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The perception of Covid-19 amongst vulnerable subgroups of the general population in Italy: insights from the qualitative study of the MOST project

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Abstract

Background The Covid-19 pandemic has had significant consequences on the well-being of individuals worldwide. However, some subgroups may be more affected, presenting numerous distressing psychological symptoms such as depression, anxiety and stress. The present study aims to explore the needs and concerns of the most vulnerable populations during the pandemic.

Methods Online focus groups were conducted with representatives of five vulnerable populations: frontline and non-frontline healthcare workers, young adults, older people, and entrepreneurs. The interviews with each group were transcribed, and an inducted theme analysis, based on the Health Belief Model, was conducted to identify recurring themes and build and implement a tailored intervention.

Results Qualitative differences between groups emerged in risk perception, one of the main domains of the Health Belief Model, while similarities emerged in the perceived cost of the pandemic. Other themes that emerged included vaccination intention, future expectations, protective measures usage, and information searching.

Conclusions The findings of the present study may help shape a Health Belief Model-based intervention to promote well-being and the use of protective measures during pandemics.

Keywords Covid-19, Health Belief Model, Health promotion, Risk susceptibility, Psychological outcomes, Smartphone app

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Background

The Covid-19 pandemic has caused a worldwide health crisis, with more than 423 million confirmed cases and almost 6 million deaths [1]. Italy has been the first Western country severely hit by the Covid-19, with the first case confirmed on February 20, 2020. In the middle of March 2020, the Italian government established extraordinary preventive measures such as quarantine, lockdown, and physical distancing [2]. The negative impact of repeated experiences of isolation and separateness on the economy, employment, and public health has remained critical for a long time. The Covid-19 pandemic has had a huge impact on people's everyday lives and mental health in the general population. In particular, low mood, irritability, anger, insomnia, emotional exhaustion, and psychological symptoms such as depression, anxiety, and stress have been variably but largely reported during the outbreak of Covid-19 all over the world [3–7], including Italy [8]. Indeed, a study involving a large general population sample showed that 32.4% of Italian individuals reported high or extremely high levels of depression, 18.7% declared high or extremely high levels of anxiety, and 27.2% of participants reported high or extremely high levels of stress in the first months of the COVID-19 pandemic [8].

Evidence also suggests that the increase in mental health symptoms remained stable over time [3, 9–12] Consequently, implementing empirically supported strategies to manage stress and minimise concomitant mental health problems has become a priority.

Vulnerable groups for Covid-19 related psychological distress

Pivotal risk factors for the development of Covid-19-related psychological distress and other psychological symptoms comprise lower levels of educational qualifications, female gender, elderly [13], and very young age (for a review, see Brooks) [3]. Age, economic (i.e., unemployment, loss of job) and social factors (i.e., social distance, mandatory use of the masks, online learning) have been shown to be strongly associated with Covid-19-related distress in young people, despite their relatively low risk of virus-related health risks and complications [14–20]. During the pandemic, young people were isolated from their friends, extra-curricular activities were disrupted, and life became increasingly uncertain. Young people were also more frequently subject to job loss, the cessation of job-seeking efforts and encountered challenges in making ends meet. Engagement in precarious employment structures (e.g., temporary and part-time contracts) made young people more vulnerable to challenges related to financial instability and housing insecurity, both of which were exacerbated during the pandemic. In fact, a three-wave longitudinal study has shown that young people's psychological symptoms first significantly decreased at the end of the lockdown phase and subsequently increased during the second wave of COVID-19 infection [10].

Evidence also suggests that older adults - particularly those with previous comorbid health conditions or cognitive impairment - were at risk of psychological symptoms due to prolonged isolation and anxiety about infection risk [17, 21–24]. In general, older adults feel lonelier, have smaller social networks, and are more isolated due to life events, such as retirement or losing loved ones. Social isolation, loneliness, prolonged confinement, loss of usual routine, and reduced social and physical contact frequently lead to boredom, frustration, and psychological distress [22, 23]. During the COVID-19 pandemic, older adults were expected to be particularly careful with physical contacts and adhere to preventive measures and restrictions for extended periods to reduce the risk of contracting the infection. Longitudinal findings support that during two years of the pandemic, feelings of loneliness and depression increased among older adults, even adjusted for confounders [25] (i.e., age, sex, having living children, education, marital status, functioning, having friends).

