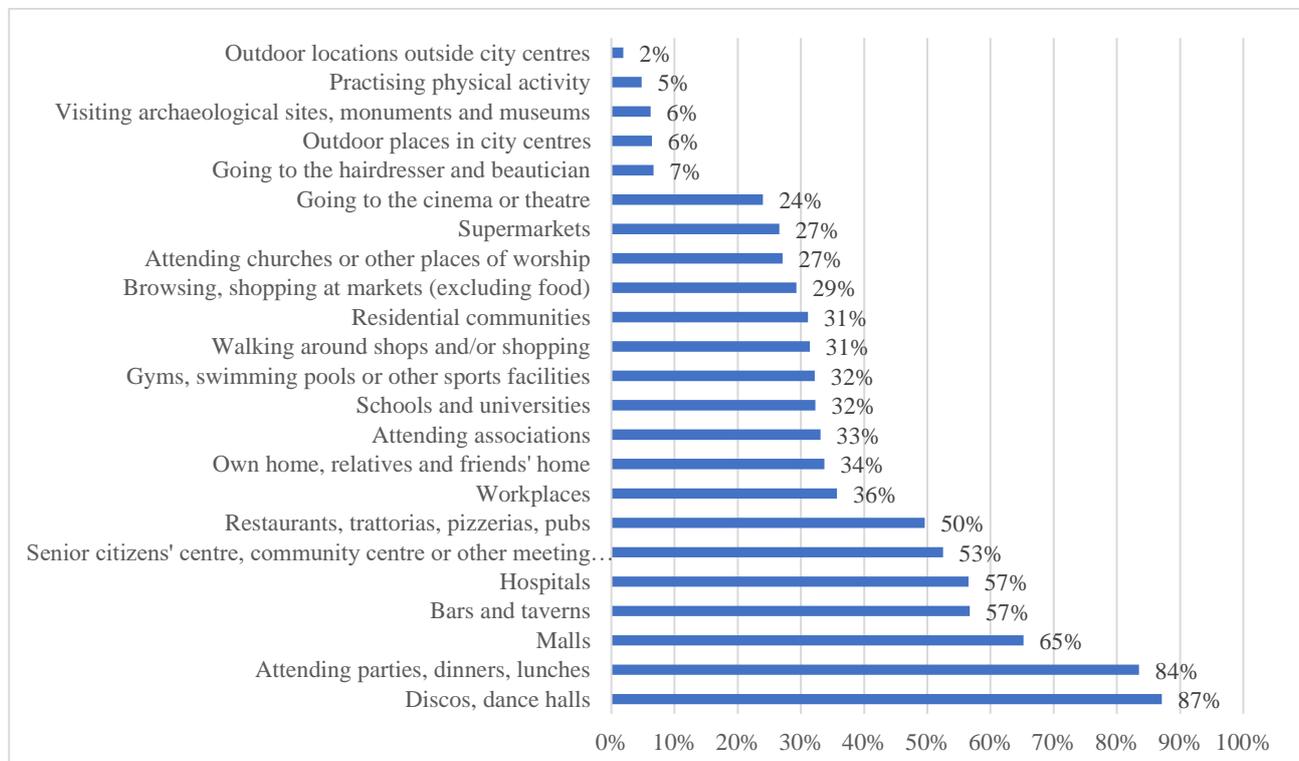
Those who live in cities with more than 50,000 inhabitants tend to consider the risk in rural areas or villages more than those who live in smaller municipalities. And it is above 100,000 inhabitants that

people are more likely to consider the risk as particularly present in smaller contexts. At the level of province of residence, it is noticeable that Trentino differs from the other territories considered: for each dimension they have a higher percentage of answers as if they perceived more than the others that the risk of falling ill is present in all the contexts analysed. Monza and Brianza, which gravitate towards the city of Milan, tend to have a lower perception of risk in the big city than Trentino responders, but a higher one compared to the other provinces. Bergamo, whose territory is characterised by a higher level of urbanisation than Treviso, Padua and Trento, perceives less the risk of the big city.

### 3.1.3 Respondents' perception of risky places and activities

A specific section of the questionnaire asked respondents to indicate which activities and places they considered to be at risk of infection. As can be seen in figure 18, the places and activities considered most at risk by the respondents are discos and dance halls (87%), attending parties, dinners and lunches (84%).

Figure 18: Places/activities perceived to be at risk



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

Interestingly, although dinners and lunches are perceived as dangerous, places where people socialise often by sharing food such as bars, restaurants, are considered less risky by the respondents. Even homes, where people often invite non-cohabitants over to have a coffee together, are seen as a risk by only 34% of respondents.

### 3.1.4 Discussion and conclusion

The descriptive analysis of the places of contagion and the perception of risk in the various places during the second Covid wave (autumn-winter 2020) is intended to provide the reader with an overview to orientate himself within a little-known and constantly changing situation. Covid-19 is a disease under constant media and institutional attention. Every day, the Civil Defence Department publishes data on infections, hospitalisations and deaths. Since it is a disease whose complications occur mainly in the elderly, the focus is mainly on these categories (Aly et al. 2020; Degarege et al. 2020). In reality, the daily news does not report the average age of the sick. Only in a few cases are the dead young people or young adults. Despite this, the virus infects people of all ages, but less importance is attached to the infection of young people (Temperoni et al. 2021), who nevertheless represent a vector for the transmission of the disease. Having so many young people infected increases the risk that the elderly will also get sick (Liu et al. 2020). The problem is therefore not just with the elderly, but is an epidemiological chain that is more serious in the elderly, but involves the whole population. In the early stages of the pandemic, with few people naturally immunised and no vaccination, even the mere fact of a large number of people falling ill at the same time is not only a health problem, but an economic and social one (Beaglehole et al. 1993:118).

In the sample 7.9% of the respondents stated that they had been diagnosed with Covid-19 following a positive swab. Differences in the proportion of ill people were found according to age and education. Young people became more ill than adults and the over 60s, highlighting that Covid-19 is not just a disease of the elderly. Data from the National Institute of Health and others have confirmed, in a period following data collection, that during the second date the number of positives was (Aleta and Moreno 2020; Bongiovanni et al. 2021; Istituto Superiore di Sanità 2021). High school graduates are the most affected. Among the professional categories, more cases were found among the armed forces and lower-skilled professions except among the group of plant operators, fixed and mobile machinery operators and vehicle drivers. The data on the professions most affected by Covid-19 is consistent with the literature (Blundell et al. 2020; Burström and Tao 2020; Hoenig and Wenz 2021; Marmot et al. 2020), except in the case of plant operators, fixed and mobile machinery operators and vehicle drivers. vehicle drivers are reported to be more susceptible to the virus. This peculiarity was probably

not taken into account in the sample because they are in the same occupational group as other jobs that are carried out alone. During the pandemic, working alone is a protective element that decreases the probability of being exposed to the virus (EMG – Transmission Group 2021). Compared to the actual incidence of the disease, there was a higher percentage of people in the sample who had the disease. This could be due to the fact that familiarity with the disease increases the perception of risk and sensitivity to the issue (Malecki, Keating, and Safdar 2021). Respondents from the provinces of Trento, Bergamo and Monza and those living in larger cities or those with fewer than 10,000 inhabitants reported having the virus to a greater percentage. More than half of the respondents who fell ill with Covid-19 said they knew where they fell ill with Covid-19. According to the data collected, homes and third places are central to the spread of the virus along with workplaces. Most infections, according to the reconstruction of respondents who have had the disease, occur in these settings. The hypothesis that people fall ill more in the workplace, at home and in leisure areas is therefore confirmed. This finding, albeit in a fragmented manner, already emerged from the literature analysed and the sample under review therefore confirms what has already emerged in this regard (Baysaikhan et al. 2021; Blundell et al. 2020; Costa and Marra 2021; Fullagar and Pavlidis 2021; Hoenig and Wenz 2021; Liu et al. 2020; Marmot et al. 2020). Despite the fact that infection is widespread in households, only 34% of respondents indicated that homes are at risk of infection. People are more afraid of discos and shopping centres or parties, dinners and lunches. Curiously enough, dinners and parties can often be held at home, but clearly the perception of the home as a place of possible contagion is low, despite the fact that even here one can drink and eat with non-cohabitants. More than 50% believe that restaurant, bar and so on are places where one can fall ill. Finally, there is a clear perception that Covid-19 is a risk mainly in larger urban settings and that it is less of a risk in those living in peri-urban or rural settings. Within this context we therefore examine whether we can identify characteristics in relation to the places frequented and the prevention adopted that may expose people more to possible infection.

### 3.2 Leisure time: dating and sociability places

Since March 2020, Italian citizens have been subject to certain restrictions on movement and social relation in order to deal with the pandemic and reduce the risk of contagion. By preventing movement, the aim was to reduce the possible spread of the virus between territories and even within the areas themselves. After a lockdown phase in which unnecessary and urgent travel was prohibited, the places

could only provide take-away service, relationships with non-cohabitants limited, the reopening phases have gradually allowed Italians to move within increasingly large areas (since 18 May 2020, travel within regions has been allowed, and since 3 June 2020 also between different regions). During the same period, it was possible to resume frequenting public places and meeting non-cohabitants. Public social spaces have been modified (Low and Smart 2020). Some activities saw a decrease in participants. For example, in North Korea following the pandemic, the frequency of malls, sports activities, religious activities and domestic travel decreased (Baysaikh et al. 2021). Green spaces, on the other hand, are more popular (Baek et al. 2021). In the same way, dating habits and sociability were profoundly altered: social relationships were suspended, re-invented or transformed (Lupton and Willis 2021). In view of all these changes it was decided to analyse habits in leisure time when the second wave of Covid-19 was starting. In particular we will focus on sociability places and crowding perception of places frequented. Meeting non-cohabitants in indoor places, where people eat and drink, and frequenting crowded spaces all increase the possible exposure to the virus.

Exploring the places of face-to-face relationships with non-cohabitants during the Covid-19 outbreak was deemed necessary to understand the habits in an era characterised by the need to combine social relations and to respect physical distancing to prevent the spread of infection. Daily encounters of at least 15 minutes with non-cohabiting persons between September and October 2020 occurred for 50.9% of the survey participants with less than 5 persons, for 28% with 6-10 non-cohabiting persons, for 11.8% with 11-20 individuals, for 3.8% with 21-30 e persons and for 5.5% with more than 30 individuals. Furthermore, respondents between September and October 2020 maintained the habit of meeting with non-cohabiting friends and relatives at least once a week in 54.2% of cases and the percentage rises to 91.6% considering those who met them a few times. Sociability is therefore still very widespread among the sample respondents.

For the analysis of sociability exploratory factor analysis will be used. The factor scores will then be analysed using t-tests and ANOVAs to detect statistically significant differences between groups in relation places frequency. Also, to analyse differences in crowding perception t-test and ANOVA will be conducted.

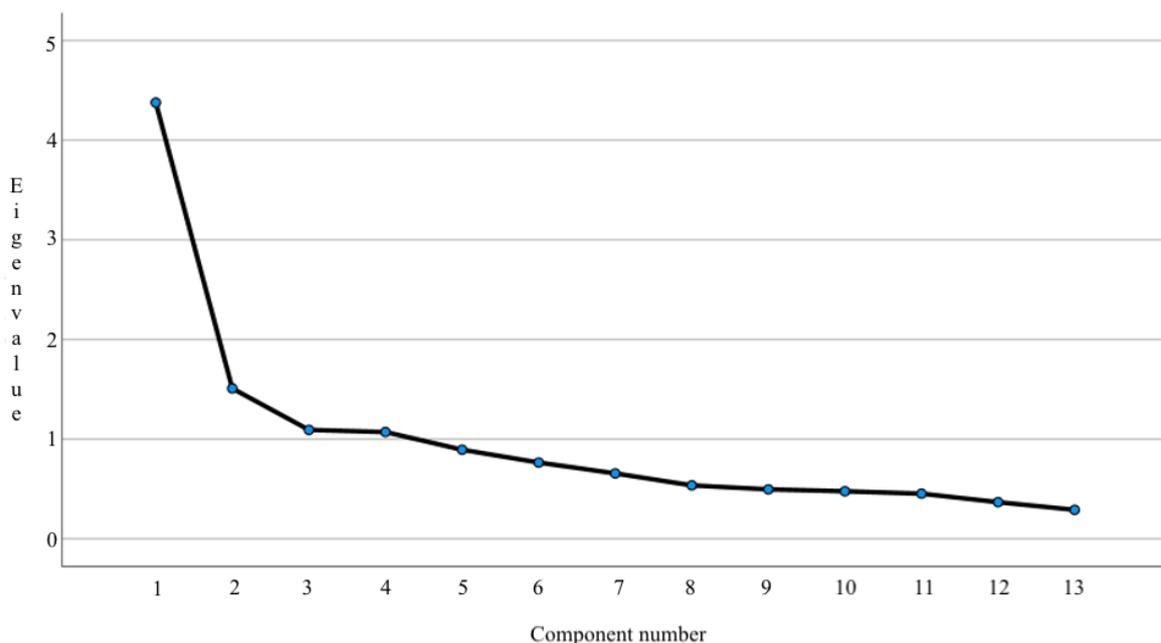
### 3.2.1 Leisure meeting places

In order to maximise the amount of information and minimise the number of variables about sociability to be used in a subsequent phase, it was decided to conduct an exploratory factor analysis (EFA) (De Lillo et al. 2007:91–129) using the principal components method for factor extraction. In order to assess whether the 12 items related to sociability habits could be grouped together, it was

decided to use Cronbach's Alpha (Cronbach 1951). The alpha score obtained (standardized  $\alpha=0.825$ ) allows the analysis to proceed.

Prior to conducting the EFA, some preliminary analysis was carried out to establish the sustainability of this analysis and the non-violation of the assumptions underlying the EFA. Inspection of the correlation matrix reveals the presence of many coefficients of 0.3 or greater. The Kaiser-Meyer-Olkin (KMO) value is 0.851 exceeding the recommended value of 0.6 (Kaiser 1970; Kaiser and Rice 1974) and Bartlett's Test of Sphericity (Bartlett 1954) reached statistical significance. Principal component analysis reveals the presence of four components with eigenvalues exceeding 1, explaining 33.7%, 11.6%, 8.4% and 8.3% of the variance respectively. The screenplot reveals a clear break after the fourth component. Analyzing Cattell's screen test (Cattell 1966), it was decided to keep the four components for future investigations (figure 19). This was also supported by the results of the Parallel Analysis (PA) showing four components with eigenvalues exceeding the corresponding criterion values for a randomly generated data matrix. Both the means and the 95 percentiles of the random data suggest a 4-factor solution since the actual (raw data) eigenvalue of the fifth component (0.89) is smaller than both the mean (1.02) and 95 percentile (1.03) of the fifth eigenvalue from the random data (O'Connor 2000).

Figure 19: Screen Plot Test



To aid the interpretation of these four components, varimax rotation was performed. The analysis of the rotated solution, shown in table 7, reveals the presence of four components linked to the places of sociability.

Table 7: Rotated Component Matrix

**Rotated Component Matrix<sup>a</sup>**

	Component			
	1	2	3	4
Own home, relatives and friends' home	<b>.859</b>			
Visiting friends, relatives or acquaintances	<b>.790</b>			
Frequency of meeting non-cohabiting friends and relatives in their free time for more than 15 minutes	<b>.670</b>			
Receiving guests at home	<b>.651</b>			
Bars and taverns		<b>.858</b>		
Go to bars, meeting places, clubs or other places.		<b>.777</b>		
Restaurants, trattorias, pizzerias, pubs		<b>.704</b>		
Talk with neighbours			<b>.712</b>	
Outdoor places in city centres (e.g. streets, squares, parks)		.419	<b>.650</b>	
Outdoor locations outside city centres (e.g. countryside, beaches, mountains)			<b>.605</b>	
Talk to acquaintances	.421		<b>.536</b>	
Mall				<b>.687</b>

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Note: Coefficients with an absolute value below .30 have been omitted. Loadings highlighted in bold indicate the factor on which the item was placed.

a. Rotation converged in 5 iterations.

The four factors identified can be defined as follows:

1. private spaces. The construct is related to private places of sociability such as homes. The variables recall one's own home or that of other people.
2. third places. This dimension is characterised by places such as bars, taverns and restaurants which are defined as third places. (Jedlowski 2012; Oldenburg 1999:20–42). They are places outside the workplace and home characterised in terms of sociability and non-discursive symbolism that provide people with a sense of distinction and wholeness (Oldenburg and Brissett 1982). They create opportunities for sociability and, as well as being widespread everywhere, they are places where everyone passes in their daily lives (Bianchi 2012). These sites are capable of safeguarding the dimension of reciprocity and conviviality (Deriu 2015).
3. open-air places: these are characterised by places such as streets, squares and other open-air places in urban and non-city environments that can both be experienced individually, but are also indispensable places for spontaneous aggregation and the development of sociability (Bianchi 2012). Think of the example of benches, which can promote social practices, being both a constraint and a resource for individual action. (Mandich 2010).

4. Malls: malls are a non-place par excellence. Non-places are the opposite of a residence or a place in the common sense of the term. They are products of the society of surmodernity and are places of transit not inhabited by anyone. They are characterised by absolute precariousness, temporariness and solitary individualism. They are spaces of anonymity frequented by individuals who are similar but alone. (Augé 2009). Being indoors in the presence of a large number of people exposes one to more risk.

Based on the questionnaire data and the literature, we consider houses and third places as high risk, shopping centres as moderate risk and outdoor places as low risk (Texas Medical Association 2020). The analysis of the factorial scores, obtained by means of the regression method that transforms the variables into standardised scores (De Lillo et al. 2007:126–27), made it possible to detect the characteristics of the people who frequented different places of sociability during the autumn 2020 wave. The analysis carried out with t-test and ANOVA will be described here, but for an overview see Annex 3.

#### *3.2.1.1 Private spaces*

About meetings in private homes, there are no significant gender differences according to t-test, although the average for women ( $M=0.005$ ) is higher than that of men ( $M=-0.022$ ). On the other hand, the ANOVA revealed that there is a difference linked to the age of the respondents. The results of the analysis of variance show that the independent variable age significantly influences the dependent variable sociability score in private spaces;  $F(2, 5161)=59.824$ ,  $p<0.001$ . The post-hoc analysis of the averages shows that all groups are statistically different from each other. Young people presented the highest value ( $M=0.305$ ,  $SD=0.97$ ) followed by adults between 30 and 59 years ( $M=-0.017$ ,  $SD=0.99$ ) and the over 60s ( $M=-0.257$ ,  $SD=0.96$ ). As age increases, the habit of meeting non-cohabitants in the home decreases. And it is mainly people with higher education who have adopted private places as the setting for their sociability;  $F(3,5156)=14.878$ ,  $p<0.001$ . The post hoc analysis (with Scheffe) shows, in fact, that people with an eighth grade or lower qualification ( $M=-0.190$ ,  $SD=0.96$ ) have significantly different values from high school graduates ( $M=-0.021$ ,  $SD=0.99$ ) or university graduates ( $M=0.101$ ,  $SD=1$ ). Based on the ANOVA there are also differences at the level of occupational groups,  $F(5, 5153)=9.300$ ,  $p<0.001$ . According to the post hoc, pensioners are the group that least encounters non-cohabitants in the houses ( $M=-0.228$ ,  $SD=0.96$ ) and differ significantly from homemakers ( $M=0.045$ ,  $SD=0.98$ ) and students ( $M=0.289$ ,  $SD=0.94$ ). The latter also engage in this type of sociability more than the employed ( $M=0.003$ ,  $SD=1$ ) and unemployed ( $M=-0.017$ ,  $SD=1.03$ ). There is also a territorial difference;  $F(4,5159)=9.163$ ,  $p<0.001$ . In particular, according to the post hoc, Treviso ( $M=0.068$ ,  $SD=0.98$ ) is significantly different from the others except Padua

( $M=-0.011$ ,  $SD=1.01$ ). The size of the city is not significant in relation to the use of houses to meet friends and relatives. No differences were found with respect to the frequency of these places in relation to self-risk perception.

#### *3.2.1.2 Third places*

An independent samples t-test was conducted to test for the existence of a gender difference in the use of third places for sociability. A statically significant difference is found with men ( $M=0.14$ ,  $SD=1.07$ ) scoring higher than women ( $M=-0.04$ ,  $SD=0.97$ ) and thus frequenting these spaces more to meet friends and acquaintances;  $t(5154)=5.45$ ,  $p<0.001$ . The ANOVA results also show that the age variable also affects this behaviour  $F(2, 5161)=82.08$ ,  $p<0.001$ . As age increases, as the post hoc results also show that each group is significantly different from the other, the habit of meeting friends and relatives in places such as bars, taverns, restaurants, trattorias and other private places, open to the public meeting places related to food consumption decreases (under 30  $M=0.405$ ,  $SD=1.06$ ; 30-59 years  $M=-0.052$ ,  $SD=0.97$ ; over 60  $M=-0.179$ ,  $SD=0.98$ ). Third places, such as private homes, are also less frequented by people with an eighth grade or lower qualification ( $M=-0.135$ ,  $SD=0.98$ ), compared to high school graduates ( $M=-0.010$ ,  $SD=0.99$ ) and university graduates ( $M=0.066$ ,  $SD=1$ );  $F(3, 5156)=10.328$ ,  $p<0.001$ . Also, in the frequency of third places there is a difference between occupational groups;  $F(5, 5153)=19.105$ ,  $p<0.001$ . At the opposite end of the spectrum are students, who are the most frequent of these places for their social relations, and, at the other extreme, retired ( $M=-0.196$ ,  $SD=0.99$ ) and homemakers ( $M=-0.184$ ,  $SD=0.94$ ). The recipients of capital income ( $M=0.295$ ,  $SD=0.85$ ) do not differ significantly from the other groups. Employed ( $M=0.012$ ,  $SD=0.98$ ) and unemployed ( $M=0.025$ ,  $SD=1.03$ ) socialise in third places less than students, but more than pensioners. A territorial analysis shows a significant difference in the habit of frequenting third places. Treviso ( $M=0.046$ ,  $SD=1$ ) that differs significantly from Monza ( $M=-0.126$ ,  $SD=0.99$ ) and Bergamo ( $M=-0.111$ ,  $SD=0.98$ );  $F(4,5159)=6.555$ ,  $p<0.001$ . Again, the size of the city of residence is not related to the places frequented for socialising. No differences were found with respect to the frequency of these places in relation to self-risk perception.

#### *3.2.1.4 Outdoor places*

As far as outdoor places are concerned, there is also a statistically significant influence of the gender and age variables. Streets, squares, parks, beaches, places in the countryside and in the mountains are frequented to meet friends and relatives more by men ( $M= 0.1$ ,  $SD=1$ ) than by women ( $M=-0.3$ ,  $SD=1$ ) as shown by the t-test;  $t(1710)=3.6$ ,  $p<0.00$ . As age increases, those who choose these outdoor sites as a setting for their sociability also increase,  $F(2, 5161)=87.434$ ,  $p<000$ . Post hoc analysis of variance shows precisely that each group is statistically different from the others (under 30  $M=-0.331$ ,

SD=0.94; adults up to 59 years of age  $M=0.017$ ,  $SD=0.98$ ; over 60  $M=0.357$ ,  $SD=1.04$ ). There were no significant differences between groups based on educational qualifications. Retired people ( $M=0.450$ ,  $SD=1.06$ ) prefer to use these places more than students ( $M=-0.183$ ,  $SD=1.01$ ),  $F(5, 23.312)=23.827$ ,  $p<0.001$ . As pensioners are older and students younger, this could be influenced by the age. By ANOVA a significant territorial difference is also evident. In the province of Trento ( $M=0.274$ ,  $SD=1.02$ ) the use of open air spaces is higher than in the provinces of Lombardy, Monza ( $M=0.020$ ,  $SD=1$ ) and Bergamo ( $M=-0.041$ ,  $SD=0.98$ ), and Veneto, Padova ( $M=-0.035$ ,  $SD=1$ ) and Treviso ( $M=-0.017$ ,  $SD=0.99$ );  $F(4,5159)=8.276$ ,  $p<0.001$ . City size is not related to the places frequented for socialising. No differences were found with respect to the frequency of these places in relation to self-risk perception.

#### *3.2.1.5 Malls*

There are no gender differences in the choice of meeting friends and relatives in shopping centres according to analysis of variance. The results of the ANOVA show that the age variable also affects this behaviour  $F(2, 5161)=5.318$ ,  $p=0.005$ . The post hoc findings show that the over 60s differ significantly from both young people and adults, who represent a homogeneous subset (under 30  $M=-0.011$ ;  $SD=1.2$ ; 30-59 years  $M=-0.018$ ,  $SD=0.96$ ; over 60  $M=0.118$ ,  $SD=0.94$ ). In contrast to the other sites considered so far in the analysis, as the analysis of variance shows, it is precisely those with lower educational qualifications ( $M=0.106$ ,  $SD=1.03$ ) and those with a high school diploma ( $M=0.159$ ,  $SD=1$ ) prefer these sites over those with a university degree ( $M=-0.062$ ,  $SD=0.97$ );  $F(3, 5156)=5.327$ ,  $p=0.001$ . At the level of employment, capital recipients ( $M=0.683$ ,  $SD=1.38$ ) and retired ( $M=0.116$ ,  $SD=1.03$ ) differ from other groups according to the post hoc conducted with Sheffe;  $F(5, 5153)=2.688$ ,  $p=0.020$ . Employed ( $M=-0.016$ ,  $SD=0.98$ ), unemployed ( $M=0.016$ ,  $SD=1.05$ ), students ( $M=-0.024$ ,  $SD=1.21$ ) and homemakers ( $M=0.004$ ,  $SD=0.86$ ) use these spaces less to entertain their social relations. Finally, it should be noted that, as evident after the post hoc, residents in the province of Bergamo ( $M=0.116$ ,  $SD=1.18$ ) prefer malls more than residents in the province of Treviso ( $M=-0.039$ ,  $SD=0.98$ );  $F(4,5159)=3.815$ ,  $p=0.004$ . As already seen in the analysis of the other places visited, the size of the city is confirmed as not significant. It is those who do not consider themselves to be at risk ( $M=0.393$ ,  $SD=1.655$ ) who frequent this place more than those who think they are little ( $M=-0.026$ ,  $SD=0.89$ , fairly ( $M=-0.003$ ,  $SD=1.07$ ) or very much at risk ( $M=0.831$ ,  $SD=0.83$ ). The difference is statistically significant;  $F(3, 4562)=7.210$ ,  $p<0.001$

### 3.2.2 Crowding perception

People's perceived crowding in leisure activity spaces can influence their choice of leisure activities (Kim and Kang 2021). Since the topic of perceived crowding in places frequented during the pandemic is new, before proceeding with the analysis of variance we will analyse descriptively the those who do not know how to assess the level of crowding. It is 5.7% of respondents who cannot indicate whether the places they went to with friends and relatives were crowded. Indecision increases with age (3.6% among the under 30s, 5.9% among adults and 6.6% among the over 60s) and decreases as the level of education increases (7% among those with an eighth grade or lower qualification, 5.9% among high school graduates and 4.8% among those with a university degree or higher). At the territorial level, it is noticeable that more respondents from Lombardy (7.7%) than from Veneto (5.1%) or Trentino (3.9%) cannot judge the level of crowding. Moreover, with the exception of cities with between 50,001 and 100,000 inhabitants where the percentage is 4.4%, the number of people who do not know how to assess the crowdedness of the places they visit decreases as the size of the municipality where they live increases. Below 20,000 inhabitants 6% are undecided, between 20,001 and 50,000 it is 4.1% and above 100,000 it is 3.9%.