Studies since the onset of COVID-19 have shown that groups of workers have been severely affected by lockdown. Healthcare workers deserve special attention as a potential vulnerable population [3, 26, 27], as during the COVID-19 pandemic they have had to cope with increasing workload with extended shifts, fear of infection, contagion and transmission to their families, frustration, highly challenging decisions, guilt and bereavement, intrusive thoughts, nightmares, physical exhaustion, and inadequate personal equipment [28–31]. Prior studies have shown that these experiences have impacted their mental health, leading to symptoms of depression, anxiety, and distress [26, 32–34]. Interestingly, empirical evidence suggests that both frontline and non-frontline healthcare professionals developed high levels of psychological symptoms, as the COVID-19 induced rapid and unplanned work reorganization, urgent replacement of colleagues in different wards, and the rapid modification of activities according to the pandemic situation likely constitute pivotal factors of distress [35, 36]. Finally, the crisis has particularly hit workers in sectors at risk of downturns due to lockdowns and social distancing rules. The devastating economic impact has forced entire professional sectors (such as tourism, hotels, sports, entertainment, and restaurants) to cease operations. Thus, entrepreneurs might represent another vulnerable group because lockdown measures greatly reduced economic activity. Entrepreneurs operate under uncertainty, and external additional uncertainty and economic shocks—such as the COVID-19 outbreak—may amplify existing stressors, particularly financial unpredictability, that are known to be detrimental to entrepreneurs' well-being [37]. Previous studies in crisis contexts have shown that such crises diminish entrepreneur well-being (more than employee well-being), mainly because they trigger financial difficulties and threaten the survival of entrepreneurs' businesses. Identifying how these different subgroups perceive susceptibility, severity, and the benefits of preventive actions is fundamental to inform targeted public health interventions, particularly in messaging and promoting preventive health behaviors [7, 31, 38–40].

The Health Belief Model for promoting health behaviors and reducing distress during Covid-19 pandemic

The elevated stress arising from the Covid-19 pandemic and associated physical restrictions required the development of strategies grounded in evidence-based principles to manage stress and reduce psychological difficulties during traumatic events. Several studies have shown the potential utility of applying the Health Belief Model (HBM) [41] in this context to mitigate the impact of these unprecedented health challenges and identify and engage people in health-promoting behaviors [42–46]. The HBM, applied in this specific context, suggests that people will adopt the protective behaviors recommended by governments to reduce the likelihood of contracting COVID-19 if they: (i) perceive themselves to be at risk of contracting COVID-19 (namely, perceived susceptibility), (ii) perceive that COVID-19 is a severe condition and is highly transmittable (namely, perceived severity), (iii) perceive that suggested actions to reduce the risk or seriousness of COVID-19 infection are effective (i.e., perceived value/efficacy of receiving the COVID-19 vaccine, maintaining physical distance, and/or wearing masks), (iv) perceive low barriers to taking action, such as tangible and psychological costs of the advised action (e.g., no obstacles to receiving the COVID-19 vaccine), (v) have cues to action or strategies to enhance responsiveness (e.g., recommendations by the government, physicians, family members, and friends). Moreover, individual characteristics, including demographic, psychosocial, knowledge, and structural variables, can affect perceptions of recommended preventive actions to avoid contracting COVID-19 [42, 43, 47, 48]. During the Covid-19 pandemic, the HBM has been found to be effective in promoting preventive health behaviors [49, 42–46], including hand washing, face mask wearing, maintaining social distance [50], and vaccination [51]. In particular, adherence to different types of precautionary measures was correlated with four HBM factors (i.e. perceived severity, perceived benefit, perceived barrier, and cue-to-action) [45], and perceived transmissibility after disease onset (i.e., perceived severity) was found to be the strongest predictor of willingness to receive vaccines [42]. Overall, HBM-based interventions could mitigate behaviors influenced by perceived health threats which provoke anxiety and fear, reinforcing individuals' perceived benefits and self-efficacy [47, 48].

The current study: rationale and objectives

The direct and indirect psychological, social and economic effects of the Covid-19 pandemic have been pervasive, affecting individuals' mental health [26, 29]. Therefore, the effective use of quarantines and other preventive measures on behalf of public health institutes required reducing, as far as possible, the negative effects associated with them, including psychological distress [3]. Furthermore, HBM suggests the importance of perceptions and beliefs in building health promoting interventions, and studies have shown the role of perceived vulnerability to the disease on stress and adoption of protective measures [52, 53]. Promoting the well-being of people during a global health crisis requires an understanding of target groups' specific beliefs, perceptions, needs, and hardships with which they struggle during routine and emergency situations. However, these aspects have not yet been explored in populations most exposed to the consequences of SARS-CoV-19.