Excluding the response mode "I don't know" assessing the crowdedness of the places attended to meet with friends and relatives, a t-test for independent samples was conducted to verify the existence of a gender difference. A statically significant difference was found with men ( $M=1.88$ ,  $SD=0.72$ ) perceiving more to attend crowded places than women ( $M=1.71$ ,  $SD=0.71$ );  $t(4976)=7.02$ ,  $p<0.001$ . In relation to age groups, an analysis of variance shows a statistically significant difference;  $F(2, 4982)=22.714$ ,  $p<0.001$ . Post hoc tests indicate that subjects under 30 ( $M=1.90$ ,  $SD=0.74$ ) believe they frequent crowded places more than adults ( $M=1.72$ ,  $SD=0.71$ ) and over 60 ( $M=1.70$ ,  $SD=0.66$ ). The results of the ANOVA show that the independent variable educational qualification significantly influences the dependent variable crowded places frequented;  $F(2, 4977)=9.17$ ,  $p<0.001$ . Observation of the group averages shows that the group with less schooling has lower crowding assessment scores ( $M=1.65$ ,  $SD=0.69$ ) than the other groups of high school graduates ( $M=1.74$ ,  $SD=0.71$ ) and university graduates ( $M=1.79$ ,  $SD=0.73$ ). The post-hoc analysis (with Scheffe) indeed shows that the groups of high school graduates and university graduates are homogeneous with each other. At the level of occupational status the only detectable difference is between the students and the other groups, but this seems to relate to the younger age of the student group. At the territorial level, there are no differences according to the province of residence, but the size of the municipality of residence influences the perception of the places attended;  $F(4,4879)=2.45$ ,  $p=0.044$ . According to the ad hoc posts in cities with more inhabitants there is a greater perception of crowding. Finally, it was found that those who considered themselves to be fairly at risk ( $M=1.80$ ,  $SD=0.71$ ) frequented crowded

places more than those who considered themselves to be a little at risk ( $M=1.73$ ,  $SD=0.69$ );  $F(3, 4425)=4.447$ ,  $p=0.004$ .

### 3.2.3 Discussion and conclusion

The basic human need to communicate, connect and interact with others is a fundamental element that affects people's physical and mental health even in the midst of a pandemic (Clark et al. 2020). The data collected from the questionnaire indicate that respondents meet frequently and engage in sociability with non-cohabitants despite the fact that the instructions from the scientific community and institutions were to reduce their contact with others at a time when no anti-Covid-19 vaccine was available. In fact, the prevention guidelines for Covid-19 indicate that leisure activities and group gatherings with friends, family and colleagues are situations where there is a risk of contagion (Lupton and Willis 2021:6). Leisure venues can be conducive to the spread of infection, especially under certain environmental conditions. Indoor settings, close proximity to others, not using a face mask, are some of the aspects that can foster contagion in leisure time (EMG – Transmission Group 2021) (Texas Medical Association 2020). Among the places conducive to infection, for example, are places of entertainment and places where people eat and drink (Baysaikhhan et al. 2021). Also, according to the questionnaire data, homes and third places are among the sites where most respondents fell ill.

Exploring people's habits in the pandemic period is crucial to ascertain whether exposure to the virus is evenly spread or certain population subgroups tend to be more exposed to risky leisure place as houses and third places. To check for statistically significant differences between groups t-test and ANOVA were conducted.

Gender seems to be a determinant of the use of sociability habits that expose one to risk in relation to the frequency of crowded places. The men in the sample reported more than the women to have frequented risky places based on declared crowding level. No significant differences were found in relation to the frequency of houses or malls but third places, where there is a high risk of contagion, are frequented more by men. In general, therefore, the findings in the literature are confirmed (Kim and Kang 2021; Lüdecke and Von Dem Knesebeck 2020). Men are more exposed to risk than women in this context as demonstrated also in other preventive contexts (Figner and Weber 2011; Harris and Jenkins 2006). This confirms the hypothesis that men frequent places with a greater risk of infection more in their free time than women.

The over 60s compared to adults under 60 tend to meeting non-cohabitants less in homes and third places and to use outdoor spaces more. Their habits therefore reveal a significantly greater attention

to frequenting places that expose them less to infection, except in the case of malls. Among the elderly, this habit is more widespread, but according to the data from the questionnaire, malls are not a place at high risk of contagion, even though they are indoors. In fact, it is a place of moderate risk (Texas Medical Association 2020). On the contrary, young people are confirmed as having frequented all the places at risk to a greater extent than adults and the elderly. This confirms the hypothesis that they are the age group most exposed to risk of contagion in sociability time and that have a higher crowding perception as already seen in the literature (Azlan et al. 2020; Kim and Cho 2020; Kim and Kang 2021). Data on occupational groups also confirm that it is younger people who are exposed. In fact, students, the youngest age group, are the group that frequents places where there is a greater risk of exposure to the virus.

Consistent with the results of other research on leisure behaviours conducted during the pandemic (Maddock and Suess 2021), the present survey showed that the level of education does not lead to frequenting less risky places. Graduates are those who frequent more homes, third places and have a greater perception of the crowding. They therefore do not seem to be particularly concerned about avoiding the places that most expose them to the virus in their free time. There are no differences between the groups based on educational qualifications in frequenting outdoor places and therefore, this low-risk activity is adopted by all equally. This finding is not consistent with the health gradients usually found when analysing the relationship between education and health. In general, it is important to consider that both very high and very low levels of education have already been associated with higher risk-taking (Barsky et al. 1997; Cutler and Lleras-Muney 2006). In this context it may be that the more educated are aware of the risks they are exposing themselves to, but, as already argued in relation to youth and risk (Neresini and Bucchi 2001:191–92), information on appropriate behaviour is only perceived in an abstract way because of the constraints one would have to undergo in order to behave virtuously. Isolating oneself, not meeting non-cohabitants could be perceived as something insurmountable compared to the risk of falling ill. The hypothesis that it is the less educated who frequent the places most at risk is therefore not confirmed.

At a territorial level, it is noted that Treviso, with an average level of urbanisation among the provinces considered, is the province where people meet more in homes and third places, which represent environments where the risk of exposure is higher. The inhabitants of Bergamo and Monza, the most urbanised areas, use houses and third places less to meet non-inhabitants, thus exposing themselves less to the risk of contagion, as already indicated in previous studies on this subject (Callaghan et al. 2021; Maddock and Suess 2021). At the same time, however, the data showed that there is no difference in the frequency of the various places according to the size of the municipality of residence, but rather that it is precisely residents in larger cities who frequent the most crowded

places more. A greater perception of crowding in realities with a higher population density has already been noted in the literature on Covid-19 (Jung and Albarracín 2021). The fact that in the more urbanised areas such as Bergamo and Monza fewer bars, restaurants and other third places are frequented and that in the larger cities more crowding is perceived should not necessarily be interpreted as an inconsistency. On the contrary, the two data should be interpreted together. The literature on the perception of crowding in recreational settings since the 1980s has indicated that crowding is perceived according to one's expectations and desires (Andereck and Becker 1989; Westover 1989). In this pandemic phase, those trying to avoid places with a higher risk of exposure may have a greater perception of crowding due to a desire to surround themselves as little as possible with potentially virus-infected strangers. Thus, a greater perception of crowding may be interpreted as a greater focus on prevention and reducing one's exposure to the virus.

In conclusion, there are differences in who attends places where there is a greater chance of contracting the Sars-Cov-2 virus. As hypothesised, there are differences in the characteristics of people who frequent the places where they are most exposed to infection in their leisure time. Those who are most at risk in their leisure time for sociability are men, young people and live in less urbanised territories. We would like to take this opportunity to point out that young people, who frequent homes and third places more, are also the ones who have declared most to have fallen ill in these places. These observations, however, make it clear that, given the importance of sociable leisure places, an approach to effectively combating the pandemic should take these elements into account in order to implement appropriate prevention policies to raise awareness that homes and places of sociability are often the places where people get sick and that therefore more attention to counteract exposure to the virus is needed in these places. It is important that these considerations are also taken into account by communication campaigns to defend knowledge of the risks and to encourage changes in risky behaviour.

### 3.3 Covid-19 preventive behaviours during the beginning of the second pandemic wave

When data collection for this research began, too little is known about the use of preventive behaviour to avoid exposure to the Sars-Cov-2 virus. What is certain is that the World Health Organisation began right from the start of the pandemic to proclaim the importance of using a face mask, taking care of hand hygiene and keeping a distance from other people to avoid spreading the infection. In Italy, these basic rules of hygiene were at the heart of the communication addressed to citizens by

health institutions. Avoiding crowded places, avoiding close encounters by keeping a distance of one metre, washing hands with soap and water or using an alcohol-based gel were the first measures recommended by experts to contain the virus (Ministero della Salute 2020a). The government has also regulated some of these behaviours in public and recommended that citizens take precautionary measures in private homes as well. In the first phase of the epidemic, the use of spacing and gloves was imposed in certain contexts to reduce the circulation of the virus (DPCM 26 April 2020). In a second phase, the mandatory use of gloves was abolished (DPCM 11 June 2020) in favour of promoting the use of hand sanitisation products. This change was decided because disposable gloves do not protect against Covid-19 and may even be counterproductive by transferring contamination between different environments if used incorrectly. (World Health Organization 2020b, 2020c). In the first months of the pandemic, there was sometimes conflicting advice on preventive behaviour and this may have been confusing for the population. From a scientific point of view, adopting preventive behaviour and using effective masks is essential to reduce exposure to the virus. However, too little is known about how these behaviours are implemented by the population. For this reason, in this section we will focus on analysing the masks used, the preventive behaviours adopted inside and outside the home, and the criteria used to choose places to go in their free time. Using these measures can reduce exposure to the risk of infection, but based on the limited existing specific literature, it is clear that not everyone adopts prevention in the same way. Although in general there seems to be good adherence to the rules for avoiding contagion, it is clear that not everyone adopts prevention in the same way (Blair et al. 2021; Gruppo Tecnico Nazionale PASSI e PASSI d'Argento 2021; Lang et al. 2021; Lee et al. 2021; Urbán, Paksi, et al. 2021). Some characteristics may favour or disfavour the adoption of preventive behaviours. As we have seen in the literature review, age, gender, education, ethnicity and immigration status, employment status, household characteristics, territory and risk perception seem to be involved in the adoption of preventive behaviours. Few data have been published in Italy analysing these aspects and focusing only on the use of a generic face mask. (Gruppo Tecnico Nazionale PASSI e PASSI d'Argento 2021). Therefore, in order to understand the spread of these behaviours, a descriptive analysis of prevention behaviours will be carried out. This is an important step to be able to understand how the behaviours are distributed in the sample. The types of masks used, prevention inside and outside the home, the criteria used to choose the places to go in leisure time and the territorial differences in the use of these elements will be analysed. A typology of the masks used will then be constructed based on their effectiveness in preventing virus transmission and the characteristics of effective and ineffective mask users will be compared using t-test and ANOVA. Cluster analysis will then be used to identify subgroups of individuals who share the same preventive behaviours. This initial exploration of data related to a new and novel phenomenon is necessary to understand the state of art and to identify social

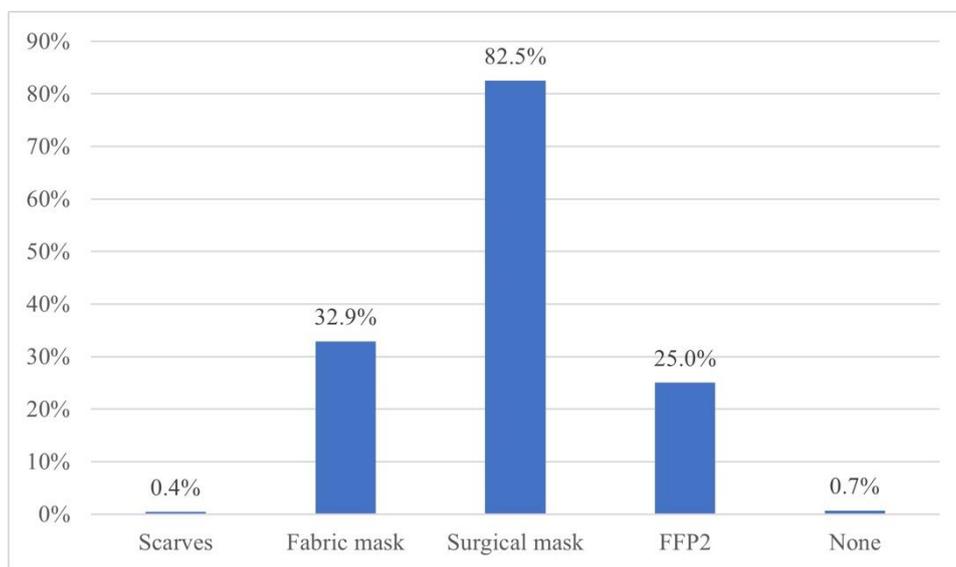
differences that could lead to inequalities in exposure to the virus. Only through these steps, it is possible to begin to investigate possible causes of health inequalities and to reflect on appropriate communication and health promotion interventions to counteract the pandemic and pandemic-related health inequalities.

### 3.3.1 Preventive behaviours adopted

#### 3.3.1.1 Face masks

The choice of the type of mask to be used can be seen as a proxy for prevention used. As there are several types, with different filtering capacities, which one to use can allow to detect the different personal attitudes to prevent the spread of Covid-19. The most commonly used face mask, by about 82% of respondents to the multiple-choice question on the device used, is the surgical mask followed at a distance by the fabric mask and personal protective equipment that filters air (FFP2 or higher) (figure 20). FFP2 provides protection to the wearer independently of other people's behaviour and reduces the transmission of the virus between people more than other face protection (Wang et al. 2022).

Figure 20: Type of face mask used to cover the airway



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

As shown in the table 8, women use fabric and surgical masks more than men, while they are less likely to use scarves or personal protective equipment. Among those who declared using no airway protection at all, men were more represented. This reveals a gender difference that has already been noted in the literature: women are more attentive to preventive behaviour. On the other hand, the

greater use of FFP2 by men could indicate a greater interest in protecting themselves and less attention to the community than the choices indicated by women. Fabric masks are used less by the over 60s, and their use decreases as the level of education increases. Fabric masks are a highly questionable type of airway protection because their effectiveness is linked to a multitude of factors. It is precisely because of the lack of clarity surrounding the use of this mask that its lesser use by the better educated can be interpreted as greater caution in terms of prevention. The use of FFP2 masks increases with increasing educational qualifications. This may be due to the fact that more educated individuals are more competent to protect their own health. PPE is used more by the over 60s age group. It is a fact that the virus affects older people or people with co-morbidities more severely. The elderly, having realised that they are more at risk of complications, may prefer to use masks that not only limit the spread of droplets but also filter the air that is inhaled. This would enable them to protect themselves better. The greater concern of the elderly is also reflected in the fact that pensioners use FFP2 the most (35.8%) along with the employed (24.9%) and students (24.9%). The unemployed (18.5%) and homemakers used the device less (19.8%).

*Table 8: Use of face masks according to gender, age and education*

		Gender		Age			Qualification		
		Male	Female	<30 years old	30-59 years old	>60 years	Eighth grade	High school diploma	Graduate degree
Scarves	N	10	11	2	19	1	2	9	9
	%	0.9%	0.3%	0.3%	0.5%	0.1%	0.3%	0.3%	0.6%
Fabric mask	N	352	1388	266	1303	173	246	928	481
	%	31.3%	33.3%	34.0%	34.1%	24.9%	35.1%	33.8%	31.3%
Surgical mask	N	893	3465	682	3108	573	572	2284	1260
	%	79.4%	83.2%	87.1%	81.3%	82.6%	81.7%	83.2%	81.9%
FFP2 or higher mask	N	328	998	188	898	242	128	654	445
	%	29.2%	24.0%	24.0%	23.5%	34.9%	18.3%	23.8%	28.9%
None	N	12	22	5	26	4	2	13	14
	%	1.1%	0.5%	0.6%	0.7%	0.6%	0.3%	0.5%	0.9%
Total	N	1125	4165	783	3821	694	700	2746	1539

Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

The unemployed (1.8%) tend to use no mask at all more than the other groups. In fact, the percentage of subjects who do not use masks varies between 0% of students and homemakers and 0.7% of the employed. Scarves are also more used by the unemployed (0.5%) followed by homemakers (0.4%). Among the other groups, based on employment status, no one reported using scarves as an airway barrier. These airway protectors are not indicated by any health organisation as an adequate tool to

prevent or avoid the spread of disease. The use of such measures is permitted, but studies on their real effectiveness are still ongoing and many doubts exist. Their use cannot therefore be seen as the adoption of a behaviour that is certainly effective in preventing contagion. Those who work in contact with the public tend to use FFP2 more and fabric masks less (table 9). Again, it can be assumed that those who have a job in contact with many other people feel the need to protect themselves against the disease. In fact, 27.8% of those who work in contact with the public use FFP2 compared to 21% of those who do not work in contact with the public. The difference between the two groups can be seen not only in the greater use of PPE, but also in the use of fabric masks used by fewer people who have a job in contact with the public (30.2%) than by others (35.5%). Minor differences were found in the use of scarves (0.4% and 0.6% respectively), surgical masks (81.8% and 82.5%) or no face mask at all (0.5% and 0.9%). In any case, those who are exposed to contact with strangers because of their work are more careful in their mask use.

Even those who live at home with elderly people or people suffering from chronic pathologies tend to use scarves and fabric masks less and, vice versa, to protect their airways using an individual protection device, probably to protect their cohabitants (table 9). There are no particular differences based on household size.

*Table 9: Use of face masks, job with public and characteristics of the cohabitants*

		Job face to face with public		Cohabitation with people >65 years old		Cohabitation with people suffering from immunodeficiencies or chronic pathologies	
		Yes	No	Yes	No	Yes	No
Scarves	N	9	10	3	17	3	19
	%	0.4%	0.6%	0.3%	0.4%	0.2%	0.5%
Fabric mask	N	652	582	281	1336	439	1298
	%	30.2%	35.5%	29.5%	34.1%	31.4%	33.4%
Surgical mask	N	1767	1352	779	3251	1139	3207
	%	81.8%	82.5%	81.9%	83.0%	81.5%	82.6%
FFP2 or higher mask	N	600	344	300	894	422	901
	%	27.8%	21.0%	31.5%	22.8%	30.2%	23.2%
None	N	11	15	5	22	8	27
	%	0.5%	0.9%	0.5%	0.6%	0.6%	0.7%
Total	N	2160	1639	951	3915	1397	3881

Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

In order to reduce the spread of infection, people must not only use the correct type of mask, but also wear it correctly covering both mouth and nose at the same time. According to self-reports, 9.1% of

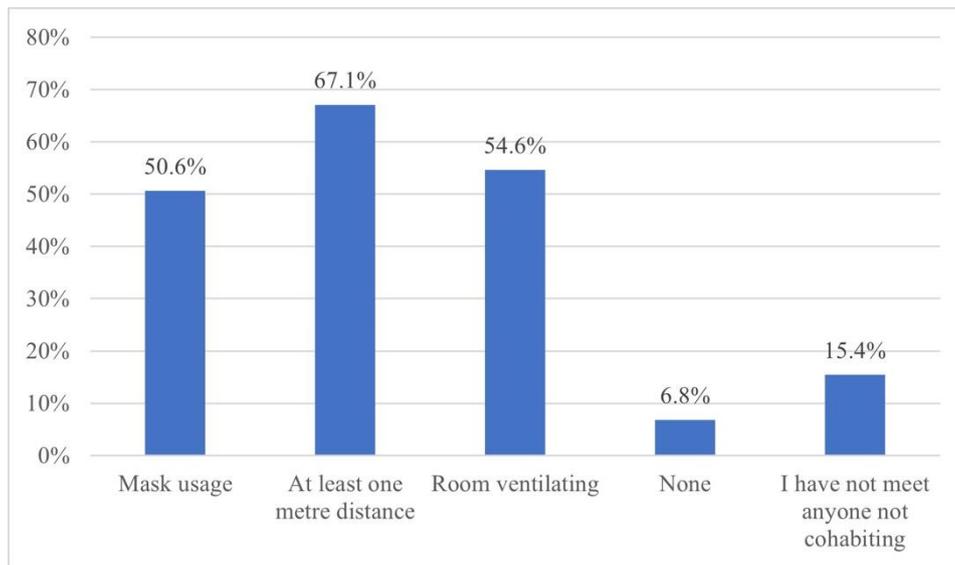
the sample did not always use the mask correctly, leaving the nose uncovered on some occasions. More men do not cover their noses (14.9%) than women (7.5%). This habit, which renders the use of a mask ineffective, is more widespread with decreasing age. Among the over 60s, 6.2% of people use a mask incorrectly, 9.1% of adults between 30 and 60 years old and 11.7% of people under 30 years old. Pensioners (5.6%), probably due to their age, do not cover their nose more than other groups. Students (11.3%) and recipients of capital income (23.1%), on the other hand, are the least adherent to nose-covering prevention rules. Once again, we see that it is the younger group that pays little attention to prevention. The professions that are least careful about covering their noses are the group of plant and vehicle operators (22.2%) and craftsmen and skilled workers (14.7%). Those who work in an office (10.2%), have a technical profession (10.2%), have an intellectual profession (7.4%) or belong to the group of legislators, entrepreneurs and senior management (7.4%) use the face mask less incorrectly.

### *3.3.1.2 Household prevention*

During the period under consideration, the use of masks in outdoor places was regulated by state law. The choice to use these devices outside the home may be due to a regulatory imposition and the risk of a financial penalty in case of non-compliance with the prescribed behaviour. A similar situation applies to the imposition of distancing between people. Regulations and compulsory signs reminding people to stay away from each other can affect people's behaviour. The use of airway protection in private homes in the presence of non-residents is not compulsory, but strongly recommended by the State (DPCM 13 October 2020). The choice is at the discretion of the individual. Assessing behaviour in private homes is important to understand the level of prevention adopted without external coercive conditioning. 86.2% of the sample met non-cohabitants in the home between September and October 2020. Homes were therefore an important setting for sociability during the period when the second wave of Covid-19 began. The preventive behaviours assessed to define the level of prevention adopted in the homes were the use of face masks, spacing of at least one metre and environmental hygiene ensured by air exchange. 15.7% of the sample indicated to have used only one precautionary measure, 35.4% to have adopted two and 28.6% to have used all of them. 6.5% of the sample indicated that they did not use any of the proposed precautionary measures, 13.7% indicated that they did not meet non-cohabitants in the household and the remaining 0.1% indicated that they did not use the criteria and did not meet non-cohabitants at the same time.

The adherence to good behavioural practices of the respondents to the multiple-choice question varies a lot according to the type of measure considered as visible in figure 21.

Figure 21: Preventive behaviour in household



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

About 15% of the respondents stated that they do not meet non-cohabitants. Most of them did not indicate any preventive behaviour because, as they do not receive strangers at home, they probably do not need to use preventive behaviour. 6.8% instead declared not to use any of the precautions considered.

Among the respondents, distancing between people is the most commonly adopted measure. It is used by less than 7 out of 10 people. It is a behaviour that does not visually interfere in the relationship between people. Only half of the people use masking inside the home. Slightly more common is to encourage air exchange in the room. It is 54.6% of the respondents who ventilate the room where the meeting takes place.

Again, it is noted that men are less attentive to prevention. They do not use any preventive behaviour in 10% of cases compared with 5.9% of women. The biggest gender difference is in airing the room (57.3% women and 44.9% men). Changing the air is a good hygienic practice that is part of the household activities to maintain healthy environments. Ensuring adequate air exchange is probably a more feminine concern both in general terms and to prevent contagion. Spacing is also more common among women (68.3% and 63% among men) while the face mask is used by 51.3% of female respondents and 48.3% of male respondents. Only the habit of not meeting non-cohabitants is fairly evenly distributed between the genders (men 16.8% and women 15%).

With increasing age there is a decrease in the percentage of those who use no criteria. This can be interpreted as a greater concern about encountering the virus among older people (table 10).

Table 10: Preventive behaviour in household and age

	<30 years old	30-59 years old	>60 years	Total
Mask usage	291	1925	466	2682
	37.2%	50.4%	67.1%	
At least one metre distance	452	2582	523	3557
	57.8%	67.6%	75.3%	
Room ventilating	392	2118	383	2893
	50.1%	55.4%	55.1%	
None	113	226	21	360
	14.5%	5.9%	3.0%	
I have not met anyone not cohabiting	99	617	98	814
	12.7%	16.1%	14.1%	
Total	782	3821	695	5298

Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

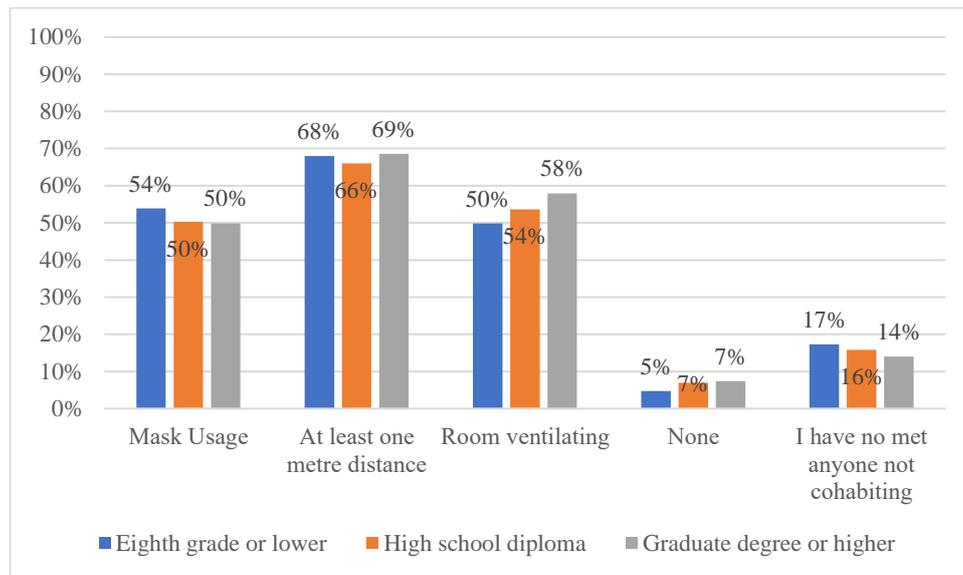
All prevention measures increase with the age of the respondents except the practice of airing the room which remains similar among adults up to 59 years old and the over 60s. This practice might be less used by the over 60s because of the lower efficiency of the thermoregulatory system of the body typical of the elderly. Keeping the window open could be experienced as an inconvenience to ventilate the room. It can be seen, however, that in all age groups a distance of one metre is preferred as a precautionary measure. It is the measure that least interferes with people's habits because it is not visible in relation to the mask and does not impact on the room temperature.

On the other hand, there is no clear link between educational qualifications and prevention measures in the home (figure 22). As the level of education increases, those who do not apply any kind of precaution and those who meet people from outside the household increase. On the contrary, the habit of airing the room decreases.

The use of the face mask is more widespread among those who have the third grade. There is therefore no trend indicating a clear relationship between the variables.

The relationship between education and health is usually such that as education increases, so does health. However, we will see that there are some situations in which this is not the case. In particular, in some areas of prevention and public health, a change in habits has already been noted (Anello et al. 2017; Valsecchi et al. 2009). Preventive behaviour seems to be flattening out and the relationship between education and health is becoming less important, also in relation to the Covid-19 health inequalities (Costa and Marra 2021).

Figure 22: Preventive behaviour in household and education



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

There is no difference between occupational groups in receiving strangers in the home. All groups indicated that they do not meet other people with percentages varying between 13.3% (students) and 15.8% (those in employment) except for income earners who never selected this response mode. Students are the occupational group that is least attentive to preventive behaviour. Probably this attitude is linked to the young age of this group. Among them, 14.1% declared that they do not use any precaution against 7.2% of the employed, 6.3% of the unemployed, 3.9% of homemakers and 3% of pensioners. The data on the criteria used confirm that students are the group least interested in using prevention. Students and the employed are the groups that use the mask at home the least (40.3% and 48.7% respectively) followed by homemakers (53.2%) and the unemployed (54.6%). The most attentive are pensioners (66%) and recipients of capital income (64.3%). Students are also the least careful about distance (52.8%) and airing the room (46.8%). In an intermediate position, in using distance, are homemakers (69.3%), the employed (68.8%) and the unemployed (68.3%). People with capital income and pensioners are more likely to use distance (85.7% and 74%). The influence of the age variable on preventive behaviour has already been noted. Again, it can be assumed that the greater propensity of pensioners towards preventive behaviour is due to their greater age. The air change is practised more by homemakers (57.5%) than by the other groups.

Again, the group that uses this preventive behaviour the most is the group with the most responsibility for household management. 55.7% of the unemployed, 54.9% of the retired, 54.6% of the employed, 50% of those with capital income and 46.8% of the students air their rooms in the presence of non-cohabitants.

With regard to the findings on the use of the mask outside the home, it can be seen that the intellectual professions are confirmed as those who most adhere to the appropriate behaviour to prevent infection even at home (table 11).

*Table 11: Preventive behaviour in household and profession*

	Legislator, entrepreneur, senior management	Intellectual, scientific and highly specialized profession	Technical profession	Executive profession in office work	Skilled occupation in commercial and service activities	Craftsman, skilled worker and farmer	Plant operator, stationary and mobile machinery workers and vehicle drivers	Unskilled occupation (in commerce, services, domestic, leisure and cultural activities, agriculture, animal husbandry, manufacturing)	Armed forces	Total
Mask usage	44	352	192	484	359	156	25	137	11	1760
	46.3%	54.4%	45.8%	46.4%	48.8%	45.7%	55.6%	50.6%	47.8%	
At least one metre distance	60	459	282	709	482	214	28	170	13	2417
	63.2%	70.9%	67.3%	67.9%	65.5%	62.8%	62.2%	62.7%	56.5%	
Room ventilating	51	404	223	580	407	155	17	135	6	1978
	53.7%	62.4%	53.2%	55.6%	55.3%	45.5%	37.8%	49.8%	26.1%	
None	7	36	30	78	60	27	4	28	1	271
	7.4%	5.6%	7.2%	7.5%	8.2%	7.9%	8.9%	10.3%	4.3%	
I have not met anyone not cohabiting	18	92	67	153	124	62	7	38	7	568
	18.9%	14.2%	16.0%	14.7%	16.8%	18.2%	15.6%	14.0%	30.4%	
Total	95	647	419	1044	736	341	45	271	23	3621

Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

This is the group that gave the most consistent responses. Many groups based on their profession seem to apply prevention in very different ways depending on the aspect considered: in some aspects they obtain scores that indicate a correct application of the anti-infection rules and at the same time in other aspects they seem not to comply with the indications. For example, the technical professions are among the occupational groups that use masks least at home, but they are among the most careful about keeping their distance and have a percentage of individuals who ventilate their homes that is intermediate between all the values recorded in the various groups. Unskilled occupations and plant operators, stationary/mobile workers and vehicle drivers are the least adherent to precautionary measures along with skilled occupations in trade and services and craftsmen, labourers and farmers. The group of those who stated that they are legislators or entrepreneurs or senior management are also less attentive to prevention in the home than other categories.

Being or having been health workers also partly influences the behaviour adopted inside the home. If we analyse the criteria used by healthcare workers, we find a greater use of ventilation (69.8% compared to 62.3% of non-healthcare workers). Smaller differences were also recorded in the use of the mask to cover the airways (54.6% and 50% respectively) and in the respect of the distance between people (69.3% and 66.8%). Less marked between health professionals and non-health professionals are the differences between those who declared to use no preventive behaviour (5.4% and 7%) and those who do not meet non-cohabitants in the home (13.5% and 15.7%).

The characteristics of the people with whom one lives, on the other hand, seem to play an important role in favouring or not favouring the adoption of preventive behaviour. Living with people with immunodeficiencies or chronic diseases or over 65 years old or having children of age seems to make people more responsible. Living with someone who has an important pathology that represents a risk factor for developing complications from Covid-19 means that the use of a mask is adopted in 55.8% of cases (against 48.7%), distancing in 70.1% (against 66.1%) and airing in 59% (against 53%). There is little difference between the two groups in terms of encounters with non-cohabitants (16.4% versus 15%), while the number of those who said they did not use any precautions indicates that those who have a sick person in the home are more careful (4.4% versus 7.7%).

A similar difference is found among those who live with an over-65. It is 4.7% who do not use precautions compared to 7.1% of those who do not have cohabitants in this age group. 58.5% of those who have persons over 65 years old at home use a mask against 49% of those who do not experience this situation. Also, the percentage of those who adopt distancing is higher among those who have an elderly person at home (72.6%) than among those who do not live with persons whose age falls within this range (66.4%). There is no difference instead at the level of airing (54.7% vs. 55.1%) and at the level of meetings with people outside the household (respectively 13.9% and 15.3% do not meet strangers at home).

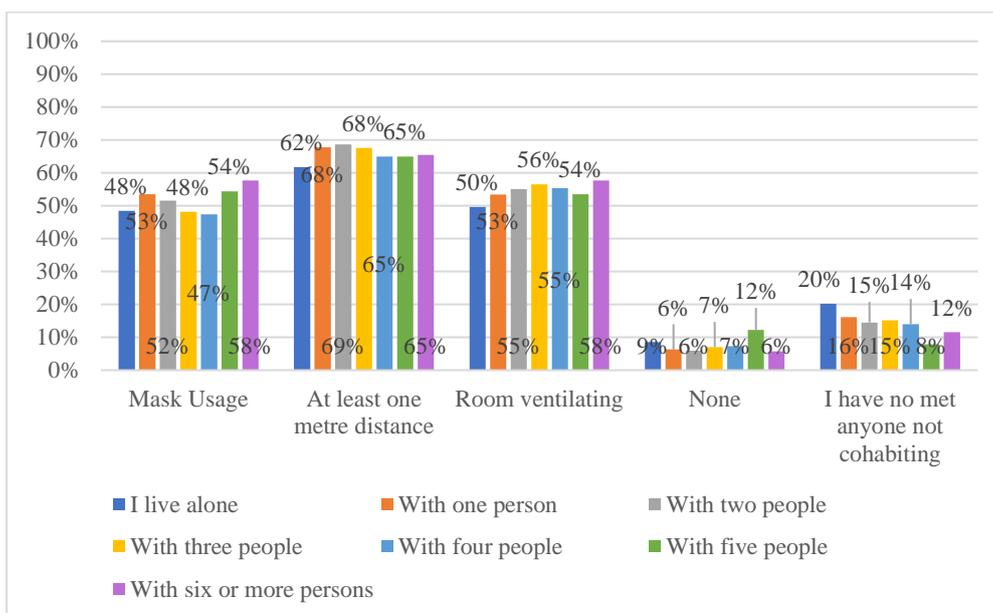
Those who have children over 18 seem to be more attentive to the use of masking when sharing a domestic space with non-cohabitants (58.4% vs. 48.8% of those who do not have children over 18) and to spacing (72.9% vs. 66.2%). The percentages of those using spacing (54.7% and 56.2%) or not meeting non-cohabitants in the home (15.3% and 13.6%) were similar between the two groups. 3.9% of the former and 7.4% of the latter stated that they do not use any preventive behaviour.

On the contrary, having minor children, does not seem to favour the action of practices against the pandemic with the exception of favouring the change of air in the rooms of one's home (57.9% vs. 52.8%). Among these subjects, in fact, the mask is used by 48.7% against 52.4% of those who do not live with minors. Both groups adopt in the same way the distancing (both 67.6%) and similar percentages of the two groups declared not to meet non-cohabitants (15.4% with children under 18

years old and 14.6% without underage children at home). No precautions were applied by 5.8% of the former and 7.3% of the latter. It can be assumed that Covid-19 is not a major problem for parents with underage children, as they are at an age where the risk of disease complications is low. The data also refer to a period in which the virus did not only affect the elderly and adults, but in which communication messages were focused on the groups at greatest risk of communication. The problem of infection among children may therefore have been underestimated. With the arrival of vaccination and the fourth wave of Covid-19, the epidemiological situation has changed. Between September and October 2020, there was less focus on infecting minors. In addition, the management of minors probably also makes it more difficult to manage the need to encourage children to meet their peers and to observe all the necessary precautions. The use of a mask is not compulsory for children under the age of 6 and is also difficult to wear when one is a pre-schooler. Furthermore, making children in this age group, or slightly older, understand the concept of distancing could also be complicated from a cognitive point of view. Consequently, it can be assumed that parents of minors adapt more easily than other adults to accepting even disease-prone situations.

The number of cohabitants, on the other hand, does not have an unequivocal relationship with the preventive measures taken in the household. As can be seen in figure 23, it is households with one to three persons or at least six persons that encounter fewer non-cohabitants and apply preventive behaviour more than other households.

Figure 23: Preventive behaviour in household and number of cohabitants



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

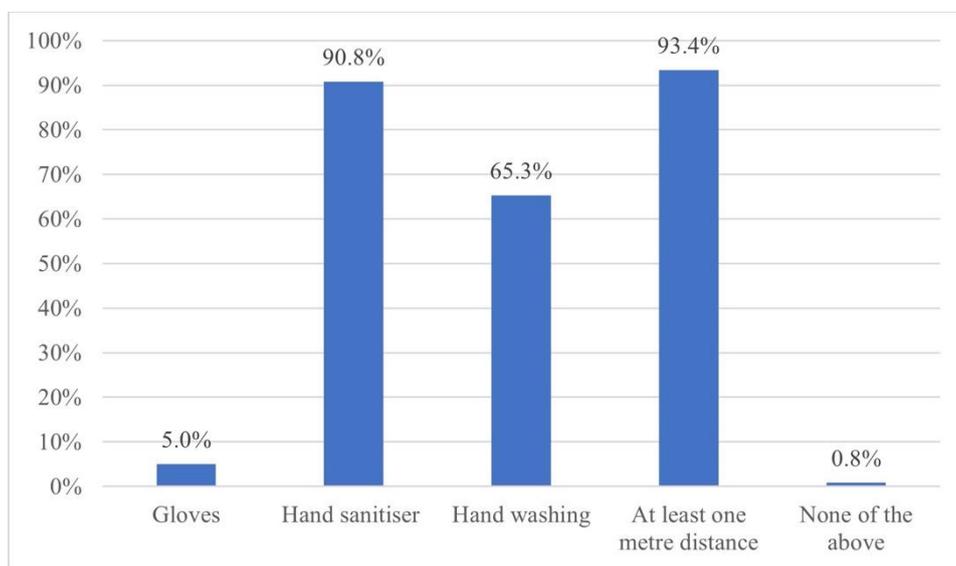
A confusion seems to be emerging that may underlie a lack of clarity about how the virus is transmitted and, consequently, how to avoid infection and through which behaviours to protect other people. In particular, the lower prevalence of mask use indicates that the guidance on how to prevent infection is probably not well understood and implemented. Beyond the confusion, what emerges is that prevention in the home is used inadequately. Too many people still only partially apply safety measures. In particular, the non-use of masks is widespread. This is an important fact to consider because in reality, as the questionnaire data show, it is one of the settings in which it is easiest to become infected. Infection in the home is not only due to intra-family transmission, but can occur when people come into contact with non-cohabitants and the probability increases if appropriate precautionary measures are not used.

### 3.3.1.3 Outside household prevention

Avoiding crowded places, avoiding close encounters by keeping a distance of one metre, washing hands with soap and water or using an alcohol-based gel, are the behaviours analysed to explore preventive habits used outside the home. 57.6% of respondents said they used all three, 35.2% used two and 6.5% used one. Only 0.7% stated that they do not use any measures.

About 9 out of 10 respondents to the multiple-choice question kept their distance and sanitized their hands with gel (figure 24).

Figure 24: Preventive behaviour outside household



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

Washing hands is less common. 6.5 out of 10 people do so. Since the beginning of the pandemic, in order to promote hand sanitation, the government has encouraged the widespread installation of public hand hygiene stations at the entrance and exit of public and community places (DPCM 1 March

2020). Gel is more readily available than using soap and water. Between September and October 2020 few respondents said they still use gloves. The use of these devices, as already seen, can constitute a barrier against the virus, but the risk of their incorrect use is very high. This is why the WHO does not recommend the use of gloves to people in the community. Of those who answered the battery of questions, only 0.8% stated that they did not use any of the precautionary measures considered.

Gloves are more used by women (5.3% vs. 3.9% of men) who are also more likely to use hand gel (92.6% vs. 84.6%) and to keep their distance (94.1% vs. 90.9%). On the other hand, there were no substantial differences in hand washing (65.2% and 65.4%). The respondents who indicated that they do not use any of the indicated behaviours are 0.5% of women and 1.9% of men. The data therefore confirm that the female gender is more likely to adopt preventive behaviours.

The age variable seems to influence the behaviour (table 12). Glove use increases with age and is twice as high among the elderly, probably because they are more afraid of possible age-related complications of the disease and continue to see gloves as additional protection. However, if gloves are used incorrectly, they become a false security. Spacing also increases with age and the use of hand sanitizer and hand washing decreases. As people get older, they pay less attention to hand hygiene, one of the most important elements in avoiding infection. It is likely that the over 60s adopt hand hygiene less, not because they are less careful, but because they do not understand the mechanisms of disease transmission. In support of this hypothesis, it can be added that the elderly adopts no preventive behaviour less than other age groups.

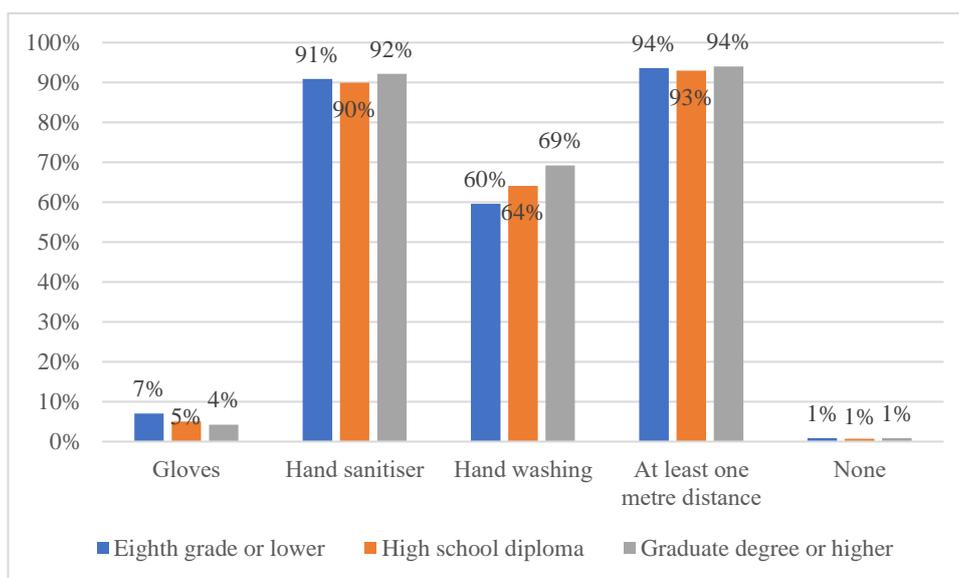
*Table 12: Preventive behaviour outside household and age*

	<30 years old	30-59 years old	>60 years	Total
Gloves	29	169	68	266
	3.7%	4.4%	9.8%	
Hand sanitiser	707	3483	621	4811
	90.3%	91.2%	89.5%	
Hand washing	559	2453	445	3457
	71.4%	64.2%	64.1%	
At least one metre distance	702	3586	658	4946
	89.7%	93.9%	94.8%	
None	12	26	4	42
	1.5%	0.7%	0.6%	
Total	783	3819	694	5296

Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

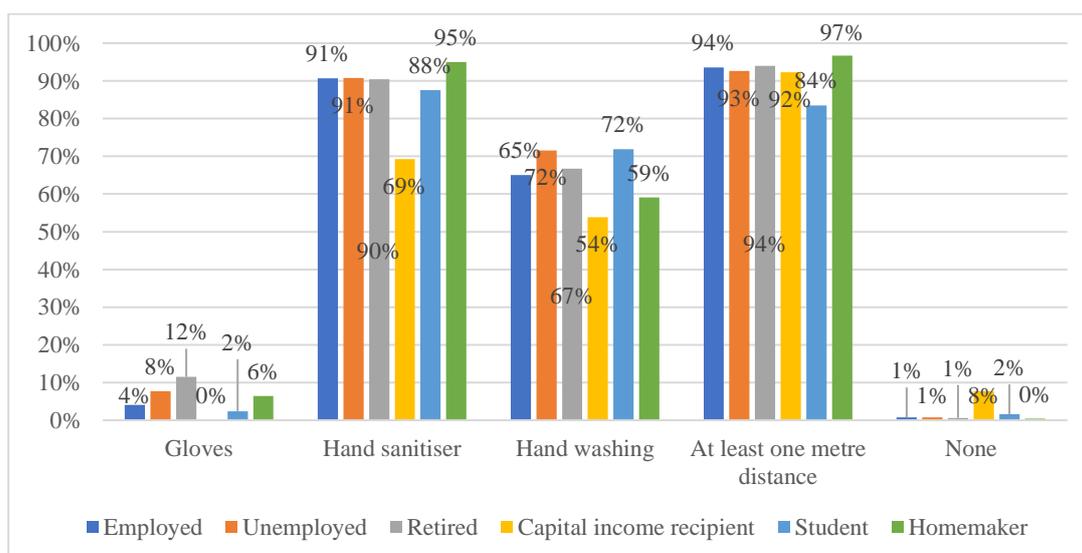
Education appears to influence glove use and hand washing. As years of education increase, the percentage of glove-wearers decreases and the percentage of hand-washers who use soap and water to sanitise their hands increases. It is likely that more education means a better understanding of the issues surrounding glove use and the effectiveness of handwashing in preventing infection. In fact, education can influence, along with other skills, the achievement of positive health outcomes by influencing the ability to understand complex concepts (Kaplan, Spittel, and David 2015).

Figure 25: Preventive behaviour outside household and education



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

Figure 26: Preventive behaviour outside household and employment status



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

The analysis of the data does not reveal a clear association between employment and preventive behaviour outside the home (figure 26). However, some peculiarities can be noted. Capital income recipients are the category with the least attention to prevention. Students are also characterised by a low level of attention to preventive measures apart from hand washing. Pensioners, given the average age of the group, are confirmed as the category that uses gloves the most. Housewives, on the other hand, show more attention to preventive aspects outside the home, with the exception of hand washing.

Analysing the behaviour outside the home according to the profession (table 13) we find similar trends to those observed for precautionary measures taken at home. The intellectual professions are confirmed as the ones that behave in a more consistent way, showing that they take more precautionary measures than others. The police are also mostly oriented towards the behaviour indicated by the institutions as protective. Less attentive to these aspects are plant operators, machine operators, vehicle drivers and craftsmen, skilled workers and farmers.

Table 13: Preventive behaviour outside household and profession

	Legislator, entrepreneur, senior management	Intellectual, scientific and highly specialized profession	Technical profession	Executive profession in office work	Skilled occupation in commercial and service activities	Craftsman, skilled worker and farmer	Plant operator, stationary and mobile machinery workers and vehicle drivers	Unskilled occupation (in commerce, services, domestic, leisure and cultural activities, agriculture, animal husbandry, manufacturing)	Armed forces	Total
Gloves	5	29	19	35	20	13	4	19	0	144
	5.32%	4.48%	4.51%	3.35%	2.72%	3.81%	8.89%	7.01%	0.00%	
Hand sanitiser	87	612	373	941	668	297	38	242	20	3278
	92.55%	94.59%	88.60%	90.13%	90.88%	87.10%	84.44%	89.30%	86.96%	
Hand washing	65	449	280	651	509	194	29	164	14	2355
	69.15%	69.40%	66.51%	62.36%	69.25%	56.89%	64.44%	60.52%	60.87%	
At least one metre distance	88	619	392	983	691	311	40	246	22	3392
	93.62%	95.67%	93.11%	94.16%	94.01%	91.20%	88.89%	90.77%	95.65%	
None	2	3	6	6	6	5	1	0	0	29
	2.13%	0.46%	1.43%	0.57%	0.82%	1.47%	2.22%	0.00%	0.00%	
Total	94	647	421	1044	735	341	45	271	23	3621

Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

On the other hand, being or having been a health worker does not change behaviour much. Gloves are used by 4.9% of the former and 5% of the latter, and gel by 93.2% and 90.5%. Hands are washed outside the home by 67.5% of health workers and 64.9% of non-health workers. Distance is also used in a similar way by the two groups (94.5% and 93.2% respectively). None of these behaviours were used by 0.5% of healthcare workers and 0.8% of the others.

Finally, living with a seriously ill person or with people over 65, who are therefore at greater risk of complications, makes people a bit more careful about wearing gloves and washing their hands (table 14). These individuals, along with those living with children of age, are also less likely to take no precautionary measures.

Table 14: Preventive behaviour outside household and cohabitants characteristics

	Cohabitation with people >65 years old		Cohabitation with people suffering from immunodeficiencies or chronic pathologies		Cohabitation with underage children		Cohabitation with adult children	
	Yes	No	Yes	No	Yes	No	Yes	No
Gloves	78	167	96	169	88	158	65	181
	8.2%	4.3%	6.9%	4.4%	4.2%	5.7%	6.4%	4.7%
Hand sanitiser	865	3561	1290	3501	1927	2509	917	3519
	91.0%	91.0%	92.3%	90.3%	91.0%	91.0%	90.7%	91.1%
Hand washing	643	2524	926	2514	1321	1855	625	2551
	67.6%	64.5%	66.3%	64.8%	62.4%	67.3%	61.8%	66.0%
At least one metre distance	887	3654	1333	3595	1988	2563	959	3592
	93.3%	93.4%	95.4%	92.7%	93.9%	93.0%	94.9%	93.0%
None	4	32	6	36	19	17	3	33
	0.4%	0.8%	0.4%	0.9%	0.9%	0.6%	0.3%	0.9%
Total	951	3913	1397	3879	2118	2756	1011	3863

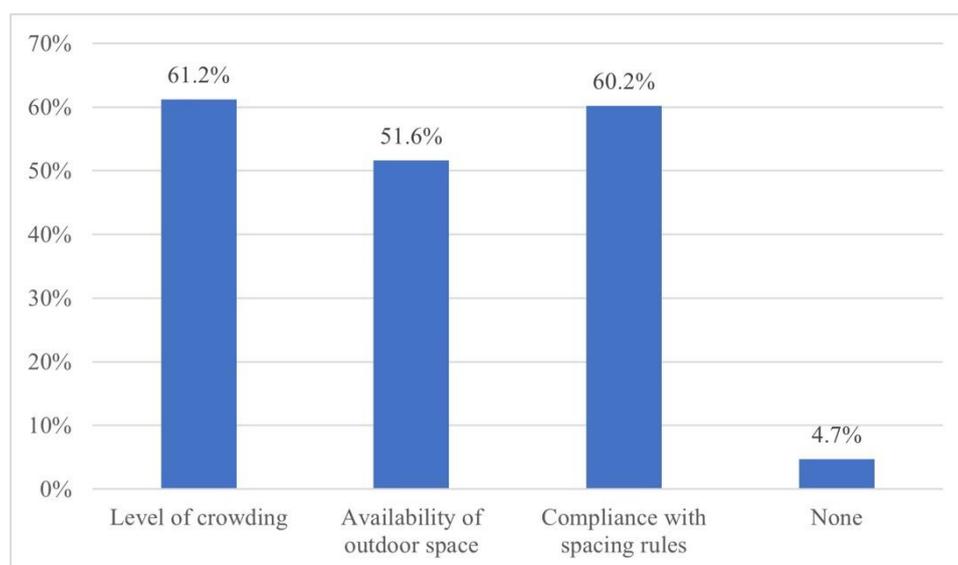
Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

The data collected show that the sample tends to pay more attention to prevention in contexts outside the home, as if the virus is more easily transmitted outside the home and not inside the home, even if there are non-cohabitants present. People belonging to the circle of intimate relationships might be perceived as less dangerous. As will be explained and argued in the section on the discussion of the data, the issue of trust in the other is also fundamental in relation to Covid-19. Having trust may in fact lead to a lowering of attention towards prevention and to the lesser use of preventive behaviours that allow less exposure to the virus within homes where there is no legal imposition on the use of devices or other preventive behaviours.