The present study aimed to explore the perceptions, attitudes, beliefs, and needs that emerged during the Covid-19 pandemic among specific vulnerable groups, including young adults, older individuals, frontline and non-frontline healthcare professionals, and entrepreneurs to build a tailored HBM-based health-promoting intervention. Indeed, this study is part of a broader research project (i.e., the MOST regional project, see Pozza et al. [54]), whose overall purpose is the development of a smartphone app that will increase skills to cope with pandemic-related distress for the groups mentioned above.

Methods

Participants and procedure

Participants were recruited in Tuscany region (Italy) using a snowball sampling method and were included in the study if they were aged ≥ 18 years old and belonged to one of the considered vulnerable groups: frontline healthcare professionals working in Covid-19 units, non-frontline healthcare professionals, university students, older people (≥ 65 years old), and entrepreneurs. Participants were recruited from universities, hospital units, associations, and community services in Florence, Pisa and Siena. Participation was voluntary, and confidentiality and anonymity were assured. No credits or remunerative rewards were given. Twenty-five subjects were recruited, and among them, only 20 individuals completed the anonymous online survey.

Five focus groups, one for each specific vulnerable population, were conducted online by two experts in group facilitation (i.e., A.P. and B.G.). During the focus groups, all participants were informed again about the study's aims, and the researchers presented themselves as both psychologists and experts in research on health issues. All participants gave consent for their narratives to be reported in a scientific manuscript. Collected data were stored in a database accessible only to the research team members. To protect the identities of participants, identification numbers followed by M for males and F for females were used throughout the manuscript.

The research protocol for this study was approved by the Area Vasta Sud Est Ethical Committee (Italy) on October 28th, 2021 (Approval code: 20831) and was conducted according to the ethical guidelines for psychological research established by the Italian Psychological Association (AIP).

Questionnaire about sociodemographic and Covid-19-related information

Before participating in the focus groups, all participants were required to fill out an anonymous online survey and report their gender, age, level of education, COVID-19-related direct and indirect experiences, and vaccination status.

Focus groups

According to Covid-19's anti-contagion health and safety protocols, five semi-structured focus groups lasting two and a half hours were conducted online using the Google Meet platform. According to Hughes and DuMont [55], focus groups provide insights into psychological and social processes that occur in specific cultural groups, shedding light on their personal and social realities. Moreover, beyond the anti-contagion restrictions, focus groups have been conducted online for a long time [56], as the online format allows for the involvement of participants from distant geographic areas, is economically more sustainable, and stimulates more commentary. Before conducting the focus groups, each participant filled out the informed consent and the release form for the audio-video recording of the meetings, which were transcribed verbatim. The focus groups were conducted so that all participants could express their thoughts. The following areas were explored during the focus groups: (i) information needs, (ii) the degree of awareness and beliefs about Covid-19, (iii) the mechanisms of contagion, (iv) the measures to manage it daily, (v) the negative consequences of social distancing in everyday life, (vi) the role of values and subjective norms that might lead to the adoption of certain preventive behaviors (e.g. peer-to-peer judgment among young people, economic gain or sanctions for entrepreneurs), (vii) beliefs based on the HBM (perception of vulnerability and severity, benefits and costs of preventive actions).

Data analysis

Following Braun and Clarke's guidelines [57], the qualitative data was analyzed through an inductive thematic analysis, aiding the interpretation of identifiable themes and patterns of behavior. To ensure validity, two independent researchers (i.e., S.B.B. and F.G.) analyzed the focus groups' transcriptions and compared opinions at the end of the analytic process. They discussed and reached agreement on divergences and differences throughout the five main stages of the analytic process. The coding process involved a combination of descriptive and interpretive coding strategies.

In the first stage, the researchers familiarized themselves with the data through a detailed and repeated reading of the transcriptions, recording initial thoughts, and highlighting concepts or.quotes. Secondly, the transcriptions were re-read several times, allowing the generation of initial codes, identifying data features, and collecting significant data extracts. Initial codes were generated line-by-line, focusing on identifying key issues,concepts, ideas, and emotions expressed by participants. The third phase consisted of a broader level of analysis: the initial codes were combined into potentially more comprehensive themes. In the current study, themes represented the seven areas investigated during the focus groups. In the fourth stage, these themes were refined and evaluated based on their internal homogeneity (i.e., codes within a theme should be conceptually similar) and external heterogeneity (i.e., themes should be distinct from each other). Thematic analysis proceeded iteratively, with researchers moving back and forth between identifying codes and data extracts, developing themes, and refining their interpretations. Finally, in the fifth stage, the themes were labelled according to the proposed questions.

To ensure validity, the researchers discussed their findings regularly and compared their interpretations throughout the analysis. Disagreements were resolved through discussion and consensus.