### 3.3.1.4 Preventive criteria for choosing leisure places adopted

Between September and October, a period in which the data on Covid-19 infection indicated an increase in the transmissibility of the disease, it is noted that the pandemic led 84.3% of the survey participants to consider at least one preventive criterion when choosing places to go in their free time between crowding, respect for distance between people and the presence of an outdoor space. In particular, 37.6% of the sample indicated only one criterion, 29.9% two and 21% three. 4.2% stated that they did not adopt any criteria and 7.3% did not answer the question. This is the question with the highest percentage of non-respondents in the whole questionnaire. The comparison of this group with the sample revealed that among the non-respondents there are more men, younger, and less graduated and that the group adopts less criteria for prevention outside the home than the rest of the participants. Being at the beginning of the questionnaire and having a similar formulation to the questions on the behaviour adopted inside and outside the home, the high number of non-respondents could indicate either a difficulty in admitting their behaviour or a lack of interest in the preventive aspects for the choice of places. In both cases, this indicates the importance of investigating these aspects, which are fundamental to fighting the pandemic. Before the introduction of mass vaccination, which began in December 2020, the only way to limit the spread of the infection was to comply with preventive behaviour. These have had an impact on everyone's habits, and the high percentage of non-respondents may also indicate a difficulty in having to change their behaviour in areas that belong to an individual's private sphere. Among the respondents to the multiple-choice question those who do not use any criteria represent 4.7% (figure 27).

Figure 27: Criteria for choosing leisure venues



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

The evaluation of the level of crowding (61.2%) and the respect of the distance between people (60.2%) are the most used criteria. Avoiding situations of proximity to other people (crowding and/or respecting distance rules) is the most considered aspect, which can be traced back to a clear measure of prevention from infection as Covid-19 is an airborne disease. A lower percentage of respondents stated that they considered the presence of outdoor spaces. Women are more likely to rate all three aspects than men. The most obvious difference concerns the availability of outdoor space, which is evaluated by 53.8% of women and 43.1% of men. Crowding is considered by 62% of the female gender and 57.9% of the male gender. The percentage of those examining spacing in the first group is 60.9% and in the second is 57.5%. The greater attention of women also emerges from the fact that more than twice as many men (8.6%) stated that they did not use any selection criteria compared to women (3.7%). Age does not have a clear relationship with the choice of criteria (table 15). As age increases, the percentage of those use any criteria decreases and those who consider respect for distances increases, as if older people use more care when choosing places to go. At the same time, however, as age increases, there is a decrease in those who consider crowding and the availability of outdoor spaces.

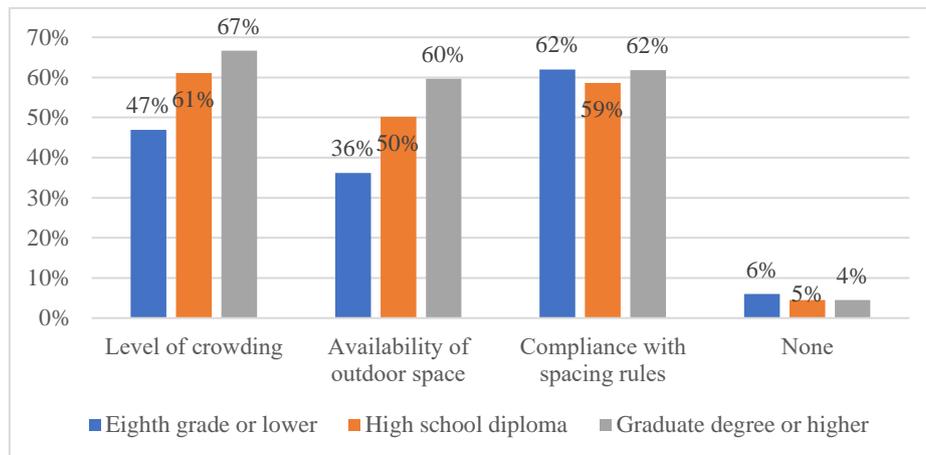
Table 15: Criteria for choosing leisure venues and age

	<30 years old	30-59 years old	>60 years	Total
Level of crowding	484	2228	302	3014
	68.5%	62.5%	46.0%	
Availability of outdoor space	408	1838	296	2542
	57.7%	51.6%	45.1%	
Compliance with spacing rules	414	2131	420	2965
	58.6%	59.8%	64.0%	
None	50	155	26	231
	7.1%	4.4%	4.0%	
Total	707	3563	656	4926

Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

It is likely that young people, who in general are less attentive to prevention, are more sensitive to the problem of the risk of infection in public places because they frequent them more. In fact, as already pointed out, as age increases the habit of meeting friends and relatives in third places or attending parties, lunches and dinners decreases. The elderly and adults, having frequented these places less, may as a consequence have taken less account of the criteria proposed for the evaluation of the sites to be frequented. Education increases the consideration of crowding and outside spaces, but not the respect of the distancing which is however similar in the three groups (figure 28).

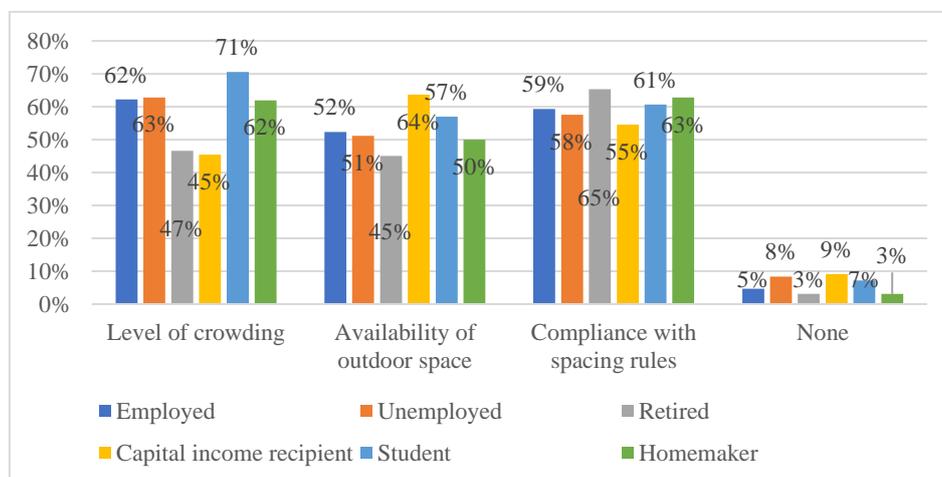
Figure 28: Criteria for choosing leisure venues and education



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

The percentage of persons who do not use criteria is also similar, but decreases with the level of education. The relationship between education and prevention emerges clearly in the first two aspects showing a greater attention towards these criteria of choice related to prevention by those who have a higher education. In terms of occupational status, students, the group with the lowest average age, are the most attentive to crowding and distance and are the second largest group to consider the availability of an outdoor space. Pensioners, the group with the highest average age, are the least interested in considering the level of crowding and the presence of an outdoor space, probably due to the lower attention to the preventive criteria already noted when analysing the age variable. However, it is not possible to detect a clearer relationship between occupational status and the criteria chosen as shown in figure 29.

Figure 29: Criteria for choosing leisure venues and employment status



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

The data show once again a greater attention to the elements of prevention on the part of the intellectual professions who have high percentages in all the criteria considered and state that they do not evaluate these aspects in only 2.3% (table 16).

Table 16: Criteria for choosing leisure venues and profession

	Legislator, entrepreneur, senior management	Intellectual, scientific and highly specialized profession	Technical profession	Executive profession in office work	Skilled occupation in commercial and service activities	Craftsman, skilled worker and farmer	Plant operator, stationary and mobile machinery workers and vehicle drivers	Unskilled occupation (in commerce, services, domestic, leisure and cultural activities, agriculture, animal husbandry, manufacturing)	Armed forces	Total
Level of crowding	49	423	256	647	412	158	17	138	10	2110
	55.1%	68.8%	66.3%	65.7%	60.6%	52.3%	41.5%	55.6%	47.6%	
Availability of outdoor space	47	368	194	544	349	121	10	119	12	1764
	52.8%	59.8%	50.3%	55.2%	51.3%	40.1%	24.4%	48.0%	57.1%	
Compliance with spacing rules	55	389	229	567	411	171	20	145	12	1999
	61.8%	63.3%	59.3%	57.6%	60.4%	56.6%	48.8%	58.5%	57.1%	
None	10	14	19	37	32	22	6	18	0	158
	11.2%	2.3%	4.9%	3.8%	4.7%	7.3%	14.6%	7.3%	0.0%	
Total	89	615	386	985	680	302	41	248	21	3367

Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

Similar percentages were also found in the other professions except for craftsmen, skilled workers, farmers and unskilled professions who do not consider the criteria in higher percentages. The group of plant operators, machine operators and vehicle drivers and the group of legislators, entrepreneurs and senior management were the least likely to take into account preventive criteria when choosing where to go.

Being a health professional does not influence the choice of criteria for the evaluation of the places to go in one's free time with the exception of the use of the criterion "respect of the rule of distancing" chosen by 66.1% of the health professionals against 59.4% of the others.

The characteristics of the people with whom one lives do not influence the criteria used to choose which places to frequent (table 17). The data do not show that living with the elderly, the sick and minors makes people more attentive to compliance with the rules imposed on public places to combat the spread of the epidemic.

Table 17: Criteria for choosing leisure venues and cohabitants characteristics

	Cohabitation with people >65 years old		Cohabitation with people suffering from immunodeficiencies or chronic pathologies		Cohabitation with underage children		Cohabitation with adult children	
	Yes	No	Yes	No	Yes	No	Yes	No
Level of crowding	786	2220	485	2299	1274	1517	486	2305
	59.2%	62.0%	53.9%	63.3%	64.5%	59.1%	51.6%	64.0%
Availability of outdoor space	652	1878	434	1891	1021	1308	433	1896
	49.1%	52.5%	48.3%	52.1%	51.7%	51.0%	46.0%	52.7%
Compliance with spacing rules	838	2114	563	2163	1128	1606	580	2154
	63.1%	59.1%	62.6%	59.6%	57.1%	62.6%	61.6%	59.8%
None	67	163	36	174	89	121	38	172
	5.0%	4.6%	4.0%	4.8%	4.5%	4.7%	4.0%	4.8%
Total	1327	3580	899	3631	1975	2565	941	3599

Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

There is a tendency among respondents to be habitual in their choice of places to go in their free time. 88.2% stated that they always or often go to the same places. This tendency seems to be related also to the adoption of criteria to choose public places where to spend their time. Among those who prefer to vary, there is almost twice as many people who do not use the criteria analysed as those who always or often go to the same sites (7.3% and 4.4%). There are also differences in the evaluation of the level of crowding (54.2% and 62.1%), while less marked are the differences found in the availability of outdoor space (50.2% and 51.9%) and respect for the rules of distance (58.7% and 60.4%). Perhaps the repetitiveness in the choice of places to frequent, during the pandemic period, is also linked to the assessment of the risk of contagion based on respect for the rules that counteract the epidemic. Once the places that most respect the rules and guarantee a lower risk of falling ill have been identified, one might prefer to frequent them repeatedly. The data on the criteria used to choose which places to visit in their free time reveal that the survey participants pay little attention to the preventive elements considered. The high non-response rate and percentages of between 50% and 60% to the multiple-choice question seem to indicate a lack of attention to prevention, especially in moments dedicated to sociability.

### 3.3.1.5 Territorial differences

The analysis of preventive behaviour on the basis of territorial differences aims to explore both the territorial scope of reference understood as size of the municipality of residence and more or less urbanised province of residence. According to the ISTAT classification, Bergamo and Monza are urbanised, Treviso and Padua and Trento have a lower degree of urbanization (Istituto Nazionale di

Statistica 2017). The respondents' perception of what type of city has a higher risk of contagion, as mentioned above, is that there is more risk of contagion in large cities. Looking at the preventive behaviour and the criteria used to choose leisure places, there is little difference in the level of prevention adopted according to the size of the municipality. The greatest difference in the masks used is found in the use of FFP2 (table 18).

*Table 18: Use of face masks according to job, province and region of residence*

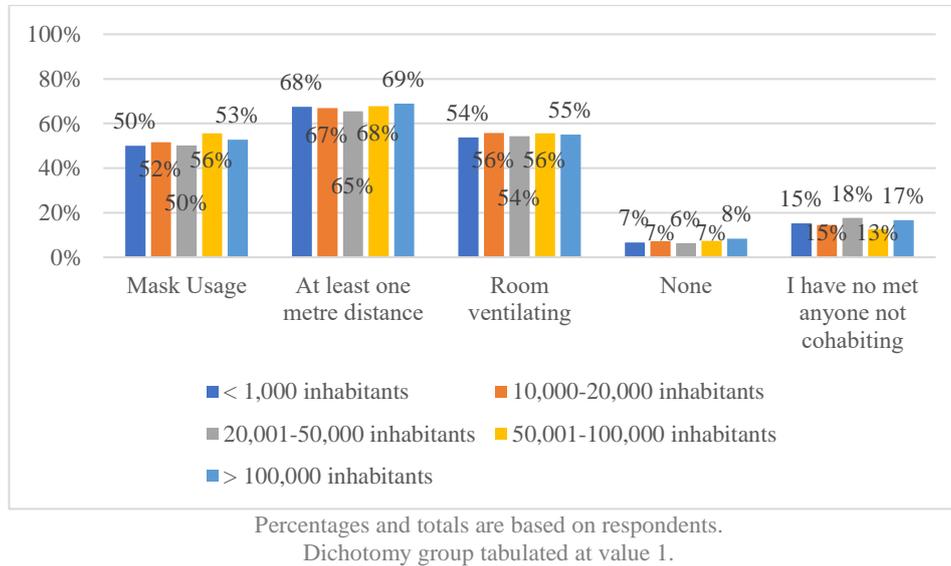
		Municipality of residence population					Total
		< 1,000 inhabitants	10,000-20,000 inhabitants	20,001-50,000 inhabitants	50,001-100,000 inhabitants	> 100,000 inhabitants	
Scarves	N	12	3	5	0	1	21
	%	0.5%	0.2%	0.5%	0.0%	0.6%	
Fabric mask	N	878	422	289	64	59	1712
	%	34.7%	31.5%	31.2%	31.2%	32.8%	
Surgical mask	N	2113	1091	749	178	144	4275
	%	83.4%	81.4%	81.0%	86.8%	80.0%	
FFP2 or higher mask	N	571	344	259	61	58	1293
	%	22.5%	25.7%	28.0%	29.8%	32.2%	
None	N	17	6	6	1	2	32
	%	0.7%	0.4%	0.6%	0.5%	1.1%	
Total	N	2533	1340	925	205	180	5183

Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

As the size of the municipality of residence increases, so does the percentage of people using this personal protective equipment. It seems that those living in more populated areas opt for masks that provide more personal protection. This may indicate an increased desire to avoid infection and not to infect others. The analysis of the percentages reveals few differences with respect to the rest of the masks used and there is no trend indicating a greater level of prevention as the size of the municipality of residence increases or decreases. However, the FFP2 figure is very important on its own. As we will see months after this survey has been carried out, the use of this PPE will be recommended and made compulsory in certain contexts (DL 24 December 2021, n. 221) precisely because it is the precautionary measure that most reduces the risk of contagion. The larger the size of the city, the greater its use. Observing the preventive behaviours adopted in households, there are no clear patterns emerging when comparing the percentages of residents in municipalities with different sizes (figure 30). The only particularity concerns towns with between 20,000 and 50,000 inhabitants. Among residents, the lowest values are found in the adoption of two out of three criteria, but there is a slightly

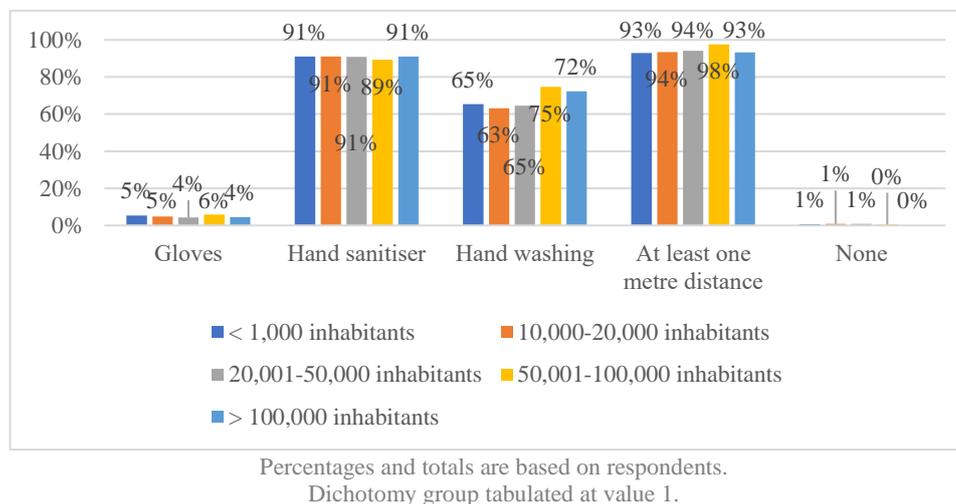
higher percentage of residents who do not meet non-cohabitants. However, these are not major percentage differences.

Figure 30: Preventive behaviour in household and municipality size



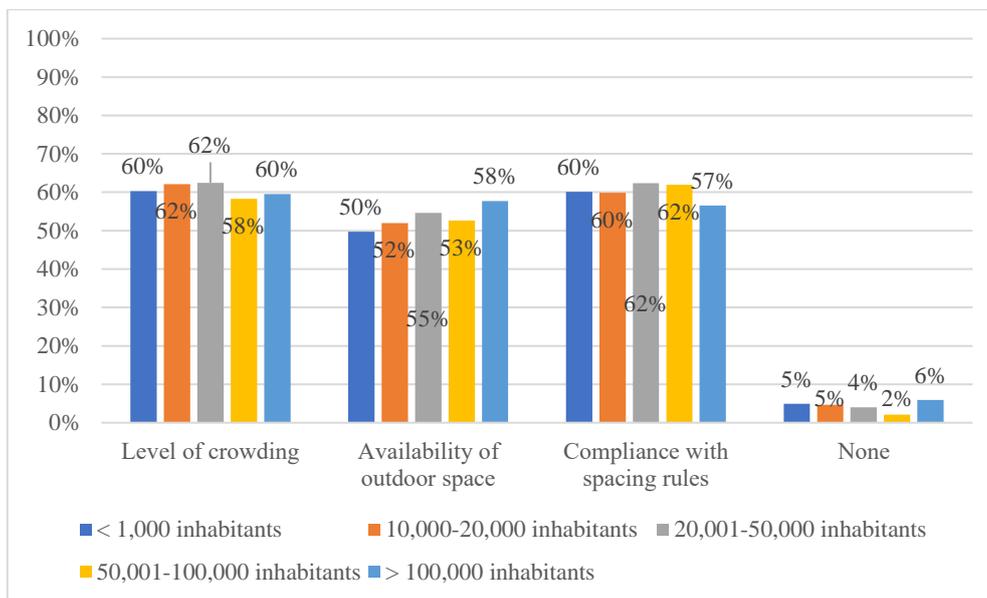
Also, municipality size of residence does not affect the preventive behaviours adopted outside home, which are distributed in a fairly similar way among the various groups (figure 31). The biggest difference is observed with respect to hand washing, which is more common in cities with more than 50,000 inhabitants. This may also indicate a greater attention to their own prevention on the part of those living in more populated contexts as has already been noted in the use of FFP2 masks. We have seen that outside the home the use of preventive behaviours is regulated by state laws and that very few respondents stated that they do not comply with the regulations. The absence of further differences can therefore be attributed to external factors.

Figure 31: Preventive behaviour outside home and municipality size



Also, at the level of criteria used to choose leisure venues, there are no substantial differences according to the size of the municipality of residence (figure 32). The most interesting fact concerns the consideration of the availability of outdoor spaces. It tends to increase as the size of the municipality increases, with the exception of those living in towns of between 20,000 and 50,000 inhabitants. Being in the open air could be perceived as a preventive element and the presence of these spaces is sought more by those who live in big cities.

Figure 32: Criteria for choosing leisure venues and municipality size



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

Compared to the analysis of the differences according to the size of the municipality of residence, greater differences between territories can be found in the analysis of behaviour and how it is distributed among the provinces analysed.

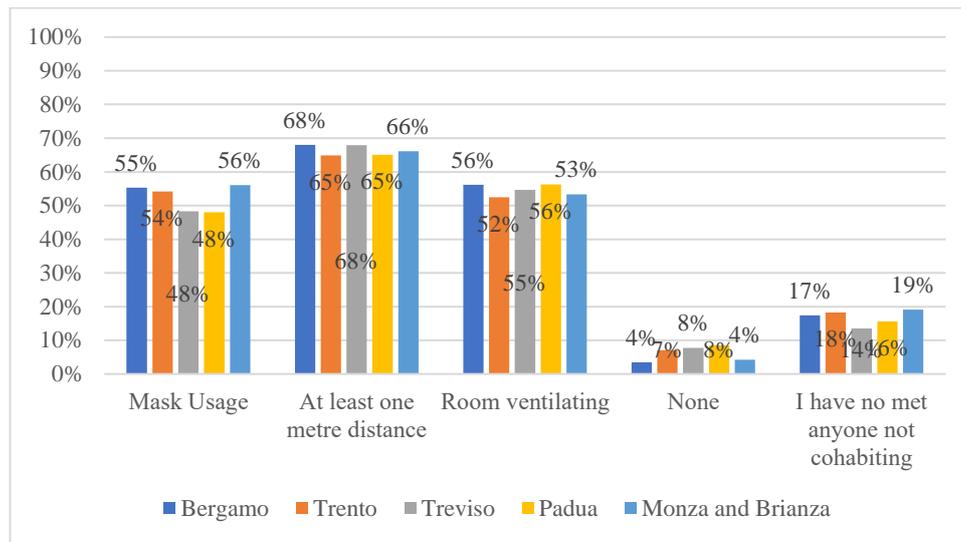
Those who live in in the provinces of Lombardy or Trentino tend to use FFP2 more and fabric masks less (table 19). It should be remembered that Lombardy was one of the areas of Italy most affected by the pandemic during both the first and second waves. It can be assumed that residents in the provinces of Bergamo and Monza feel the need to protect themselves against the disease. more than those residing in provinces that, as we have already seen, were less indicated as being at risk during the pandemic by the media (Corica and De Vito 2020b; De Luca et al. 2020; Spadiciari 2020).

Table 19: Use of face masks according to province of residence

		Province of residence				
		Bergamo	Trento	Treviso	Padua	Monza and Brianza
Scarves	N	3	3	9	4	3
	%	0.6%	0.7%	0.3%	0.7%	0.4%
Fabric mask	N	143	115	1087	155	242
	%	26.4%	28.0%	36.4%	28.5%	29.6%
Surgical mask	N	460	328	2495	436	644
	%	85.0%	80.0%	83.6%	80.1%	78.8%
FFP2 or higher mask	N	157	122	602	143	304
	%	29.0%	29.8%	20.2%	26.3%	37.2%
None	N	4	8	15	4	4
	%	0.7%	2.0%	0.5%	0.7%	0.5%
Total	N	541	410	2986	544	817

In fact, the data on the use of FFP2 in Lombardy is influenced in particular by the province of Monza and Brianza (table 2x). It is here that respondents tend to use this type of personal protection much more. Being close to the metropolis of Milan may make people more inclined to use PPE. In fact, Milan was always indicated during the first phase of the pandemic as an area at risk, given the area's population density (Corica and De Vito 2020b; Dardari 2020). This too could therefore influence the preventive behaviour adopted. FFP2 prevent the dispersion of droplets into the environment like other masks. In addition, they protect the wearer from infection regardless of the precautionary measures of others because they filter the inhaled air. A greater desire to protect oneself could therefore be the cause in the difference in the use of masks that belong to the PPE category. Data on FFP2 and surgical masks show that in Lombardy, the masks that best prevent the spread of the virus are used more than in Trentino or Veneto. Treviso, on the other hand, is characterised by a greater use of fabric masks and this may denote less interest in prevention on the part of people living in peri-urban areas. Also, there is a greater attention towards precautionary measures at home by the Lombard respondents (figure 33): it is 4% who do not adopt any precautionary measures among those who live in the province of Bergamo or Monza. Residents in the Lombardy provinces analysed also have higher percentages of adherents to the use of masks. They also practice more physical distance more than Treviso and Padua residents. Residents of the Venetian provinces use face masks less than the others and tend to apply no precautions at all. They also say less than others that they do not meet people in their homes therefore expose themselves more to the risk of infection as they encounter more non-cohabitants.

Figure 33: Preventive behaviour in household and province of residence

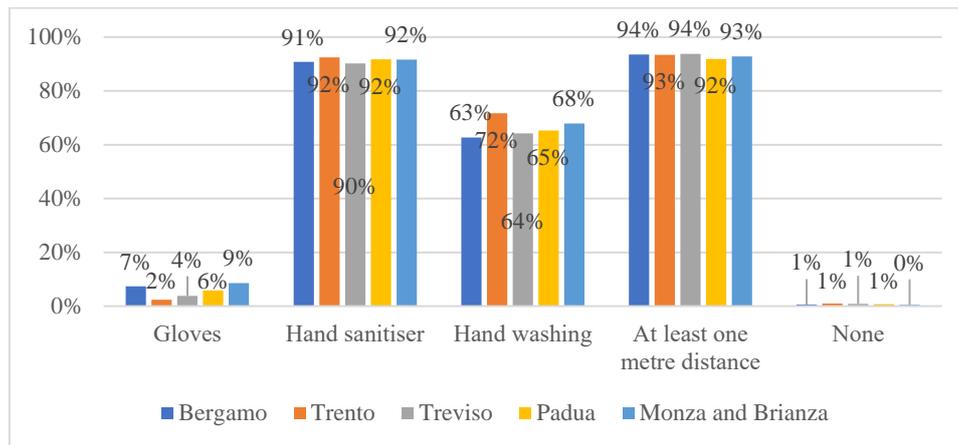


Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

The difference in the use of precautions in the home is very important because, as we have already stated, it is not regulated by law and homes are the places where people most often fall ill. For this reason, having detected differences that indicate greater attention to prevention on the part of the Lombardy provinces that are more urbanised supports the thesis that in the less urban provinces there is less attention to prevention.

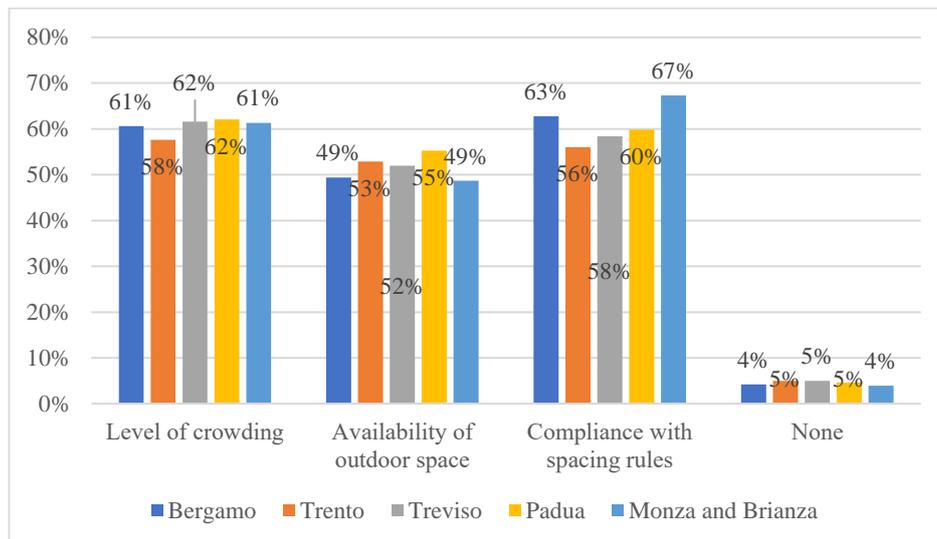
Less marked is the difference between provinces in the use of preventive behaviour outside the home, which in any case is used much more than at home. The only differences to be reported concern the use of gloves and hand washing. Gloves are used by 8.6% of the Brianza citizens and by 7.4% of the Bergamo citizens (figure 34). This answer was given by 5.9% of the Paduans, 3.8% of the people from Treviso and 2.4% of the people from Trento. Hand washing is more common in Trentino (71.6%). Respondents to the multiple-choice question from the other provinces tend to use soap and water in 67.9% among residents of the province of Monza, 65.3% among Padua, 64.2% among Treviso and 62.7% among Bergamo. The differences between percentages are not high and therefore no clear patterns of behaviour by province of residence can be identified as seen with respect to preventive behaviour at home. The respondents living in the provinces of Bergamo and Monza also pay more attention to the choice of leisure place. In particular, it can be noticed that, compared to people from Veneto and Trentino, those who live in the Lombardy provinces are more attentive to the respect of the rules of distance between people in third places. Moreover, a smaller percentage of them declare not to consider any criteria, showing themselves to be more attentive to the respect of preventive rules as shown in figure 35.

Figure 34: Preventive behaviour outside household and province of residence



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

Figure 35: Criteria for choosing leisure venues and province of residence



Percentages and totals are based on respondents.  
Dichotomy group tabulated at value 1.

The data analysed therefore indicate that there is more attention to preventive behaviour in the Lombardy provinces, which are the most urbanised of the areas considered in this paper while preventive behaviours do not change much according to the size of the municipality. Certainly, the provinces of Lombardy, which are the most urbanized, pay more attention than less urbanised areas such as the provinces of Veneto, Padua and Treviso, and Trentino. This therefore supports the hypothesis that in peri-urban and rural areas there is less attention to prevent exposure to the virus. Lombardy areas were more affected by the virus in the first wave, and this could be one of the reasons why prevention is implemented more in these areas, but in Trentino, which was similarly affected, the same attention to prevention is not found. For this reason, the hypothesis that the level of

urbanisation plays a role in the choice of preventive behaviour is confirmed, but needs further investigation.

### 3.3.2 Differences in prevention based on the face mask used

The decision to analyse in depth the masks used and their effectiveness derives from the fact that at a time of great confusion, such as that experienced in the year in which the data were collected (2020), with contradictory communications and obligations imposed by the government on the behaviours to be adopted, the choice of the type of mask to be used can indicate more clearly than other behaviours the attitude of respondents towards prevention. For this reason, it is possible to analyse the presence of differences in prevention. Table 20 shows the usage habits of the masks used by the sample

*Table 20: Types of masks used and their combinations*

	Frequency	Percent	Valid Percent	Cumulative Percent
No masks	28	0.5	0.5	0.5
1 type: surgical only	2406	45.4	45.4	45.9
1 type: FFP2 only	385	7.3	7.3	53.2
1 type: scarves only	5	0.1	0.1	53.3
1 type: fabric only	472	8.9	8.9	62.2
2 types: surgical, FFP2	723	13.6	13.6	75.9
2 types: surgical, scarves	3	0.1	0.1	75.9
2 types: fabric, scarves	5	0.1	0.1	76
2 types: surgical, fabric	1039	19.6	19.6	95.6
2 types: FFP2, fabric	39	0.7	0.7	96.4
3 types: FFP2, surgical, scarves	1	0	0	96.4
3 types: surgical, fabric, scarves	6	0.1	0.1	96.5
3 types: surgical, fabric, FFP2	178	3.4	3.4	99.8
4: types: all kinds of masks	1	0	0	99.9
None and surgical mask	4	0.1	0.1	99.9
None, surgical mask and FFP2	1	0	0	100
None, scarves and fabric mask	1	0	0	100
None, fabric and surgical mask	1	0	0	100
Total	5298	99.9	100	
Missing	7	0.1		
Total	5305	100		

61.7% of the respondents used only one type of mask, while 37.7% tended to alternate between different types of face protection. The remaining 0.6% stated that they either do not use a mask or alternate not using one with various other types of masks.

The alternating use of several types of masks could be due either to personal choice, due to fashion, ecological choice or Self-risk perception, or to the imposition in certain contexts to use a certain type of mask. In some places the wearing of a surgical mask is required. The "Shared protocol for the regulation of measures to combat and contain the spread of the Covid-19 virus in the workplace" between the Minister of Labour and Social Policies, the Minister of Economic Development, the Minister of Health, CGIL, CISL, UIL, UGL, Confindustria, Rete Imprese Italiane, CONFAPI, Alleanza Cooperative, CONFIMI, Federdistribuzione, and Confprofessioni of 2020 provided for the use of surgical masks for all workers sharing common spaces. The obligation to use a surgical mask was then also imposed on non-workers (DPCM 7 August 2020). For example, many healthcare facilities and airlines do not accept the use of fabric masks by users. In addition, different types of masks could also be used depending on the perceived risk of infection. Different contexts could be assessed as more or less risky and therefore the choice of mask would be dependent on the assessment of the individual situation. A situation perceived as riskier might favour the use of personal protective equipment. Conversely, in a situation perceived as less risky, the fabric mask might be used. However, the literature indicates that surgical masks and personal protective equipment, such as FFP2, are more effective in preventing the spread of the virus.

By analysing behaviour, it is possible to identify how many people use appropriate masks to limit the spread of Covid-19. The use of inappropriate masks may be an indicator of a lack of prevention. To assess social differences in prevention based on the face mask used, a typology of masks was therefore reviewed by assigning each item a value from 1 to 4 indicating preventive effectiveness of the masks. A score of 1 was associated with those who said they did not use masks (very low attention to prevention). Those who stated they do not use masks and alternate this habit with all other types of masks or those who only use scarves and/or fabric masks scored 2 (low attention to prevention). Those who use surgical and/or FFP2 alternating with other types scored 3 (quite high attention to prevention). The highest score, 4, was obtained by those who stated that they only use surgical and/or FFP2 (very high attention to prevention). 66.3% of the respondents always used appropriate masks to prevent the spread of the disease (surgical and/or FFP2), thus demonstrating that they are very attentive about prevention. 23.9% have a fairly clear idea of prevention because they wear adequate masks even if they alternate them with less effective masks (fabric, scarves and headscarves). The concept of prevention is unclear to 9.2%, who state that they either use a mask or do not use any. Finally, 0.5% do not use any of the masks listed, thus demonstrating both that they are not following

the instructions of the government, which in autumn 2020 introduced the mandatory use of devices to cover the airways outdoors (DL 7 October 2020, n. 125), and that they have not understood the importance of this precautionary measure for preventive purposes.

To compare the use of effective and ineffective masks t-test and ANOVA are used. Through the t-test no particular gender differences were found at the level of masks used to prevent the spread of Covid-19, young people ( $M=3.568$ ,  $SD=0.65$ ) and adults ( $M=3.538$ ,  $SD=0.69$ , use masks less effectively than the over 60s ( $M=3.670$ ,  $SD=0.68$ ), as noted by post hoc;  $F(2, 5295)=11.022$ ;  $p<0.001$ . It is therefore confirmed that the elderly pays more attention to mask use and, in particular, to self-protection. The greater adherence to mask use in the elderly therefore confirms what has already been found in other studies (Haischer et al. 2020). No differences in educational qualifications were found. Retired people ( $M=3.652$ ,  $SD=0.65$ ), a category that by definition includes the over 65s, have a significantly higher clarity value than the unemployed ( $M=3.461$ ,  $SD=0.73$ );  $F(5, 5286)=3.858$ ,  $p=0.002$ . On the other hand, intellectual ( $M=3.65$ ,  $SD=0.60$ ) and technical ( $M=3.65$ ,  $SD=0.64$ ) professions differ from craftsmen who score lower ( $M=3.43$ ,  $SD=0.77$ ); ( $F=8, 3613$ )= $4.291$ ,  $p<0.001$ . A significant difference was found at territorial level; ( $F=4, 5293$ )= $8.029$ ,  $p<0.001$ . According to the post hoc findings, the inhabitants of Bergamo ( $M=3.663$ ,  $SD= 0.59$ ), Monza ( $M=3.616$ ,  $SD=0.63$ ) and Treviso ( $M=3.517$ ,  $SD=0.69$ ) use effective masks differently, thus demonstrating that they adopt different preventions. Inhabitants of the Veneto province are therefore less attentive to prevention because they use fewer effective masks. There is no significant difference according to the size of the city of residence.

Self-risk perception of the disease also plays a role in the use of masks. The greater the perception of risk, the greater the use of effective masks;  $F(4, 5282)=7.599$ ,  $p<0.001$ . According to the post hoc findings, those who judge themselves to be at high risk of becoming infected with Covid-19 disease ( $M=3.686$ ,  $SD=0.68$ ) use masks that are more effective at controlling droplet transmission than those who are not afraid of getting sick ( $M=3.463$ ,  $SD=0.87$ ), those who have little fear ( $M=3.586$ ,  $SD=0.71$ ) or who judge themselves to be fairly at risk ( $M=3.586$ ,  $SD=0.65$ ).

At territorial level, there is no significant difference according to the size of the municipality. On the other hand, analysis of the effectiveness of the masks used also indicates that there is more attention to prevention in the Lombardy provinces. In fact, ANOVA showed a statistically significant difference between provinces;  $F(4, 5293)=8.029$ ,  $p<0.001$ . Post hoc studies reveal a significant difference between Treviso ( $M=3.517$ ,  $SD=0.69$ ) and the Lombard provinces of Bergamo ( $M=3.663$ ,  $SD=0.59$ ) and Monza-Brianza ( $M=3.616$ ,  $SD=0.64$ );. The people of Treviso use masks that are less suitable for preventing the spread of Sars-Cov-2. This seems to show that they pay less attention to prevention and avoiding exposure to the virus for themselves and others.

### 3.3.3 Respondents profile according to preventive behaviours

Cluster analysis reduces the number of individuals into a smaller number of profiles by assessing the interrelationships between individuals. It is a technique already used in the context of health and preventive behaviours to decrease the exposure and spread of Covid-19 (Bernabe-Valero et al. 2021; Hofstetter et al. 2014). In the pandemic context, research on individual differences in coping with the Covid-19 pandemic appears to be crucial for designing targeted and effective intervention strategies to foster the adoption of preventive behaviours. Therefore, through the use of cluster analysis we aim to further investigate individual differences surrounding the Covid-19 pandemic situation as already carried out by Bernabe and colleagues (Bernabe-Valero et al. 2021). Through the TwoSteps cluster analysis, it was possible to create a segmentation of the survey participants based on the precautionary measures and preventive criteria adopted by the respondents. Preliminary analyses suggest the feasibility of TSCA as the average silhouette size of cohesion and separation was approximately 0.5 for the cluster solution. This indicates that the measured distance between clusters was fair and therefore acceptable for further analysis. The variable absence of encounters with non-cohabitants in the house, airing of the room, distance of at least one metre and use of the mask have the highest predictive importance of all variables and are the most relevant in defining the differences between the five clusters. The variables with the lowest importance in the formation of the clusters were the number of preventive criteria used outside the home (0.28) and the number of preventive criteria adopted when choosing public places to visit during leisure time (0.17). TSCA indicated the presence of 5 clusters with differences in both prevention and group characteristics. Table 21 and table 22 describe the clusters.

Table 21: Cluster Solution (continuous variables)

		Cluster				
		1	2	3	4	5
		Medium-low prevention outside and inside distancing plus some masks N=1099	Medium prevention outside and isolated at home N=738	Low prevention outside and inside home N=1075	Medium-high prevention outside and inside distancing plus airing N=901	High prevention outside and inside home N=1495
In October in the presence of NO-COHAUSING did you do the following?						
Preventive behaviour adopted when choosing public places to go during leisure time	Mean	1.4049	1.5769	1.2419	1.7003	1.8227
	Std. Deviation	0.98199	1.04880	1.06717	0.98832	0.97011
Preventive behaviours adopted in general (outside home)	Mean	2.3867	2.4986	2.1888	2.5916	2.7037
	Std. Deviation	0.67660	0.66345	0.88893	0.55946	0.49342

Table 22: Cluster solution (categorical variables)

		Cluster					Pearson Chi-Square		
		1 Medium-low prevention outside and inside distancing plus some masks N=1099	2 Medium prevention outside and isolated at home N=738	3 Low prevention outside and inside home N=1075	4 Medium- high prevention outside and inside distancing plus airing N=901	5 High prevention outside and inside home N=1495	Value	df	Asymptotic Significance (2-sided)
Mask use	Yes	67.2%	0.0%	41.7%	0.0%	100.0%	3284.195	4	0.000
	No	32.8%	100.0%	58.3%	100.0%	0.0%			
At least 1 meter away	Yes	100.0%	0.0%	5.6%	100.0%	100.0%	5041.377	4	0.000
	No	0.0%	100.0%	94.4%	0.0%	0.0%			
Airing room	Yes	0.0%	0.0%	46.0%	100.0%	100.0%	4220.730	4	0.000
	No	100.0%	100.0%	54.0%	0.0%	0.0%			
I have no meet anyone no cohabiting in the house	Yes	0.0%	100.0%	7.7%	0.0%	0.0%	4707.217	4	0.000
	No	100.0%	0.0%	92.3%	100.0%	100.0%			

The characteristics of the clusters are as follows.

1. To the first cluster, which is the second largest (20.7%) belong people who are not particularly attentive to preventive measures when they are outside the home, but pay enough attention inside the home. All of them keep the interpersonal distance and 67.2% use also the mask. No one uses the trick of airing the room. The group can therefore be called “Medium Low prevention outside and inside distancing plus some masks”.
2. The second cluster, the smallest of the groups (13.7%), is characterised by medium prevention outside and inside distancing plus some masks. Precisely because they indicated that they do not host and hang out with strangers in the household they did not select any preventive behaviour related to the home environment. The group can be named as “Medium prevention outside and isolated at home”.
3. The third cluster, which is also the third largest (20.3%), is the one with the most inappropriate behaviour. The level of prevention outside the home is the lowest and there is little appropriate behaviour at home. Less than half use face masks and air changes in the presence of people outside the home. Only 5.6% respect distance to prevent contagion. They are therefore the group that pays the least attention to avoiding contagion. For this reason the group can be referred to as “Low prevention outside and inside home”.
4. The fourth group, which represents 17% of the survey participants, is very focused on prevention of contagion outside the home. All the subjects in this group implement the behaviours at home that least interfere with interpersonal relationships: airing and distance.

No one uses a face mask. Although distance and air exchange may help to avoid contagion, the absence of the mask is a limitation. The name of this cluster is “Medium-high prevention outside and inside distancing plus airing”.

- The fifth and last cluster is the most numerous and includes 28.2% of the respondents to the questionnaire. These are people who implement preventive behaviour in all situations both inside and outside the home. The cluster can therefore be called “High prevention outside and inside home”.

Clusters are characterised on the basis of the use of face masks (efficacy characteristics and habit of covering the nose), the SRP, the socio-demographic and territorial variables (age, educational qualification, occupation, carrying out a health profession, province and city size of residence) and characteristics of cohabitants. **Tables 23 and 24 describe** how these characteristics are distributed within the clusters and thus make it possible to see how the clusters differ. In the first table, data are given on the preventive effectiveness of the masks used, correct use with the nose covered and self-risk perception. In the second, the composition of the clusters is analysed on the basis of certain socio-demographic, territorial and housing characteristics and the presence of subjects who declared having been diagnosed with Covid-19 by means of a swab.

Table 23: Face masks, self-risk perception and cluster

Variable	Response mode	Cluster					Pearson Chi-Square		
		1 Medium-low prevention outside and inside distancing plus some masks N=1099	2 Medium prevention outside and isolated at home N=738	3 Low prevention outside and inside home N=1075	4 Medium-high prevention outside and inside distancing plus airing N=901	5 High prevention outside and inside home N=1495	Value	df	Asymptotic Significance (2-sided)
Preventive effectiveness of masks used	Not at all	0.4%	0.3%	1.5%	0.3%	0.2%	95.984	12	.000
	Slightly	10.4%	8.7%	13.1%	10.4%	5.2%			
	Fairly	24.0%	20.2%	23.0%	28.1%	23.8%			
	Very	65.2%	70.9%	62.4%	61.2%	70.8%			
Correct mask use with covered nose	No	8.2%	7.9%	16.4%	8.8%	5.2%	99.045	4	.000
	Yes	91.8%	92.1%	83.6%	91.2%	94.8%			
Self risk perception	Don't know	9.6%	13.8%	12.7%	10.5%	11.7%	52.902	16	.000
	Not at all	2.6%	3.0%	3.6%	2.4%	1.7%			
	A little	39.2%	32.9%	31.4%	34.6%	33.7%			
	Fairly	43.0%	39.7%	42.1%	45.2%	43.9%			
	Very	5.7%	10.6%	10.2%	7.3%	9.0%			

Table 24: Cluster composition

Variable	Response mode	Cluster					Pearson Chi-Square		Asymptotic Significance (2-sided)
		1 Medium-low prevention outside and inside distancing plus some masks N=1099	2 Medium prevention outside and isolated at home N=738	3 Low prevention outside and inside home N=1075	4 Medium-high prevention outside and inside distancing plus airing N=901	5 High prevention outside and inside home N=1495	Value	df	
Gender	Man	25.8%	23.4%	23.8%	18.4%	16.8%	41.374	4	.000
	Woman	74.2%	76.6%	76.2%	81.6%	83.2%			
Age	< 30 years old	14.1%	12.5%	22.8%	15.4%	10.2%	129.769	8	.000
	30-59 years old	70.4%	76.6%	67.1%	76.1%	72.4%			
	< 60 years	15.5%	10.9%	10.1%	8.4%	17.4%			
Education	Eighth grade or lower	15.5%	13.6%	13.0%	12.6%	11.9%	18.969	8	.015
	High school diploma	52.7%	55.2%	51.8%	50.1%	50.8%			
	Graduate degree or higher	31.8%	31.2%	35.1%	37.3%	37.3%			
Employment	Employed	69.3%	74.6%	70.8%	76.5%	70.5%	85.931	20	.000
	Unemployed	5.3%	5.4%	4.5%	4.2%	5.9%			
	Retired	10.1%	7.7%	7.2%	6.2%	11.3%			
	Capital income recipient	0.6%	0.0%	0.2%	0.2%	0.2%			
	Student	4.8%	4.1%	8.4%	3.4%	3.0%			
	Homemaker	9.8%	8.2%	9.0%	9.3%	9.0%			
Profession	Legislator, entrepreneur, senior management	2.6%	3.5%	2.3%	2.1%	2.7%	72.017	32	.000
	Intellectual, scientific and highly specialised profession	14.2%	15.7%	16.0%	17.6%	23.2%			
	Technical profession	12.8%	11.9%	11.2%	12.4%	10.4%			
	Executive profession in office work	28.7%	27.8%	27.4%	31.2%	29.0%			
	Skilled occupation in commercial and service activities	18.8%	20.7%	21.5%	20.5%	20.2%			
	Craftsman, skilled	12.1%	11.0%	10.3%	8.4%	6.7%			

	worker and farmer								
	Plant operator, stationary and mobile machinery workers and vehicle drivers	1.8%	1.0%	1.8%	0.9%	0.8%			
	Unskilled occupation	7.7%	7.0%	9.2%	6.6%	6.9%			
	Armed forces	1.2%	1.4%	0.4%	0.3%	0.2%			
Health workers	Yes	9.5%	10.4%	11.6%	13.8%	13.8%	15.494	4	.004
	No	90.5%	89.6%	88.4%	86.2%	86.2%			
Province of residence	Bergamo	10.0%	11.1%	9.5%	9.5%	10.8%	49.070	16	.000
	Trento	6.9%	9.5%	7.5%	6.3%	8.5%			
	Treviso	58.4%	49.3%	58.6%	61.9%	53.3%			
	Padua	9.0%	10.4%	11.2%	10.3%	10.4%			
	Monza and Brianza	15.7%	19.6%	13.2%	11.9%	16.9%			
City of residence size	< 1,000 inhabitants	51.3%	48.3%	48.2%	48.9%	47.8%	11.303	16	.790
	10,000-20,000 inhabitants	25.4%	24.3%	26.9%	26.1%	26.1%			
	20,001-50,000 inhabitants	16.4%	20.1%	18.0%	17.8%	17.7%			
	50,001-100,000 inhabitants	3.8%	3.4%	4.1%	3.9%	4.3%			
	> 100,000 inhabitants	3.1%	3.9%	2.8%	3.3%	4.1%			
Cohabitation with people > 65 years old	Yes	22.3%	17.3%	16.7%	16.0%	22.7%	27.324	4	.000
	No	77.7%	82.7%	83.3%	84.0%	77.3%			
Cohabitation with people suffering from immunodeficiencies or chronic pathologies	Yes	24.0%	26.4%	23.7%	23.7%	32.0%	34.845	4	.000
	No	76.0%	73.6%	76.3%	76.3%	68.0%			
Cohabitation with underage children	Yes	39.0%	45.3%	41.9%	48.3%	44.0%	18.347	4	.001
	No	61.0%	54.7%	58.1%	51.7%	56.0%			
Cohabitation with adult children	Yes	23.7%	18.8%	16.8%	18.9%	23.4%	24.035	4	.000
	No	76.3%	81.2%	83.2%	81.1%	76.6%			
Covid-19 positive	Yes	8.5%	8.0%	8.7%	7.3%	7.2%	3.081	4	.544
	No	91.5%	92.0%	91.3%	92.7%	92.8%			

According to the chi-square, all the relationships analysed are significant except the size of the city of residence and the number of Covid-19 positives. From the analysis of the differences of the frequencies it emerges that the SRP, the title of study, being a health worker, living with minor children are not particularly important to characterise the clusters.

At the preventive level, the masks with greater preventive efficacy are more used by cluster 5 that demonstrated to adopt preventive behaviours in all areas. Cluster 3 confirms itself as the group less attentive to prevention both at the level of effectiveness of the masks used and at the level of correct use. The percentage of people who do not cover their nose is very different from the other groups. Some socio-demographic, territorial and housing characteristics are distributed differently among the groups. Women are more represented in the two clusters with the highest level of prevention (4 and 5) but there is no greater presence of men in the groups with the lowest level of prevention. In terms of age, clusters 1 and 5, both of which are very attentive to prevention at home, have the highest percentages of over 65s. Cluster 3, on the other hand, has a higher presence of young people. Age is therefore an important variable in determining preventive behaviour. The differences between the occupational groups probably reflect the importance of age, since pensioners are more represented in the clusters with more elderly persons (1 and 5) and students in cluster 3. Among the professions, an overrepresentation of intellectuals and a lower presence of craftsmen in the groups more attentive to prevention can be noted. At the level of territorial characteristics, it is noticeable that the inhabitants of the province of Bergamo and Monza are less represented in the cluster with low prevention outside and inside the house and more represented in the cluster with opposite behaviours. At the level of housing characteristics those who live with subjects over 65 at greater risk of complications from Covid-19, are more represented in the groups attentive to prevention at home. On the other hand, those who do not receive strangers in the home or the group that is more attentive to prevention in all aspects are characterised by a higher percentage of cohabitants with subjects at risk who already have chronic pathologies.

With this 5-cluster model the ANOVA analysis shows a statistical significance of the variables concerning prevention implemented at home ( $F(4,4558)=2380.44$ ,  $p<0.001$ ), outside the home ( $F(4,5293)=106.670$ ,  $p<0.001$ ) and in public places ( $F(4,5293)=63.2$ ,  $p<0.001$ ). The averages of the different clusters were compared using Sheffe post hoc. The comparison between groups starts with the cluster that takes the most precautionary measures.

Cluster 5 (High prevention outside and inside home) is the most attentive of all. It adopts more preventive behaviours in the different contexts than the other groups. In fact, it has values that are significantly higher than the other groups in all prevention fields except in the case of prevention in leisure places where the average is not statistically different from that of cluster 4 (the averages are shown in table 21). However, it is the homogeneous group that most closely matches the preventive behaviour.

Cluster 4 (medium-high prevention outside and inside distancing plus airing) in leisure areas has a level of prevention that is not significantly different from either cluster 5 or cluster 2. It has a good

general prevention level in leisure contexts. Also the averages for prevention outside the home indicate the use of preventive behaviour significantly lower only than cluster 5 and higher than all other clusters. In prevention inside the home cluster 4 has a mean significantly lower than cluster 5, higher than cluster 3, and similar to cluster 1. The prevention implemented at home cannot be described as optimal, but the cluster has a good overall prevention level.

Cluster 2 (Medium prevention outside and isolated at home) is the group that does not see any non-cohabitants at home and consequently did not indicate any preventive measures in this area. In leisure places the average of cluster 2, similar to cluster 4, is statistically higher than clusters 3 and 1 and lower than cluster 5. Outside the home the average preventive behaviour used by cluster 2 is significantly higher than clusters 3 and 1 and lower than cluster 4 and 5. Cluster 2 adopts overall intermediate preventive behaviours outside the home. Although isolation might be the highest form of prevention, the fact that the values in the other areas are intermediate, does not allow to consider this cluster as one of the groups with the highest attention to various preventive aspects.

Cluster 1 "Medium Low prevention outside and inside distancing plus some masks" has significantly lower averages than clusters 2, 4 and 5 in the leisure and out-of-home places.

In the home the average preventive behaviour of cluster 1 is similar to that already described for cluster 4. Both of them use distancing and to some extent also other precautions, but do not use all the precautionary measures to prevent infection. With regard to the measures taken outside the home and in places of leisure, cluster 1, excluding group 3, has values indicating a significantly lower level of prevention than the other clusters. Cluster 1 is the cluster that adopts the most incorrect behaviour to prevent the spread of the virus after cluster 3.

Cluster 3 (Low prevention outside and inside home) in fact confirms itself as the group that has the lowest averages of all the other clusters whatever preventive aspect is considered. They are the group that adopts the most incorrect behaviours to prevent the spread of the virus.

Again, in terms of prevention, it can be seen that clusters 5, 4 and 1, which take more precautionary measures at home, are characterised by a lower percentage of infections at home compared with those who declared they had isolated themselves at home (cluster 2) and those who have a low level of prevention both inside and outside the home (3) (table 25). A good level of prevention is found among those who contract the virus less.

Cluster 3, low prevention outside and inside home, reported having contracted the virus in other places more than the other clusters together with the cluster with a low average level of prevention outside the home (1). Other places, as already described in section X are schools and universities, residential communities, sports facilities, community centres, shopping venues, beauty salons, hotels, city halls and public and private transport. In other places and at work, however, a higher percentage

of people from clusters with high prevention levels fell ill. It should be noted, however, that 4 and 5 are the clusters with the lowest proportion of Covid-19 cases as already shown in table 24.

Table 25: Exposure locations and prevention clusters

Variable	Cluster					Total
	1 Medium-low prevention outside and inside distancing plus some masks	2 Medium prevention outside and isolated at home	3 Low prevention outside and inside home	4 Medium-high prevention outside and inside distancing plus airing	5 High prevention outside and inside home	
Homes	23	14	25	12	24	98
	44.2%	46.7%	51.0%	36.4%	40.7%	43.9%
Workplaces	18	12	15	13	25	83
	34.6%	40.0%	30.6%	39.4%	42.4%	37.2%
Hospitals	2	1	2	3	2	10
	3.8%	3.3%	4.1%	9.1%	3.4%	4.5%
Third places	4	1	2	2	6	15
	7.7%	3.3%	4.1%	6.1%	10.2%	6.7%
Other	5	2	5	3	2	17
	9.6%	6.7%	10.2%	9.1%	3.4%	7.6
Total	52	30	49	33	59	223
	100.0%	100.0%	100.0%	100.0%	100.0%	

In conclusion, according to the data collected, being young, working and having a low-skilled profession or belonging to the armed forces exposes more people to the virus. The size of the municipality also seems to expose more to the virus. The positives in the sample live more in larger towns or in towns with fewer than 10,000 inhabitants. Many people are unable to identify where they contracted Covid-19, demonstrating how difficult it is to pinpoint the place of infection. Among those who were able to trace the epidemiological chain (54% of those who were Covid-19 positive), homes were the places where the infection was most often transmitted and affected more women, over 30s and graduates. Contrary to what was expected, however, no association was found between the number of inhabitants and the disease. Workplaces are the highest risk setting after homes. Men and those with a higher level of education were more likely to fall ill here, but there was also a higher proportion of sufferers in the groups of those in technical professions, those working in commerce or services and craftsmen. In addition, a statistically significant relationship was found between being a health worker or working with the public and Covid-19 positive cases. The workplace is where a higher proportion of people with a high level of prevention fell ill, probably because it is one of the places where exposure to the virus is highest. Many respondents also fell ill in bars, taverns and

restaurants or in other places such as sports facilities, community centres, shops, shopping centres, hotels and transport facilities. Young people and the elderly indicated that they fell ill more in these places than those in between. There are therefore socio-demographic differences both in the characteristics of those who fell ill exposure places. Different exposure to the virus is therefore attributable to these differences. And having different exposure to the virus leads to unequal levels of illness and death, which are health inequalities.

### 3.3.4 Discussion and conclusion

Through the analysis of the data collected with the questionnaire it was possible to reconstruct how preventive behaviours are used by the sample. By taking preventive measures, people can reduce their exposure to the virus and, as a consequence, reduce the likelihood of becoming ill and having health consequences. Since the outbreak of the pandemic, the rules on preventive behaviour to be adopted by law have changed and there has also been an infodemic of information on the most appropriate behaviour to adopt in order to limit the spread of the virus. The example of gloves clearly illustrates how information was contradictory and this may have influenced people's decisions. At first it seemed that gloves were a protective element, but a few days after the introduction of the obligation to use them, a new discussion between the luminaries in the field began, which led the government to remove the obligation because, as we have already explained, if used incorrectly they can become a vehicle for the transmission of the disease. The requirement to use a face mask was initially generic and did not differentiate between different types of masks. One could use an FFP2 or a home-made mask made from leftover fabric as if they were of equal value. Suffice it to say that during the first wave in some regions, such as the Veneto region, masks printed in non-woven fabric were given to all residents as gifts, and their effectiveness in filtering the air and containing droplets had not even been tested since they were produced by a local printer. Around the same time, however, obligations were also changed in relation to the type of masks to be used. First in workplaces, then in other environments such as aeroplanes or some healthcare facilities, the use of surgical masks was imposed. At the end of 2021, FFP2 will be required for public transport. It is clear that in such a complex situation, people have also found it difficult to find the right information and understand what to do to avoid exposing themselves to the virus. For this reason, thanks to the data collected, it was decided to analyse the use of preventive behaviours in the sample. Regarding the use of masks 98.2% of the sample indicated that they use some type of device. Many people use several types of masks alternating them. Several reasons can be hypothesised to explain the choice of the type of mask used,

such as the availability of the products on the market (during the first wave it was difficult to find any type of device), their cost, self-risk perception, the dangerousness in terms of virus exposure attributed to the situation in which one finds oneself, work and legal obligations, preferences for aesthetics or environmental reasons. For example, if you have economic means, you can spend more to buy the most effective masks such as FFP2. Having a higher perception of risk may lead to choosing masks that filter the air better in order to be better protected. In contrast, fabric masks may be preferred by those who use these devices as fashion accessories (Budiak and Lahoda 2020). Fabric masks can be more easily personalised and can be tailored to communicate identity, beliefs or concerns (Kipp and Matthews David 2021). Or in some cases, environmentally conscious people may choose a mask based on an assessment of the least environmental impact, preferring fabric masks that are reusable and less polluting (Bouchet et al. 2021). What is certain is that the most effective preventive masks are FFP2 and surgical masks, which were the third and first choice in the sample respectively. Cotton masks are widely used, but their effectiveness is relative. They are the second most used type. On the whole, however, the use of masks seems to be very widespread and this is very important for the prevention of infection. The analysis revealed differences in the characteristics of those who use face masks for prevention, as already identified in the literature: the over 60s and those with a higher self-risk perception are more attentive to prevention (Capraro and Barcelo 2020; Clark et al. 2020; Dryhurst et al. 2020; Durand et al. 2021; Galasso et al. 2020; Gruppo Tecnico Nazionale PASSI e PASSI d'Argento 2021; Haischer et al. 2020; Khosravi 2020; Mondal et al. 2021; Raude et al. 2020; Urbán, Paksi, et al. 2021; Urbán, Király, et al. 2021). It was shown that, in the sample analysed, the elderly and those who consider themselves to be most at risk are the groups that use effective masks more than other age groups, while no significant differences were found in gender and education. In the sample, women used surgical or cotton masks more than men and FFP2 less than men, but no statistically significant difference was found. It was expected that women would be more concerned about prevention because the literature indicates that women tend to be more attentive to prevention (Capraro and Barcelo 2020; Clark et al. 2020; Durand et al. 2021; Galasso et al. 2020; Gruppo Tecnico Nazionale PASSI e PASSI d'Argento 2021; Mondal et al. 2021; Raude et al. 2020; Urbán, Paksi, et al. 2021). However, even in a study conducted in Germany, they found no gender differences in the use of masks as in our case (Lüdecke and Von Dem Knesebeck 2020). This is the only behaviour in which women are found to be careless. A possible hypothesis for why women are less careful about mask use while being careful about other preventive aspects could be related to the fact that these devices have become fashionable accessories. Fabric masks are more likely to be multi-coloured and to match one's aesthetic taste. And one can assume that women are more interested in these aspects and therefore the choice of masks depends on this. As far as the other preventive aspects are

concerned, the data show that adherence to preventive behaviour outside the home is very high. The data confirms therefore that also in the sample under analysis, as already found in the literature, there is a high adherence to the preventive rules imposed outside the home (Blair et al. 2021; Burger et al. 2020; Gruppo Tecnico Nazionale PASSI e PASSI d'Argento 2021; Kollamparambil and Oyenubi 2021; Lang et al. 2021; Lee et al. 2021; Urbán, Paksi, et al. 2021). Preventive behaviours outside the home are widely used: 98.2% of the sample use masks, 93.4% keep their distance from other people and 90.8% sanitise their hands when out of the home. As already noted in China, however, there is a lower level of prevention inside the home (Ye et al. 2021). Only 50.6% use masks, 67.1% keep their distance, 54.6% ventilate their rooms. 6.8% stated that they do not use any precautions. The reason for this difference, as already argued by Ye and colleagues, could be due to a lack of information. We have seen that homes are among the places where people fall ill the most, but the perception of the participants in the questionnaire is that homes are not one of the places most at risk. It therefore seems that there may indeed be a lack of information that makes it difficult to understand that exposure to infection can also occur in one's own home through encounters with non-cohabitants. In addition, people in the home feel that they control their environment, are free from surveillance and feel calm and at ease (Saunders 2021:360). This can also lead people to paying less attention to prevention in the home and lowering the use of preventive measures. Ontological security is described by Giddens as an attitude of people who trust in the constancy of the material and social environment in which they act and thus give a sense of trustworthiness to people and things (Giddens 1994:96). In the pandemic context one probably trusts friends and trusts them not to carry the virus. Borrowing some previously analysed sociological aspects related to HIV prevention (Le Breton 2017), we can speculate that although the use of a mask or other preventive measures may protect against an infectious disease such as Covid-19, their use can be seen as an expression of doubt towards the other person. If someone you trust were HIV positive, she/he would definitely say so, even a Covid-19 positive person you trust would definitely say so. If someone I trust, a significant person, comes to my home, I might not use the mask to show that I trust them and also because I do not see them as sick or as a risk. As the concept of "other" is central to ways of thinking and acting with respect to risk (Lupton 2013), those who come into homes are trusted, are not "other" and are not seen as a threat to personal health. And this can lead to fewer preventive measures being taken. And it is precisely because of ontological security and trust in the other that it is not considered coincidental that the least adopted precaution in the home is precisely the use of the mask. Its use recalls the situation of global fragility that we are experiencing (Baronian 2020) and could be interpreted as a lack of trust in the other. It also creates a barrier in the relationship because it compromises facial expressions and behavioural synchrony interfering with social ties, expression of emotions, empathy

and playful interactions (Cagol and Viola 2020; Marini et al. 2021). Finally, it should be stressed that the difference in the use of prevention inside and outside the home can also be influenced by the rules imposed by the State, which have imposed behaviours that if disregarded can also lead to sanctions. All these reasons may therefore be the cause of less prevention in the home. It is necessary, from a public health perspective, to take into account both a lower level of adherence to preventive behaviour in the home and the need to understand the reasons for this, so as to be able to define a plan of action to change behaviour and thus reduce possible exposure to the virus.

Exposure to the virus was not the same for everyone according to the adoption of preventive behaviour. As already seen in the literature with respect to other infectious diseases and other preventive behaviours, this analysis also revealed differences in the characteristics of people who use prevention to avoid exposure to the virus (Bish and Michie 2010; Fung and Cairncross 2007; Jones and Salathé 2009; Lau et al. 2003; Leung et al. 2003, 2004, 2005; Moran and Del Valle 2016; Quah and Hin-Peng 2004; Raude et al. 2019; Tang and Wong 2003). With the exception of the use of effective masks, women adopt more of all other preventive behaviours than men, as identified in the literature on the subject (Capraro and Barcelo 2020; Clark et al. 2020; Durand et al. 2021; Galasso et al. 2020; Gruppo Tecnico Nazionale PASSI e PASSI d'Argento 2021; Mondal et al. 2021; Raude et al. 2020; Urbán, Paksi, et al. 2021). Women are therefore confirmed as the gender that generally adopts less risky behaviours (Courtenay, McCreary, and Merighi 2002; Harris and Jenkins 2006). Worse behaviour in men can be read in the light of previous literature on health-related behaviour and health risks at the level of gender differences. Before the pandemic, Courtenay for example pointed out that health-related behaviours, like other social practices, are used to demonstrate femininity and masculinity. The social construction of men as the stronger sex and men's health risks are also supported by social and institutional structures (Courtenay 2000). A similar conclusion is also reported by Mahalik and colleagues that traditional masculine models and socialisation encourage men to expose themselves to more health risks (Mahalik, Burns, and Syzdek 2007). A practical example is condom use. Among men who do not use this precaution, masculine ideology is associated with the refusal to use condoms (Noar, Morokoff, and Harlow 2002). Consistent with this perspective, several academic authors have argued that the most inappropriate preventive behaviours adopted by men during the pandemic are due to masculine ideals that value courage and challenge which clearly explains the difference in the use of preventive measures (Ewing 2020; Glick 2020; Umamaheswar and Tan 2020; Willingham 2020).

Young people are less likely to adopt the correct preventive behaviours as already identified in literature (Graupensperger, Lee, and Larimer 2021; Jørgensen, Bor, and Petersen 2021; Qeadan et al. 2020; Urbán, Király, et al. 2021). Indeed, older people tend to be considered more careful, especially

when it concerns their health and safety (Wolfe, Sirota, and Clarke 2021). Also in Italy, during the lockdown, it was found that the elderly have greater compliance with preventive rules (Ceccato et al. 2021). In the sample the data on effective masks used show that there is a significant difference according to age, with the over 60s being the most likely to take the most effective precautions in preventing the spread of the virus. There is therefore a strong disconnect between young people, young adults and the elderly (Cohen 2001). Reporting on Covid-19 has always indicated that the disease mainly threatens the older population although this is not true (Cunningham et al. 2021; Urbán, Király, et al. 2021). Some people believe that the pandemic is only a problem of the elderly (Fraser et al. 2020) and this idea can lead to a false safety message for younger people (Urbán, Paksi, et al. 2021). In general, young people and young adults tend to take more risks precisely based on the likelihood of a negative outcome (Graham et al. 2018). In addition, it seems that the stage of brain development of young adults and adolescents also leads them to take more risks (Casey, Jones, and Hare 2008). If Covid-19 is perceived as a problem of the elderly, young people may be inclined to adopt fewer preventive behaviours and ignore preventive behavioural guidelines precisely because they have a low probability of a negative outcome (Graupensperger et al. 2021). Young people's propensity to take more risks to obtain social and emotional stimulation, their lower perceived vulnerability to Covid-19 and underestimation of the consequences of their behaviour may be some of the reasons why they adopt fewer preventive behaviours as also found in this sample (Urbán, Király, et al. 2021).

Less clear is the influence of education in adopting preventive behaviours during the second pandemic wave. While with increasing educational attainment there is an increase in the use of preventive behaviours both indoors and outdoors, in the use of FFP2 and a decrease in the use of fabric masks. Actually, data analysis shows that the difference in the use of effective masks is not significant. In the literature, the relationship between education and health is widely recognised and it has been shown that education also plays an important role in adopting health behaviours (Cutler and Lleras-Muney 2006, 2010; Egerter et al. 2011; Ross and Wu 1995; Zajacova and Lawrence 2018). Despite this, Costa and Marra identified that education only partly plays a role in Covid-19-related health inequalities (Costa and Marra 2021). This seems to be consistent with the findings of our sample. In the field of prevention at the level of education, in recent years, we have seen a flattening in preventive behaviours concerning health. In fact, as highlighted by a study on socio-cultural factors influencing children's immunisation conducted in two regions of northern Italy, a change in behaviour is being witnessed (Anello et al. 2017). Low adherence to vaccination programmes among more educated mothers has increased over the years. Research conducted in a third region of Northern Italy also found a significant difference in the educational level of parents: parents of children who are not

vaccinated tend to have higher educational qualifications (Valsecchi et al. 2009). Although it is thought that an educated person has a greater health literacy and more skills to protect their own health, one can see both in the case of Covid-19 preventive behaviours and in vaccinations a new trend that could be connected to the fact that those who have studied feel more than capable of independently assessing what is good and what is bad for their own health even if not specialised in public health issues. And this may be one of the reasons why the results on the relationship between greater education and greater adherence to preventive behaviour do not emerge as clearly as had been assumed.

It should also be added that during 2020, for the first time, a public health problem was faced due to the spread of an airborne virus with a high diffusibility. In the beginning, people probably did not understand what this meant, as can be seen from the fact that immediately after the lockdown in the cities there were gatherings of people without masks in meeting places (Gallione 2020). As we have already explained, communications on how to behave were fragmented and confused. The period in which the data in this survey were collected was just after these events and it is believed that many people had not yet understood the pandemic dimension. Analyses of preventive behaviour by profession also indicate a degree of confusion. While in general some higher-skilled professions, such as intellectuals, tend to adopt the correct behaviour more, and some lower-skilled professions, such as craftsmen and plant operators, adopt it to a lesser extent, several inconsistencies can be noted. Some occupational groups use some preventive behaviours and at the same time neglect others, without it being possible to identify a precise pattern in the adoption of prevention. However, as this is an exploratory work, it is felt that these aspects should be explored in greater depth.

Finally, it is possible to identify territorial differences in the use of prevention. Probst and colleagues had noticed in the preventive behaviours during the summer of 2020, therefore in a period very close to that in which the questionnaire of this research was administered, consistent rural deficiencies (Probst, Crouch, and Eberth 2021). In the sample under analysis there was a statistically significant difference between the inhabitants of the provinces of Monza and Bergamo and those of Treviso in the use of effective masks. The former live in an area with greater urbanisation while the latter in a less urbanised area (Istituto Nazionale di Statistica 2017). The difference in the use of masks is that those who live in an area with a higher level of urbanisation use the most effective ones while those in areas with a lower level of urbanisation are less careful to use devices with a level of effectiveness such that they are considered effectively effective in preventing the disease. As already noted in the literature, mask use in the sample is also lower in suburban or rural areas (Callaghan et al. 2021; Chen et al. 2020; Zhang et al. 2021). The data show that the use of this device in the home in the presence of non-cohabitants is also less common in the less urbanised provinces. It is the inhabitants of all

these areas (Padua, Treviso and Trento) who do not adopt any preventive behaviour at home to a greater extent than those of Bergamo and Monza. It is believed that the level of urbanisation conditions the choice to adopt preventive behaviour. One might be inclined to think that the inhabitants of the Lombardy provinces behave more cautiously because this is the area most affected by the epidemic, but at the time of the data collection Trentino had a similar incidence to Monza and Bergamo (Dipartimento della Protezione Civile 2021). Despite this common element, the Trentino respondents adopt less precautionary behaviour at home and use less protective masks to a greater extent than residents in the Lombardy provinces. What differentiates these territories, therefore, is not the dynamics of the epidemic, but precisely the level of urbanisation. The hypothesis that less prevention is used in peri-urban and rural areas is thus confirmed (Callaghan et al. 2021; Chavarría et al. 2021; Connolly et al. 2020; Kollamparambil and Oyenubi 2021; Ye et al. 2021). This is also supported by the fact that the use of FFP2 masks, the best at prevention, increases as the size of cities increases. There are several reasons why less preventive behaviour is adopted in less urban areas. Already before Covid-19, it was found that some health disparities between urban and non-urban may be due to a lack of awareness of diseases and associated risk factors among the latter (Balamurugan et al. 2007). With the outbreak of the pandemic, it has been noted that in less urban areas people are less aware of prevention, generally less accepting of health habits and moving to less dense areas, for example, are less likely to wear masks or take other preventive measures (Zhang et al. 2021). The decision to adhere less to preventive behaviours may be due to a lower perception of infection risk. Low risk awareness is widespread among those living in these areas due to differences in household space and lower population density (Burford et al. 2020; Jung and Albarracín 2021). That there is less awareness of the importance of prevention among those living in less urban areas can also be deduced from the fact that in rural areas there is also less adherence to vaccinations. The rural-urban disparity in vaccination clearly emerges when considering both compulsory and recommended vaccination data, not only because of less easy access to health facilities, but also because of less knowledge and awareness of the problem (Jung and Albarracín 2021). The problem of correctly conveying the disease risk message in rural areas has existed since before Covid-19 (Pro et al. 2021) and is becoming increasingly important. Attention to potential exposure to infection in urban areas has been greater since the beginning of the pandemic (AGI 2020; Dardari 2020). This has occurred not only in Italy, but worldwide (Chen and Chen 2020; Wahba 2020) and has led, for example, to increased promotion of mask use in urban areas (Jung and Albarracín 2021). Although in Italy pandemic local transmission of Covid-19 was initially detected in peripheral and less urbanised areas, such as the province of Padua, the continued focus on cities may have contributed to a false sense of immunity from the pandemic among peri-urban and rural residents. Such a situation has already been described in the

literature by Rebmann and colleagues (Rebmann et al. 2021). In fact, media coverage of Covid-19 prevention especially during the first wave focused on urban areas and was poorly adapted to target the population of rural areas by not meeting the specific needs of this population (Chen and Chen 2020). This situation may lead non-urban residents to assess preventive information and behaviour as less important to them than urban residents. The result is less commitment to taking precautionary measures due to this situation (Chen and Chen 2020). The sample data clearly indicate that most respondents consider large cities to be more at risk than smaller towns or rural areas. Disbelief about the Covid-19 pandemic, its impact on communities and lack of interest were found among people living in rural areas (Rebmann et al. 2021). This may lead residents of less urban areas to perceive themselves as less at risk and, as a consequence, not heeding health warnings and not following recommended prevention practices (Prusaczyk 2021). To this should be added that retention of health messaging is lower in non-urban areas and that if messaging about Covid-19 and behaviours to be adopted is conveyed by state authorities and not local authorities in some rural settings it is less considered (Pro et al. 2021). The issue of trusting others is very important. Jung and Albarracín pointed out that people living in urban regions have more anxiety in interactions with “dissimilar others” (Jung and Albarracín 2021). Fear of the “other” might also play a role in the adoption of preventive behaviours. As already described in relation to the use of masks in the home, the concept of the “other” is central to risk thinking and acting (Lupton 2013). Certainly, whatever the reason for those living in non-urban areas to expose themselves more to the virus by not applying preventive measures may lead to an increase in the incidence of Covid-19 cases (Callaghan et al. 2021) and thus to increase health inequalities (Balamurugan et al. 2007). Those who do not live in urban and metropolitan areas are already identified as more vulnerable to the virus (Haischer et al. 2020) and this may exacerbate the disparities that already exist between people in less urban areas and those living in urban areas (Rebmann et al. 2021).

In the course of this study, as we have just seen, a number of elements were therefore examined to prove the existence of disparities in the characteristics of those who adopt health behaviours and thus those who are more exposed to the risk of infection. Furthermore, it was possible to recognise subgroups that share the same preventive behaviours. By means of cluster analysis five groups were identified. There are interesting differences between the clusters, especially in terms of gender, age, profession, province of residence and the presence of cohabitants at risk of Covid-19 complications. Education is confirmed as a variable that does not characterize prevention also when analysing the composition of the groups. The clusters adopting a higher prevention, 4 and 5, were defined respectively as "Medium-high prevention outside and inside distancing plus airing" and "High prevention outside and inside home". These are the clusters with the most women, a higher proportion

of intellectuals and health workers. The two clusters differ in the use of masks at home. Cluster 5 is attentive to this aspect while cluster 4 does not use facial protection when hosting non-cohabitants at home. Moreover, in cluster 5 there is a higher presence of over 60s and, linked to this, of pensioners. There is also a higher percentage of people who live in the provinces of Bergamo and Monza and who have over 65 or ill cohabitants. The cluster 2, "Medium prevention outside and isolated at home" adopts in comparison to the various clusters a medium level of prevention outside home and does not receive not cohabitants at home. In this cluster there is a higher percentage of men, adults between 30 and 59 years old and people living in Bergamo and Monza. The clusters that adopt less prevention are number 1 and 3 that have been named "Medium Low prevention outside and inside distancing plus some masks" and "Low prevention outside and inside home". Compared to the other clusters they are characterised by a higher percentage of men, young people, students, craftsmen, plant operators and inskilled occupation. In the clusters there is also a higher percentage of residents in Treviso and Padova provinces.

These results have important implications for future research and public health interventions because they demonstrate the importance of classifying participants into profiles based on preventive behaviour, thus further clarifying the results obtained in the analysis of characteristics that expose or do not expose people to infection. In fact, recognising the characteristics of those who are less attentive to prevention makes it possible to design public health interventions to counter the spread of the epidemic through health promotion projects aimed at modifying inappropriate behaviour in the pandemic situation.

## CONCLUSION

In the course of this work we have seen that there is no single or universal definition of health. The definition of health used in health promotion converges towards a positive concept that emphasises social and personal resources for everyday life and focuses on the factors that influence health (WHO 1986). Political, social and economic forces shape the conditions which are experienced throughout life and which can lead to avoidable, unfair and unequal differences in health which are called health inequalities (Whitehead 1992). Income and social protection, education, unemployment and job insecurity, working life conditions, food insecurity, housing, basic services and environment, early childhood development, social inclusion and non-discrimination are some of the elements that represent the social determinants of health. These are those non-medical factors that influence health outcomes (World Health Organization 2021c). Inequalities are thus caused by the social context which is able to shape people's behaviour and affect their well-being. The Commission on Social Determinants of Health, created under the aegis of the WHO (CSDH), in its conceptual framework has made explicit that socio-economic position, gender, education, income influence behaviour, material living conditions and psychosocial factors that have an impact on equity in health and well-being. And these factors are also playing a role in the current Covid-19 pandemic because they influence exposure to the virus Sars-Cov-2 virus, which is one of the elements contributing to different levels of disease (Blumenshine et al. 2008; Quinn and Kumar 2014; Terraneo 2020).

As the pandemic situation is poorly understood and constantly changing, before analysing whether there are any social characteristics that favour exposure to the virus, we analysed the locations of infection and people's perceptions of them during the second pandemic wave. The data collected through an online survey conducted between October and December 2020 showed that homes and third places such as bars, taverns and restaurants (Jedlowski 2012; Oldenburg 1999:20–42) are central to the spread of the infection in the sample, confirming what has already been described in the literature (Bayrsaikhan et al. 2021; Blundell et al. 2020; Costa and Marra 2021; Fullagar and Pavlidis 2021; Hoenig and Wenz 2021; Liu et al. 2020; Marmot et al. 2020). They represent the first and third settings, respectively, in terms of the number of infections that occurred in the sample. While third locations are perceived as risk locations by more than half of the respondents, homes are perceived less as risk locations. However, they are the first place in terms of number of infections. In addition, the majority of the respondents believe that participating in parties, dinners and lunches, activities often done with friends at home, is an infectious activity.

Thus, on the one hand, convivial activities are identified as dangerous, but on the other hand, there seems to be no link between private home and the probability of contracting Covid-19. In addition,

almost the entire sample believes that the risk of infection is greater in large cities than in less urbanised settings, despite the fact that the epidemic started in peri-urban areas of the country. It is the inhabitants of the larger cities in the sample who indicate a higher percentage that the risk of infection is also present in more rural settings. Those living in small towns, villages or rural areas tend to perceive the risk in these areas less than those living in municipalities with more than 50,000 inhabitants.

Once the most common perceptions among respondents were identified, we focused on differences in the characteristics of people who expose themselves to the virus either in their free time, by engaging in sociability in places more at risk of infection, or by adopting less preventive behaviour. Through the analysis, characteristics were identified that seem to be involved in frequenting more risky places or adopting more risky behaviour. Before going into the specifics, we would like to underline that the description of the behaviours allowed to identify a discrepancy between the prevention adopted at home and the prevention adopted outside the home. The former is lower than the latter and this is very important if we consider that more infections occur in the home than in other places. There are many reasons for this. The home is a place where you are free from surveillance, there are no rules dictating how to behave. In the home one feels calm and at ease (Saunders 2021), and ontological security can play a role in allowing people and things to be felt as trustworthy (Giddens 1994). And it is precisely because of ontological security and trust in the other that it is not considered coincidental that the least adopted precaution in the home is precisely the use of the mask. The friends and acquaintances we hang out with are not seen as "others" who may pose a threat or risk to one's health as has already been shown in other fields of prevention such as HIV (Lupton 2013) (Le Breton 2017). Furthermore, using the mask can have negative effects on the relationship and recall in a place considered private and safe the situation of global fragility that we are experiencing (Baronian 2020) (Cagol and Viola 2020; Marini et al. 2021).

The survey also revealed that the characteristics that seem to be most relevant in the sample for adopting behaviour that exposes them more to the virus are being male, being young and living in a less urbanised area. Men tend to adopt behaviours that are more at risk of exposure to the Sars-Cov-2 virus at the level of places frequented in leisure time for sociability and preventive behaviours except for the use of FFP2 masks. We have seen that lower adherence to prevention by men may be due to male ideals that value courage and challenge (Ewing 2020; Glick 2020; Umamaheswar and Tan 2020; Willingham 2020). Still referring to the theme of challenges and risk, it has been found that it is young people who are more exposed to infection in both aspects considered in this work probably because they tend to take more risks since they are less likely to have a negative health outcome (Graham et al. 2018). The disease is perceived as a threat to the older population, but younger

people can also become seriously ill and can be the vector for transmission of the disease to other generations. For this reason, a message of false safety may have been received by younger people (Cunningham et al. 2021; Urbán, Király, et al. 2021) (Fraser et al. 2020) and affect both the choice of places to go and the adoption of preventive behaviour. In the sample, there were no significant differences in behaviour according to level of education, contrary to expectations. The less risky places are frequented by the different groups based on educational qualifications in the same way, while the homes and third places, which are more risky places, are frequented mainly by those with higher educational qualifications. At the preventive level there was no significant difference in behaviour. In fact, it has already been argued in the literature that education only partly plays a role in health inequalities in relation to Covid-19 (Costa and Marra 2021) and, in the recent past, a flattening in preventive behaviour has been seen in other prevention contexts. While adherence to vaccination was once higher among those with more education, in recent years it has been seen that even parents with high educational qualifications have begun to choose not to vaccinate their children (Anello et al. 2017) (Valsecchi et al. 2009). Despite this evidence, an inconsistency emerges from the data. Assuming that one's occupation is related to one's qualification, it has been noted that more qualified professions often tend to adopt better preventive behaviour, especially among those in intellectual occupations. Less qualified professions, such as craftsmen or plant operators, on the other hand, tend to adopt less preventive behaviour. Other professions adopt some behaviours correctly and others incorrectly. Such confusion must also be read in the light of the data collection period. Information on how to avoid exposure was unclear at the beginning of the pandemic and sometimes contradictory. The requirement to use gloves, which was later removed, the requirement to use any mask, which was later changed to surgical masks in some settings and FFP2 in other settings, are some elements that indicate the confusion that characterised the information on how to avoid exposure to the virus not only in the early period of the pandemic. Not only, therefore, may there be a relative importance of the level of education to health inequalities as argued by Costa and Marra (Costa and Marra 2021), but these uncertainties may have influenced people's behaviour.

Finally, at the territorial level, it was found that inhabitants of less urbanised areas tend to pay less attention to what might expose them to infection. Inhabitants of Monza and Bergamo tend to meet less with non-cohabitants in places where more contagion occurs, such as homes and third places, and tend to use prevention more. Monza and Bergamo are the most urbanised areas compared to Treviso, Padua and Trento (Istituto Nazionale di Statistica 2017). For example, respondents from these three provinces, the least urbanised areas, use masks in the home in the presence of non-cohabitants less than respondents from the Lombardy provinces. It is not believed that this difference can be justified by the fact that Bergamo and Monza were more affected during the first wave because

Trentino had a similar incidence of Covid-19 during the period considered (Dipartimento della Protezione Civile 2021). These areas differ precisely because of the different level of urbanisation. The analysis of preventive behaviour according to the size of the city of residence also shows that FFP2 masks, which are the best at preventing the spread of the virus, are used more as the size of the city of residence increases. The findings in the literature are therefore confirmed by the sample data. In less urbanised areas, there is less use of prevention, both in terms of avoiding risky places (Callaghan et al. 2021; Maddock and Suess 2021) and adopting preventive behaviour (Callaghan et al. 2021; Chavarría et al. 2021; Connolly et al. 2020; Kollamparambil and Oyenubi 2021; Ye et al. 2021). Historically, cities were characterized by features linked to poor health such as population density, marginalized groups, pollution and crime (Vlahov et al. 2004). Over time the situation has changed. An urban health penalty (Fitzpatrick and LaGory 2003; Freudenberg, Galea, and Vlahov 2005) still exists, but in many Western countries, health is better than in rural areas (Vlahov et al. 2004). As a consequence of this, it is possible to assert an urban health advantage (Vlahov, Galea, and Freudenberg 2005). Also, in relation to Covid-19 an advantage of the more urbanised areas can be observed. The underlying reasons for this may be a lower awareness of diseases and their risk factors (Balamurugan et al. 2007), a lower perception of risk (Prusaczyk 2021), disinterest in the topic or a false sense of immunity (Rebmann et al. 2021), which is also caused by a greater focus on potential exposure to infection in urban areas (AGI 2020; Dardari 2020) (Chen and Chen 2020; Wahba 2020). In addition, in urban areas there is greater anxiety about interactions with one's 'dissimilar', which may lead those living in urban areas to be more cautious than those living in less urban areas (Jung and Albarracín 2021). Fear of the 'other' might play a role in the adoption of preventive behaviours (Lupton 2013). If someone I trust, a significant person which for example belongs to my community, comes to my home, I might not use the mask to show that I trust them and also because I do not see them as sick or as a risk. These elements and the data collected also highlight the role that territory plays in this pandemic by influencing the adoption of behaviours that can reduce exposure to Covid-19.

All the aspects that we have seen to be relevant for adopting behaviours that expose more to the virus are also characterised differently in the five profiles that have been created based on preventive behaviours. Women are more represented in the clusters that are more attentive to prevention. In particular, the most virtuous cluster is characterised by a higher percentage of over 60s, intellectual professionals and residents of Monza and Bergamo and differs from the second most virtuous cluster for the use of face masks at home in the presence of non-cohabitants. The cluster that adopts an intermediate level of prevention outside the home and that does not meet with non-cohabitants at home is characterized by a greater presence of men between 30 and 59 years old and of residents in

the Lombardy provinces. Also the groups in the two clusters less attentive to prevention are characterised by a greater presence of men, young people, less qualified professions and residents in the Venetian provinces.

Thanks to the findings we can therefore state that gender, age, profession and the level of urbanisation of the territory in which one lives can be considered social determinants of health also in relation to Covid-19. On the basis of these determinants, differences in exposure to the virus can be detected at the level of places frequented in leisure time for sociability and preventive behaviour adopted.

The present work is characterised by certain limitations. However, before explaining these, it is important to note that this is not a study that aims to reach causal conclusions, but rather to describe the state of the art of a new and unprecedented situation that was still poorly documented when the study was designed. Even today, it is still important to study these aspects of the pandemic in order to know the consequences of Covid-19 and to implement interventions to counteract the health inequalities generated by Sars-Cov-2. The choice of methodology was conditioned by the historical period that required keeping a distance to avoid the spread of Covid-19. The aim of the research was to be able to capture behaviour in a time period coinciding with a phase of increased infection that represented the beginning of the second pandemic wave. Given the little literature available, the need to collect data from that precise historical period and the impossibility of identifying questionnaires already validated on the subject, led to the creation of the questionnaire "Covid-19 and places frequented". As suggested by the literature published in conjunction with the administration of the questionnaire, in order to better understand the potential impact of the preventive behaviours analysed during the COVID-19 pandemic it would have been appropriate to include additional variables such as belief in the efficacy of health behaviours (Clark et al. 2020), role of trust in science (Plohl and Musil 2021), party affiliations ideological orientations and worldviews ((Burford et al. 2020) (Painter and Qiu 2020), (Raude et al. 2020). The use of a non-probabilistic sample does not allow for inferences to be made about the entire universe, but only about the sample. The use of social media to disseminate the questionnaire has limitations in its ability to ensure the representativeness of the sample across all socio-demographic variables, but attempts were made to compensate for this problem by involving associations that could reach the less adherent categories of questionnaire completion such as over 80s and men (Ali et al. 2020). The work is limited in its reliance on self-selection of the sample and self-reported participation in each of the analysed behaviours. Social desirability bias could lead individuals to report inaccurate levels of participation in various behaviours. However, the literature suggests that the social desirability bias for self-reported health behaviours is generally lower in online surveys (Jones et al. 2016).

Regardless of these limitations, this work contributes significantly to the literature on Covid-19 through an in-depth characterisation of preventive behaviour adoption. Findings from this study can inform future Covid-19 research, which can further study virus-exposing behaviour based on health determinants. The introduction of the vaccine is certainly a milestone in combating the pandemic, but the health situation is still important and it is believed that adopting behaviours that decrease the risk of disease is still central to public health policies. This is demonstrated by the fact that the obligation to use FFP2 masks in some places has recently been introduced. For this reason, it would be important to continue to study behaviours that can expose people to the virus because of the changes we are seeing over the months. In addition, monitoring changes in habits is key to recognising and intervening to reduce health inequalities.

Furthermore, this work provides useful information for the development and implementation of targeted messages and projects to improve the adoption of preventive behaviour. In fact, this is an exploratory study that could help public health policy makers understand how behaviours that put people at risk of Covid-19 are distributed. On the basis of these considerations, health promotion interventions can be designed to target groups that are less adherent to preventive behaviour, such as men, young people, less qualified professions and inhabitants of peri-urban and rural areas. Historically, health promotion has dealt with non-communicable diseases resulting from the adoption of behaviours such as physical inactivity, poor nutrition, smoking and alcohol and has only rarely dealt with infectious diseases such as AIDS or Ebola. And it is as a result of Covid-19 that there is a strong need to apply health promotion also to infectious diseases and in health emergencies (Laverack 2017). Changes in people's behaviour are needed to prevent the spread of infection. In order to make it possible to adhere to new patterns of behaviour, health promotion teaches the importance of involving people because they will only act if they consider themselves personally susceptible to the infection, if they perceive the seriousness of the situation, if they perceive the preventive action as effective and feel able to perform the required preventive action (Van den Broucke 2020).

Empowerment of individuals and communities therefore becomes a key word in pandemic management because it is fundamental to exerting control over one's own health and environments. Using participatory methodologies, involving the recipients of the interventions in the choices, using appropriate communication strategies even to reach the categories that are less concerned about prevention are some of the objectives of health promotion and are fundamental to addressing Covid-19 (Laverack 2018). In this way, adherence to preventive behaviours can be expanded and the reduction of health inequalities can be promoted using a health determinants approach.

## Annex 1: Original questionnaire

### Covid-19 e luoghi frequentati

Questo questionario, realizzato nell'ambito di un progetto di ricerca di una dottoranda del DOTTORATO URBEUR-Studi Urbani dell'UNIVERSITÀ DEGLI STUDI DI MILANO BICOCCA, indaga le abitudini e i luoghi frequentati dalla popolazione nel tempo libero per analizzare come avvenga la diffusione sul territorio di Covid-19.

Il questionario è completamente anonimo, i dati saranno trattati in modo aggregato ed esclusivamente per scopi di ricerca scientifica e nel rispetto della legislazione vigente.

La durata di compilazione è di circa 7 minuti.

La gestione dell'indagine è curata dalla Dott.ssa Roberta Gallina.  
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Le saremmo grati se ci aiutasse anche a diffondere il link del questionario con l'invito a compilarlo anche tra i suoi contatti personali.

GRAZIE PER LA PREZIOSA COLLABORAZIONE!  
Ci sono 171 domande in questa indagine.

### LUOGHI E ATTIVITÀ FREQUENTATE PRIMA DI FINE OTTOBRE 2020

Pensi alle abitudini che aveva prima delle misure restrittive imposte dai Dpcm del 24 ottobre 2020 e del 3 novembre 2020

Tra settembre e ottobre, i luoghi da lei frequentati nel tempo libero (es. bar, ristoranti, negozi) erano:

● Scegliere solo una delle seguenti voci  
Scegli **solo una** delle seguenti:

- Sempre gli stessi
- Spesso gli stessi
- Raramente gli stessi
- Mai gli stessi

Tra settembre e ottobre, quali criteri adottava per scegliere quali luoghi frequentare nel tempo libero?

*(Possibili più risposte)*

● Scegliere una o più delle seguenti opzioni  
Scegliere **tutte** le corrispondenti:

- Livello di affollamento
- Disponibilità di spazio esterno
- Rispetto delle regole di distanziamento
- Nessuna di queste
- Non mi ponevo il problema

Tra settembre e ottobre, si fermava a parlare più di 5 minuti con conoscenti incontrati per caso nei luoghi da lei frequentati (es. strade, bar, negozi)?

● Scegliere solo una delle seguenti voci  
Scegli **solo una** delle seguenti:

- Tutti i giorni
- Una o più volte a settimana
- Una o più volte al mese
- Più raramente
- Mai

## RELAZIONI INTERPERSONALI PRIMA DI FINE OTTOBRE 2020

Pensi alle abitudini che aveva prima delle misure restrittive imposte dai Dpcm del 24 ottobre 2020 e del 3 novembre 2020

Tra settembre e ottobre, in media con quante persone **NON CONVIVENTI** ha parlato faccia a faccia per almeno 15 minuti consecutivi durante la giornata?

● Scegliere una o più delle seguenti opzioni  
Scegliere **tutte** le corrispondenti:

- Meno di 5
- Tra 6 e 10
- Tra 11 e 20
- Tra 21 e 30
- Oltre 30

Tra settembre ed ottobre, le capitava di:

Scegliere la risposta appropriata per ciascun elemento:

	Una o più volte a settimana	Una o più volte al mese	Più raramente	Mai
Intrattenersi con i vicini di casa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Parlare con conoscenti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Frequentare bar, centri d'incontro, circoli o altri locali	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ricevere ospiti a casa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fare visite ad amici, parenti o conoscenti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Tra settembre e ottobre, con quale frequenza si vedeva per più di 15 minuti con amici e parenti non conviventi nel tempo libero?**

☛ Scegliere solo una delle seguenti voci  
Scegli **solo una** delle seguenti:

- Tutti i giorni
- Qualche volta a settimana
- Una volta a settimana
- Qualche volta al mese
- Qualche volta all'anno
- Mai

Per **tempo libero** si intende il tempo **dedicato alle attività che più piacciono** (NON per motivi di lavoro o scuola)

Tra settembre e ottobre dove si incontrava con i suoi amici e parenti non conviventi?

Scegliere la risposta appropriata per ciascun elemento:

	Una o più volte a settimana	Una o più volte al mese	Più raramente	Mai
<b>Casa propria, di amici e parenti</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Bar, osterie</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Ristoranti, trattorie, pizzerie, birrerie, pub</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Luoghi all'aperto nei centri cittadini (es. strade, piazze, parchi)</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Luoghi all'aperto fuori dai centri cittadini (es. campagna, spiagge, montagne)</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Discoteca, balera</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Centri commerciali</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Palestre, piscine o altri impianti sportivi</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Centro anziani, centro sociale o altri centri di aggregazione</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>In parrocchia o altri luoghi di culto</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Tra settembre e ottobre, i luoghi dove si incontrava con amici e parenti non conviventi erano affollati?**

☛ Scegliere solo una delle seguenti voci  
Scegli **solo una** delle seguenti:

- Molto
- Abbastanza
- Poco
- Per niente
- Non saprei

## ATTIVITÀ, LUOGHI E RISCHIO COVID-19

Quali sono secondo lei le attività che favoriscono il contagio da Covid-19?

(Possibili più risposte)

📌 Scegliere una o più delle seguenti opzioni

Scegliere **tutte** le corrispondenti:

- Andare dal parrucchiere e estetista
- Andare a curiosare, fare acquisti ai mercatini (escluso alimentari)
- Passeggiare per negozi e/o fare acquisti (Shopping)
- Partecipare a feste, cene, pranzi
- Frequentare associazioni
- Frequentare chiese o altri luoghi di culto
- Visitare siti archeologici, monumenti e musei
- Andare al cinema o a teatro
- Usare i mezzi pubblici
- Praticare attività fisica

Altro:

Quali sono secondo lei i luoghi che favoriscono il contagio da Covid-19?

(Possibili più risposte)

📌 Scegliere una o più delle seguenti opzioni

Scegliere **tutte** le corrispondenti:

- Casa propria o di amici e parenti
- Bar, Osterie
- Ristoranti, trattorie, pizzerie, birrerie, pub
- Luoghi all'aperto nei centri cittadini (es. strade, piazze, parchi)
- Luoghi all'aperto fuori dai centri cittadini (es. campagna, spiagge, montagne)
- Discoteca, balera
- Supermercati
- Centri commerciali
- Palestre, piscine o altri impianti sportivi
- Centro anziani, centro sociale o altri centri di aggregazione
- Scuole e Università
- Luoghi di lavoro
- Ospedali
- Comunità residenziali

Altro:

Secondo lei è più a rischio di Covid-19 chi vive:

*(Possibili più risposte)*

● Scegliere una o più delle seguenti opzioni

Scegliere **tutte** le corrispondenti:

- In una grande città
- In una città di medie dimensioni
- In una piccola città
- In un paese
- In un'area rurale

Quanto pensa di essere a rischio di ammalarsi di Covid-19?

● Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Molto
- Abbastanza
- Poco
- Per niente
- Non saprei

## COMPORAMENTI

Pensi alle abitudini che aveva prima delle misure restrittive imposte dai Dpcm del 24 ottobre 2020 e del 3 novembre 2020

Ad ottobre quale maschera ha usato fuori di casa?

*(Possibili più risposte)*

● Scegliere una o più delle seguenti opzioni

Scegliere **tutte** le corrispondenti:

- Foulard o sciarpe
- Una maschera in tessuto
- Una maschera chirurgica
- Una maschera ffp2 o superiore
- Nessuna di queste
- Non esco mai di casa

**Ad ottobre ha sempre coperto il naso quando indossava la maschera fuori di casa?**

Rispondere solo se le seguenti condizioni sono rispettate:

La risposta era 'Nessuna di queste' o 'Una maschera ffp2 o superiore' o 'Una maschera chirurgica' o 'Una maschera in tessuto' o 'Foulard o sciarpe' Alla domanda '19 [E1]' (Ad ottobre quale maschera ha usato fuori di casa? (Possibili più risposte) )

● Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Sì
- No

Ad ottobre quale dei seguenti comportamenti ha adottato fuori di casa?

*(Possibili più risposte)*

Rispondere solo se le seguenti condizioni sono rispettate:

La risposta era 'Nessuna di queste' o 'Una maschera ffp2 o superiore' o 'Una maschera chirurgica' o 'Una maschera in tessuto' o 'Foulard o sciarpe' Alla domanda '19 [E1]' (Ad ottobre quale maschera ha usato fuori di casa? (Possibili più risposte) )

🗳 Scegliere una o più delle seguenti opzioni

Scegliere **tutte** le corrispondenti:

- Uso di guanti
- Uso dell'igienizzante per le mani
- Lavaggio delle mani
- Distanza di almeno 1 metro dalle altre persone
- Nessuno di questi

Ad ottobre in presenza di persone NON CONVIVENTI IN CASA ha adottato i seguenti comportamenti?

*(Possibili più risposte)*

🗳 Scegliere una o più delle seguenti opzioni

Scegliere **tutte** le corrispondenti:

- Uso della maschera
- Distanza di almeno un metro
- Arieggiamento della stanza
- Nessuno di questi
- Non ho incontrato non conviventi in casa

## COVID-19: MALATTIA

Tra gli individui che conosce direttamente c'è qualcuno che si è ammalato di Covid-19?

🗳 Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Sì
- No

Lei è stato o è in quarantena o in isolamento (domiciliare, fiduciario, preventivo) a causa di Covid-19?

🗳 Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Sì
- No

Lei ha avuto sintomi che potrebbero essere stati causati da Covid-19 (es. febbre, tosse, difficoltà respiratorie, alterazione olfatto e gusto, naso che cola, mal di gola, diarrea)?

🗳 Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Sì
- No

Lei è stato testato con un tampone o un altro esame diagnostico per il Covid-19?

📌 Scegliere solo una delle seguenti voci  
Scegli **solo una** delle seguenti:

- Sì  
 No

### Quali sono stati i risultati del test?

Rispondere solo se le seguenti condizioni sono rispettate:

La risposta era 'Sì' Alla domanda '26 [F4]' (Lei è stato testato con un tampone o un altro esame diagnostico per il Covid-19? )

📌 Scegliere solo una delle seguenti voci  
Scegli **solo una** delle seguenti:

- Infetto (è risultato positivo al test)  
 Non infetto (test negativo)  
 Non ho ancora ricevuto i risultati del test

In che mese è stato fatto il primo test positivo al coronavirus (tampone o altro esame diagnostico)?

Rispondere solo se le seguenti condizioni sono rispettate:

La risposta era 'Infetto (è risultato positivo al test) ' Alla domanda '27 [F5]' (Quali sono stati i risultati del test?)

📌 Scegliere una o più delle seguenti opzioni  
Scegliere **tutte** le corrispondenti:

- Febbraio 2020  
 Marzo 2020  
 Aprile 2020  
 Maggio 2020  
 Giugno 2020  
 Luglio 2020  
 Agosto 2020  
 Settembre 2020  
 Ottobre 2020  
 Novembre 2020  
 Dicembre 2020

### Lei sa come è entrato in contatto con Covid-19?

Rispondere solo se le seguenti condizioni sono rispettate:

La risposta era 'Infetto (è risultato positivo al test) ' Alla domanda '27 [F5]' (Quali sono stati i risultati del test?)

📌 Scegliere solo una delle seguenti voci  
Scegli **solo una** delle seguenti:

- Sì  
 No

Ritiene di aver preso Covid-19 a causa delle seguenti attività?

*(Possibili più risposte)*

Rispondere solo se le seguenti condizioni sono rispettate:

La risposta era 'Sì' Alla domanda '29 [F7]' (Lei sa come è entrato in contatto con Covid-19?)

● Scegliere una o più delle seguenti opzioni

Scegliere **tutte** le corrispondenti:

- Andando dal parrucchiere e estetista
- Andando a curiosare, facendo acquisti ai mercatini (escluso alimentari)
- Passeggiando per negozi e/o facendo acquisti (Shopping)
- Partecipando a feste, cene, pranzi
- Frequentando associazioni
- Frequentando parrocchie o altri luoghi di culto
- Visitando siti archeologici, monumenti e musei
- Andando al cinema o a teatro
- Usando i mezzi pubblici
- Praticando attività fisica

Altro:

Ritiene di aver preso Covid-19 frequentando uno dei seguenti luoghi?

*(Possibili più risposte)*

Rispondere solo se le seguenti condizioni sono rispettate:

La risposta era 'Sì' Alla domanda '29 [F7]' (Lei sa come è entrato in contatto con Covid-19?)

● Scegliere una o più delle seguenti opzioni

Scegliere **tutte** le corrispondenti:

- Casa propria o di amici e parenti
- Bar, Osterie
- Ristoranti, trattorie, pizzerie, birrerie, pub
- Luoghi all'aperto nei centri cittadini (es. strade, piazze, parchi)
- Luoghi all'aperto fuori dai centri cittadini (es. campagna, spiagge, montagne)
- Discoteca, balera
- Supermercati
- Centri commerciali
- Palestre, piscine o altri impianti sportivi
- Centro anziani, centro sociale o altri centri di aggregazione
- Scuole e Università
- Luoghi di lavoro
- Ospedali
- Comunità residenziali

Altro:

## SITUAZIONE ABITATIVA

### Lei con quante persone vive?

● Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Con nessuno, vivo solo
- Con una persona
- Con due persone
- Con tre persone
- Con quattro persone
- Con cinque persone
- Con sei o più persone

Con chi vive?

*(Possibili più risposte)*

Rispondere solo se le seguenti condizioni sono rispettate:

La risposta era 'Con una persona' o 'Con due persone' o 'Con tre persone' o 'Con quattro persone' o 'Con cinque persone' o 'Con sei o più persone' Alla domanda '32 [G1]' (Lei con quante persone vive? )

● Scegliere una o più delle seguenti opzioni

Scegliere **tutte** le corrispondenti:

- Col partner/coniuge
- Con figli minorenni
- Con figli maggiorenni
- Con genitori
- Con fratelli

Altro:

In casa ci sono persone con più di 65 anni?

Rispondere solo se le seguenti condizioni sono rispettate:

La risposta era 'Con una persona' o 'Con due persone' o 'Con tre persone' o 'Con quattro persone' o 'Con cinque persone' o 'Con sei o più persone' Alla domanda '32 [G1]' (Lei con quante persone vive? )

● Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Sì
- No

In casa ci sono persone affette da immunodeficienze o da patologie croniche (es. malattie respiratorie croniche, malattie cardio-vascolari, tumori, ipertensione e obesità)?

● Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Sì
- No

### In quale Regione vive?

❶ Scegliere solo una delle seguenti voci  
Scegli **solo una** delle seguenti:

- Abruzzo
- Basilicata
- Calabria
- Campania
- Emilia-Romagna
- Friuli-Venezia Giulia
- Lazio
- Liguria
- Lombardia
- Marche
- Molise
- Piemonte
- Puglia
- Sardegna
- Sicilia
- Toscana
- Trentino Alto Adige
- Umbria
- Valle D'Aosta
- Veneto

### In quale Provincia vive?

Rispondere solo se le seguenti condizioni sono rispettate:

La risposta era 'Abruzzo' Alla domanda '36 [G5]' (In quale Regione vive?)

❶ Scegliere solo una delle seguenti voci  
Scegli **solo una** delle seguenti:

- 
- 
- 
- 

### In quale Comune vive?

Rispondere solo se le seguenti condizioni sono rispettate:

La risposta era 'Chieti' Alla domanda '37 [ABR]' (In quale Provincia vive?)

❶ Scegliere solo una delle seguenti voci  
Scegli **solo una** delle seguenti:

## INFORMAZIONI SOCIO-DEMOGRAFICHE

### Lei quanti anni compiuti ha?

❶ Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Meno di 16
- 16
- 17
- 89
- 90
- Oltre 90

### Lei è:

❶ Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Maschio
- Femmina
- Altro

Qual è il titolo di studio più elevato che ha conseguito tra quelli elencati?

❶ Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Licenza media o titolo inferiore
- Diploma
- Laurea
- Post-lauream (dottorato/master)

### Lei è o è stato un operatore sanitario?

❶ Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Sì
- No

Nell'ultimo mese qual è stata la sua condizione occupazionale principale?

❶ Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Occupato
- Disoccupato
- Pensionato
- Percettore di redditi da capitale
- Studente
- Casalingo

Qual è la sua professione?

Rispondere solo se le seguenti condizioni sono rispettate:

La risposta era 'Occupato' Alla domanda '167 [H4]' (Nell'ultimo mese qual è stata la sua condizione occupazionale principale? )

❗ Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Legislatore, imprenditore, alta dirigenza
- Professione intellettuale, scientifica e di elevata specializzazione
- Professione tecnica
- Professione esecutiva nel lavoro d'ufficio
- Professione qualificata nelle attività commerciali e nei servizi
- Artigiano, operaio specializzato e agricoltore
- Conduttore di impianti, operai di macchinari fissi e mobili e conducenti di veicoli
- Professione non qualificata (nel commercio, servizi, attività domestiche, ricreative, culturali, agricoltura, allevamento, manifattura)
- Forze armate

È un lavoro a contatto con il pubblico?

Rispondere solo se le seguenti condizioni sono rispettate:

La risposta era 'Occupato' Alla domanda '167 [H4]' (Nell'ultimo mese qual è stata la sua condizione occupazionale principale? )

❗ Scegliere solo una delle seguenti voci

Scegli **solo una** delle seguenti:

- Sì
- No

La ringraziamo per il tempo dedicato a questa ricerca.

Annex 2: Descriptive questionnaire data table

Query		Answer options	Frequency	Percent	Valid Percent
Between September and October, did you stop to talk for more than 5 minutes with acquaintances you met by chance in the places you frequented (e.g. streets, bars, shops)?		Every day	625	11.8	11.8
		Once a week or more	1845	34.8	34.8
		Once a month or more	1017	19.2	19.2
		More rarely	1354	25.5	25.6
		Never	458	8.6	8.6
		Total	5299	99.9	100.0
		Not answered	6	0.1	
Between September and October, on average, how many NO COHABITING did you talk to face-to-face for at least 15 consecutive minutes during the day? (Multiple-choice question - selected answers)		Less than 5	2718	51.2	51.2
		Between 6 and 10	1495	28.2	28.2
		Between 11 and 20	628	11.8	11.8
		Between 21 and 30	203	3.8	3.8
		More than 30	296	5.6	5.6
Between September and October, did you:	Talk to neighbours	Once or more times a week	903	17.0	17.0
		Once or more times a month	1043	19.7	19.7
		More rarely	1816	34.2	34.3
		Never	1537	29.0	29.0
		Total	5299	99.9	100.0
		Not answered	6	0.1	
	Talk to acquaintances	Once or more times a week	2039	38.4	38.5
		Once or more times a month	1333	25.1	25.2
		More rarely	1709	32.2	32.2
		Never	219	4.1	4.1
		Total	5300	99.9	100.0
		Not answered	5	0.1	
	Go to bars, meeting places, clubs or other places.	Once or more times a week	1172	22.1	22.1
		Once or more times a month	968	18.2	18.3
		More rarely	1499	28.3	28.3
		Never	1656	31.2	31.3
		Total	5295	99.8	100.0
		Not answered	10	0.2	
	Receive guests at home	Once or more times a week	435	8.2	8.2
		Once or more times a month	1113	21.0	21.0
		More rarely	2022	38.1	38.2
		Never	1727	32.6	32.6
		Total	5297	99.8	100.0
		Not answered	8	0.2	
	Visit friends, relatives or acquaintances	Once or more times a week	1106	20.8	20.9
		Once or more times a month	1408	26.5	26.6
		More rarely	1906	35.9	36.0
Never		872	16.4	16.5	
Total		5292	99.8	100.0	
Not answered		13	0.2		
Between September and October, how often did you spend more than 15 minutes with no-cohabiting friends and relatives in your free time? Free time is defined as time spent doing activities you enjoy (NOT for work or school)		Every day	260	4.9	4.9
		A few times a week	1266	23.9	23.9
		Once a week	1347	25.4	25.4
		A few times a month	1679	31.6	31.7
		A few times a year	302	5.7	5.7
		Never	447	8.4	8.4
		Total	5301	99.9	100.0
		Not answered	4	0.1	

Query		Answer options	Frequency	Percent	Valid Percent
Where did you meet your no-cohabiting friends and relatives between September and October?	Own home, relatives and friends' home	Once or more times a week	1269	23.9	24.0
		Once or more times a month	1634	30.8	30.9
		More rarely	1526	28.8	28.9
		Never	855	16.1	16.2
		Total	5284	99.6	100.0
		Not answered	21	0.4	
	Bars and taverns	Once or more times a week	602	11.3	11.4
		Once or more times a month	863	16.3	16.4
		More rarely	1301	24.5	24.7
		Never	2498	47.1	47.5
		Total	5264	99.2	100.0
		Not answered	41	0.8	
	Restaurants, trattorias, pizzerias, pubs	Once or more times a week	309	5.8	5.9
		Once or more times a month	965	18.2	18.4
		More rarely	1588	29.9	30.2
		Never	2390	45.1	45.5
		Total	5252	99.0	100.0
		Not answered	53	1.0	
	Outdoor places in cities centres (e.g. streets, squares, parks)	Once or more times a week	841	15.9	16.0
		Once or more times a month	1319	24.9	25.0
		More rarely	1724	32.5	32.7
		Never	1388	26.2	26.3
		Total	5272	99.4	100.0
		Not answered	33	0.6	
	Outdoor locations outside cities centres (e.g. countryside, beaches, mountains)	Once or more times a week	593	11.2	11.3
		Once or more times a month	1060	20.0	20.1
		More rarely	1393	26.3	26.4
		Never	2221	41.9	42.2
		Total	5267	99.3	100.0
		Not answered	38	0.7	
	Discos, dance halls	Once or more times a week	9	0.2	0.2
		Once or more times a month	21	0.4	0.4
		More rarely	65	1.2	1.2
		Never	5167	97.4	98.2
		Total	5262	99.2	100.0
		Not answered	43	0.8	
	Mall	Once or more times a week	142	2.7	2.7
		Once or more times a month	387	7.3	7.3
		More rarely	1012	19.1	19.2
		Never	3728	70.3	70.8
		Total	5269	99.3	100.0
		Not answered	36	0.7	
	Gyms, swimming pools or other sports facilities	Once or more times a week	653	12.3	12.4
		Once or more times a month	216	4.1	4.1
		More rarely	386	7.3	7.3
		Never	4012	75.6	76.2
		Total	5267	99.3	100.0
		Not answered	38	0.7	
	Senior citizens' centre, social centre or other community centres	Once or more times a week	58	1.1	1.1
		Once or more times a month	71	1.3	1.3
		More rarely	153	2.9	2.9
		Never	4984	93.9	94.6
Total		5266	99.3	100.0	
Not answered		39	0.7		
Parish or other places of worship	Once or more times a week	309	5.8	5.9	
	Once or more times a month	241	4.5	4.6	
	More rarely	620	11.7	11.8	
	Never	4097	77.2	77.8	
	Total	5267	99.3	100.0	
	Not answered	38	0.7		

Query	Answer options	Frequency	Percent	Valid Percent
Between September and October, were the places where you met with no-cohabiting friends and relatives crowded?	Very	30	0.6	0.6
	Fairly	708	13.3	13.4
	A little	2207	41.6	41.8
	Not at all	2040	38.5	38.6
	Don't know	300	5.7	5.7
	Total	5285	99.6	100.0
	Not answered	20	0.4	
What activities do you consider to be conducive to Covid-19 infection? (Multiple-choice question - selected answers)	Going to the hairdresser and beautician	350	6.6	6.6
	Browsing, shopping at markets (excluding food)	1540	29.0	29.0
	Walking around shops and/or shopping (Shopping)	1647	31.0	31.0
	Attending parties, dinners, lunches	4383	82.6	82.6
	Attending associations	1736	32.7	32.7
	Attending churches or other places of worship	1425	26.9	26.9
	Visiting archaeological sites, monuments and museums	326	6.1	6.1
	Going to the cinema or theatre	1259	23.7	23.7
	Using public transport	4687	88.4	88.4
	Practising physical activity	250	4.7	4.7
	What do you think are the places that promote Covid-19 infection? (Multiple-choice question - selected answers)	Your own home or that of your friends and relatives	1767	33.3
Bars, taverns		2975	56.1	56.1
Restaurants, trattorias, pizzerias, breweries, pubs		2605	49.1	49.1
Outdoor locations in cities centres (e.g. streets, squares, parks)		337	6.4	6.4
Outdoor locations outside cities centres (e.g. countryside, beaches, mountains)		102	1.9	1.9
Discos, dance halls		4572	86.2	86.2
Supermarkets		1395	26.3	26.3
Malls		3424	64.5	64.5
Gyms, swimming pools or other sports facilities		1693	31.9	31.9
Senior citizens' centre, community centre or other meeting place		2756	52.0	52.0
Schools and universities		1692	31.9	31.9
Workplaces		1872	35.3	35.3
Hospitals		2973	56.0	56.0
Residential communities		1631	30.7	30.7
Other	222	4.2	4.2	
In your opinion, are more at risk of Covid-19 people who in live in: (Multiple-choice question - selected answers)	In a large city	4849	91.4	91.4
	In a medium-sized town	1871	35.3	35.3
	In a small town	879	16.6	16.6
	In a village	738	13.9	13.9
	In a rural area	251	4.7	4.7

Query	Answer options	Frequency	Percent	Valid Percent
How much do you think you are at risk of becoming infected with Covid-19?	Very	449	8.5	8.5
	Fairly	2273	42.8	42.9
	A little	1824	34.4	34.5
	Not at all	137	2.6	2.6
	Don't know	611	11.5	11.5
	Total	5294	99.8	100.0
	Not answered	11	0.2	
In October what mask did you use outside the home? (Multiple-choice question - selected answers)	Scarves	22	0.4	0.4
	Fabric mask	1742	32.8	32.8
	Surgical mask	4363	82.2	82.2
	FFP2 or higher mask	1328	25.0	25.0
	None	35	0.7	0.7
	I never leave home	11	0.2	0.2
In October did you always cover your nose when you wore your mask outside the house?	Yes	4807	90.6	90.9
	No	480	9.0	9.1
	Total	5287	99.7	100.0
	Not answered	15	0.3	
	Not applicable	3	0.1	
In October which of the following behaviours did you engage in outside the home? (Multiple-choice question - selected answers)	Gloves	266	5.0	5.0
	Hand sanitiser	4811	90.7	90.8
	Hand washing	3457	65.2	65.3
	At least one metre distance	4946	93.2	93.4
	None	42	0.8	0.8
In October in the presence of NO-COHAUSING did you do the following? (Multiple-choice question - selected answers)	Mask usage	2682	50.6	50.6
	At least one metre distance	3557	67.0	67.0
	Room ventilating	2893	54.5	54.5
	None	360	6.8	6.8
	I have not met anyone not cohabiting	814	15.3	15.3
Amongst the individuals you know directly, is there anyone who has fallen ill with Covid-19?	Yes	4305	81.1	81.3
	No	988	18.6	18.7
	Total	5293	99.8	100.0
	Not answered	12	0.2	
Have you been or are you in quarantine or isolation (home, trust, preventive) because of Covid-19?	Yes	1064	20.1	20.1
	No	4232	79.8	79.9
	Total	5296	99.8	100.0
	Not answered	9	0.2	
Have you experienced any symptoms that could have been caused by Covid-19 (e.g. fever, cough, difficulty breathing, altered sense of smell and taste, runny nose, sore throat, diarrhoea)?	Yes	959	18.1	18.1
	No	4338	81.8	81.9
	Total	5297	99.8	100
	Not answered	8	0.2	
Have you been tested with a swab or other diagnostic test for Covid-19?	Yes	2609	49.2	49.2
	No	2693	50.8	50.8
	Total	5302	99.9	100
	Not answered	3	0.1	
What were the results of the test?	Infected (tested positive)	418	7.9	16.0
	Not infected (negative test)	2178	41.1	83.5
	I have not yet received the test results	11	0.2	0.4
	Total	2607	49.1	100.0
	Not answered	2	0.0	
	Not applicable	2696	50.8	

Query	Answer options	Frequency	Percent	Valid Percent
In what month was the first positive test for coronavirus (swab or other diagnostic test) done? (Multiple-choice question - selected answers)	February 2020	2	0.0	0.5
	March 2020	34	0.6	8.1
	April 2020	14	0.3	3.3
	May 2020	20	0.4	4.8
	June 2020	4	0.1	1.0
	July 2020	11	0.2	2.6
	August 2020	5	0.1	1.2
	September 2020	10	0.2	2.4
	October 2020	90	1.7	21.5
	November 2020	207	3.9	49.5
	December 2020	23	0.4	5.5
Do you know how you came into contact with Covid-19?	Yes	227	4.3	54.3
	No	191	3.6	45.7
	Total	418	7.9	100.0
	Not applicable	4887	92.1	
Do you think you have taken Covid-19 because of the following activities? (Multiple-choice question - selected answers)	Going to the hairdresser and beautician	1	0.0	0.4
	Browsing, shopping at markets (excluding food)	0	0.0	0.0
	Walking around shops and/or shopping (Shopping)	0	0.0	0.0
	Attending parties, dinners, lunches	33	0.6	14.5
	Attending associations	2	0.0	0.9
	Attending churches or other places of worship	0	0.0	0.0
	Visiting archaeological sites, monuments and museums	0	0.0	0.0
	Going to the cinema or theatre	0	0.0	0.0
	Using public transport	1	0.0	0.4
	Practising physical activity	2	0.0	0.9
Do you think you have taken Covid-19 by attending one of the following places? (Multiple-choice question - selected answers)		98	1.8	43.2
	Your own home or that of friends and relatives			
	Bars, taverns	6	0.1	2.6
	Restaurants, trattorias, pizzerias, breweries, pubs	9	0.2	4.0
	Outdoor locations in city centres (e.g. streets, squares, parks)	0	0.0	0.0
	Outdoor locations outside city centres (e.g. countryside, beaches, mountains)	0	0.0	0.0
	Discos, dance halls	0	0.0	0.0
	Supermarkets	1	0.0	0.4
	Shopping centres	1	0.0	0.4
	Gyms, swimming pools or other sports facilities	2	0.0	0.9
	Senior citizens' centre, community centre or other meeting place	2	0.0	0.9
	Schools and universities	9	0.2	4.0
	Workplaces	83	1.6	36.6
	Hospitals	27	0.5	11.9
Residential communities	6	0.1	2.6	

Query	Answer options	Frequency	Percent	Valid Percent
How many people do you live with?	I live alone	421	7.9	7.9
	With one person	1418	26.7	26.7
	With two people	1349	25.4	25.4
	With three people	1512	28.5	28.5
	With four people	438	8.3	8.3
	With five people	114	2.1	2.1
	With six or more persons	52	1.0	1.0
	Total	5304	100.0	100.0
	Not answered	1	0.0	
Who do you live with? (Multiple-choice question - selected answers)	With partner/spouse	3799	71.6	77.8
	With underage children	2121	40.0	43.4
	With adult children	1012	19.1	20.7
	With parents	958	18.1	19.6
	With siblings	426	8.0	8.7
Are there people over 65 in the house?	Yes	953	18.0	19.6
	No	3920	73.9	80.4
	Total	4873	91.9	100.0
	Not answered	432	8.1	
Do you have any people in your house who suffer from immunodeficiencies or chronic diseases (e.g. chronic respiratory diseases, cardio-vascular diseases, cancer, hypertension and obesity)?	Yes	1400	26.4	26.5
	No	3885	73.2	73.5
	Total	5285	99.6	100.0
	Not answered	20	0.4	
In which Region do you live?	Lombardy	1361	25.7	25.7
	Trentino Alto Adige	411	7.7	7.7
	Veneto	3533	66.6	66.6
In which Province do you live?	Bergamo	542	10.2	10.2
	Trento	411	7.7	7.7
	Treviso	2988	56.3	56.3
	Padua	545	10.3	10.3
	Monza and Brianza	819	15.4	15.4
Municipality size	< 10,000 inhabitants	2539	47.9	48.9
	10,000-20,000 inhabitants	1340	25.3	25.8
	20,001-50,000 inhabitants	926	17.5	17.8
	50,001-100,000 inhabitants	205	3.9	3.9
	100,000 inhabitants	180	3.4	3.5
	Total	5190	97.8	100.0
	Missing	115	2.2	
How old are you?	< 30 years old	783	14.8	14.8
	30-50 years old	3825	72.1	72.1
	> 60 years old	697	13.1	13.1
You are:	Male	1129	21.3	21.3
	Female	4168	78.6	78.6
	Other	8	0.2	0.2
What is the highest qualification you have obtained among those listed?	Eighth grade or lower	702	13.2	13.2
	High school diploma	2748	51.8	51.9
	Graduate degree	1541	29.0	29.1
	Post-graduate (PhD/master)	308	5.8	5.8
	Total	5299	99.9	100.0
Not answered	6	0.1		
Are you now or have you ever been a health worker?	Yes	635	12.0	12.0
	No	4657	87.8	88.0
	Total	5292	99.8	100.0
	Not answered	13	0.2	

Query	Answer options	Frequency	Percent	Valid Percent
In the last month, what was your main employment status?	Employed	3809	71.8	71.9
	Unemployed	271	5.1	5.1
	Retired	471	8.9	8.9
	Capital income recipient	14	0.3	0.3
	Student	249	4.7	4.7
	Homemaker	485	9.1	9.2
	Total	5299	99.9	100.0
	Not answered	6	0.1	
What is your profession?	Legislator, entrepreneur, senior management	95	1.8	2.6
	Intellectual, scientific and highly specialised profession	648	12.2	17.9
	Technical profession	421	7.9	11.6
	Executive profession in office work	1045	19.7	28.8
	Skilled occupation in commercial and service activities	736	13.9	20.3
	Craftsman, skilled worker and farmer	341	6.4	9.4
	Plant operator, stationary and mobile machinery workers and vehicle drivers	45	0.8	1.2
	Unskilled occupation (in commerce, services, domestic, leisure and cultural activities, agriculture, animal husbandry, manufacturing)	272	5.1	7.5
	Armed forces	23	0.4	0.6
	Total	3626	68.4	100.0
	Not answered	183	3.4	
	Not applicable	1496	28.2	
	Is it a job face to face with the public?	Yes	2162	40.8
No		1641	30.9	43.2
Total		3803	71.7	100.0
Not answered		6	0.1	
Not applicable		1496	28.2	

### Annex 3: ANOVA Table

#### Age

Variable	<30 years old <sup>1</sup>	30-59 years old <sup>2</sup>	>60 years <sup>3</sup>	F-Value	p
Dating and sociability in private spaces	0.305 <sup>2,3</sup>	-0.017 <sup>1,3</sup>	-0.257 <sup>1,2</sup>	59.824	<.001
Dating and sociability in third places	0.405 <sup>2,3</sup>	0.052 <sup>1,3</sup>	-0.179 <sup>1,2</sup>	82.080	<.001
Dating and sociability in outdoor places	-0.331 <sup>2,3</sup>	0.005 <sup>1,3</sup>	0.357 <sup>1,2</sup>	97.434	<.001
Dating and sociability in malls	-0.011 <sup>3</sup>	-0.018 <sup>3</sup>	0.118 <sup>1,2</sup>	5.318	.005
Level of crowding perceived	1.90 <sup>2,3</sup>	1.72 <sup>1,3</sup>	1.70 <sup>1,2</sup>	22.714	<.001
Preventive effectiveness of masks used	3.568 <sup>3</sup>	3.538 <sup>3</sup>	3.670 <sup>1,2</sup>	11.022	<.001

#### Educational qualification

Variable	Eighth grade <sup>1</sup>	High school diploma <sup>2</sup>	Graduate degree <sup>3</sup>	F-Value	p
Dating and sociability in private spaces	-0.190 <sup>2,3</sup>	-0.021 <sup>1,3</sup>	0.101 <sup>1,2</sup>	22.181	<.001
Dating and sociability in third places	-0.135 <sup>2,3</sup>	-0.010 <sup>1,3</sup>	0.066 <sup>1,2</sup>	10.328	<.001
Dating and sociability in outdoor places	0.040	0.020	-0.045	2.934	.053
Dating and sociability in malls	0.106 <sup>3</sup>	0.159 <sup>3</sup>	-0.062 <sup>1,2</sup>	7.721	<.001
Level of crowding perceived	1.65 <sup>2,3</sup>	1.74 <sup>1,3</sup>	1.79 <sup>1,2</sup>	9.169	<.001
Preventive effectiveness of masks used	3.525	3.551	3.587	2.688	.069

#### Occupation

Variable	Employed <sup>1</sup>	Unemployed <sup>2</sup>	Retired <sup>3</sup>	Capital income recipient <sup>4</sup>	Student <sup>5</sup>	Homemaker <sup>6</sup>	F-Value	p
Dating and sociability in private spaces	0.003 <sup>3,5</sup>	-0.017 <sup>5</sup>	- 0.228 <sup>1,5,6</sup>	0.258	0.289 <sup>1,2,3</sup>	0.045 <sup>3</sup>	9.300	<.001
Dating and sociability in third places	0.012 <sup>3,5,6</sup>	0.025 <sup>5</sup>	-0.196 <sup>1,5</sup>	0.295	0.487 <sup>1,2,3,6</sup>	-0.184 <sup>1,5</sup>	19.105	<.001
Dating and sociability in outdoor places	-0.056	0.006	0.450	0.162	-0.183	0.100	23.827	<.001
Dating and sociability in malls	-0.016	0.016	1.116	0.683	-0.024	0.004	2.688	.020

Level of crowding perceived	1.76 <sup>6</sup>	1.69 <sup>5</sup>	1.68 <sup>5</sup>	2.21 <sup>5</sup>	1.91 <sup>2,3,6</sup>	1.61 <sup>1,5</sup>	8.352	<.001
Preventive effectiveness of masks used	3.564	3.461 <sup>3</sup>	3.652 <sup>2</sup>	3.285	2.550	3.512	3.858	.002

### Province of residence

Variable	Bergamo <sup>1</sup>	Trento <sup>2</sup>	Treviso <sup>3</sup>	Padua <sup>4</sup>	Monza e Brianza <sup>5</sup>	F-Value	p
Dating and sociability in private spaces	-0.081 <sup>3</sup>	-0.013 <sup>3</sup>	0.068 <sup>1,2,5</sup>	-0.011	-0.121 <sup>3</sup>	9.163	<.001
Dating and sociability in third places	-0.111 <sup>3</sup>	0.019	0.046 <sup>1,5</sup>	0.027	-0.126 <sup>3</sup>	6.555	<.001
Dating and sociability in outdoor places	-0.041 <sup>2</sup>	0.274 <sup>1,3,4,5</sup>	-0.017 <sup>2</sup>	-0.035 <sup>2</sup>	-0.020 <sup>2</sup>	8.276	<.001
Dating and sociability in malls	0.116 <sup>3</sup>	-0.020	-0.039 <sup>1</sup>	0.068	0.031	3.815	0.004
Level of crowding perceived	1.72	1.72	1.76	1.75	1.70	1.204	.307
Preventive effectiveness of masks used	3.663 <sup>3</sup>	3.595	3.517 <sup>1</sup>	3.584	3.616 <sup>3</sup>	8.029	<.001

### City of residence size

Variable	<10,000 inhabitants <sup>1</sup>	10,000 – 20,000 inhabitants <sup>2</sup>	20,001- 50,000 inhabitants <sup>3</sup>	50,001- 100,000 inhabitants <sup>4</sup>	>100,000 inhabitants <sup>5</sup>	F-Value	p
Dating and sociability in private spaces	0.025	0.011	-0.048	-0.100	-0.015	1.475	.208
Dating and sociability in third places	-0.013	-0.017	0.074	-0.012	-0.015	1.467	.209
Dating and sociability in outdoor places	0.004	-0.033	0.001	0.039	0.161	1.573	.179
Dating and sociability in malls	-0.005	0.008	0.013	-0.135	-0.082	1.279	.276
Level of crowding perceived	1.72	1.76	1.78	1.78	1.83	2.454	.044

Preventive effectiveness of masks used	3.542	3.575	3.578	3.619	3.538	1.205	.306
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### Self risk perception

Variable	Not at all at risk <sup>1</sup>	A little at risk <sup>2</sup>	Fairly at risk <sup>3</sup>	Very high risk <sup>4</sup>	F-Value	p
Dating and sociability in private spaces	0.076	-0.006	0.054	-0.054	2.220	.084
Dating and sociability in third places	0.030	0.015	0.040	-0.089	2.047	.105
Dating and sociability in outdoor places	0.161	-0.023	0.042	-0.021	8.276	.054
Dating and sociability in malls	0.393 <sup>2,3,4</sup>	-0.026 <sup>1</sup>	-0.003 <sup>1</sup>	0.004 <sup>1</sup>	7.210	0.004
Level of crowding perceived	1.70	1.73 <sup>3</sup>	1.80 <sup>2</sup>	1.73	4.447	.004
Preventive effectiveness of masks used	3.463 <sup>4</sup>	3.517 <sup>3,4</sup>	3.586 <sup>2,4</sup>	3.686 <sup>1,2,3</sup>	9.512	<.001

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