Results

Table 1 shows the characteristics of the focus groups' participants. Age varied from 21 to 78 years old; 37.5% had high school graduation, 50% had graduated, and 12.5% had a master's degree. Concerning the direct and indirect experiences related to Covid-19, the SARS-CoV-2 had infected 33% of participants, 66.7% had at least one friend or one relative who had been affected by COVID-19, and only 4.2% knew someone who had died from Covid-19-related complications. Furthermore, 4.2% were alone during the first lockdown wave, 29.2% lived or

Table 1 Characteristics of focus groups' participants

	Target	Mean age (SD)	Males	Females	Total
Focus group 1	Young adults	23 (2.35)	4	4	8
Focus group 2	Older adults	72 (6.38)	2	3	5
Focus group 3	Frontline healthcare professionals	38.25 (17.33)	2	2	4
Focus group 4	Non-frontline healthcare professionals	48.67 (12.44)	1	4	5
Focus group 5	Entrepreneurs	61 (0.00)	1	2	3
	Total	45.45 (20.09)	10	15	25

were still living with fragile patients, and 100% of participants were vaccinated.

The inductive thematic analysis allowed us to cluster the themes investigated during the focus groups into eight themes for a total of 52 codes. An additional table file shows these themes in more detail [See Table 2]. The results are presented with extracts of quotations from the dataset to exemplify each category.

Information search

For each focus group, participants discussed their information search during the pandemic, including time spent in this activity, used channels of information, and which type of information they searched. Some participants of the young adult group reported a high frequency of searching for emergency status information (code 1a) (1 F, 2 M, 4 F) and negative outcomes related to information search (code 1e) (1 F, 5 F), an example of this code is: Participant 1 F (young adults): *"I was seeking information, even though I knew it wasn't great for me"*.

Other participants of the young adult (2 M, 7 M) and older adult (12 M) groups reported a decreased frequency of searching for infection rate (code 1b): *"However, I have tried over the time to - and it has come rather spontaneously - to detach myself from the continuous search of information regarding mainly the infection rate"* (Participant 2 M, young adult).

Also, two individuals (1 F, 3 F) in the young adult group reported a sense of hope of making improvements in the data (code 1 F), e.g. *"I was looking for information especially, shall we say, hoping to read some positive news"* (Participant 1 F, young adult). Additionally, three young adults (3 F, 5 F, 6 M) declared that during the pandemic, they had planned the moment of the search for information (code 1c), e.g. *"I tried, almost from the beginning, to dedicate some specific moments of the day for the search of information to have updates on what was happening"* (Participant 5 F, young adult). Two individuals belonging to the young (2 M, 7 M) and one older adult (12 M) group both declare that they searched for information to understand health risks (code 1d), e.g. *"The search for information went a lot in the direction of the psychological and social impacts that Covid had; therefore, not only about medical impacts or intensive therapies, but also about the psychological and social implications"* (Participant 7 M, young adult).

Regarding trust in information sources, some young adults (2 M, 5 F, 6 M, 7 M, 8 F), older adults (11 F, 12 M), and one non-frontline healthcare professional (19 F) declared trust in official/institutional sources (code 1 g).

Furthermore, concerning channels for information search, most participants declared that they searched for information on traditional media (i.e., television and newspapers; code 1k) (*young adults* = 1 F, 2 M, 4 F, 7 M, 8 F; *older adults* = 10 F; *frontline healthcare professionals* = 15 F; *non-frontline healthcare professionals* = 19 F, 22M; *entrepreneurs* = 23 F, 24 F) and on institutional/official channels (code 1 h) (*young adults* = 2 M, 4 F; *older adults* = 9 F,10 F, 11 F, 12M; *frontline healthcare professionals* = 15 F, 16M; *non-frontline healthcare professionals* = 19 F; *entrepreneurs* = 25 M), followed by Internet and social media (code 1j) (*young adults* = 1 F, 5 F, 6M; *older adults* = 10 F, 12M; *frontline healthcare professionals* = 14 F; *non-frontline healthcare professionals* = 18 F, 20 F, 22M; *entrepreneurs* = 23 F, 25 M), WhatsApp groups (code 1i) (*older adults* = 10 F; *non-frontline healthcare professionals* = 18 F, 19 F, 20 F, 22 M), and comparison among colleagues (code 1 L) (*frontline healthcare professionals* = 14 F, 15 F; *non-frontline healthcare professionals* = 18 F, 20 F).

Perception of susceptibility

During the focus groups, perceived susceptibility and severity were investigated as the main components of the Health Belief Model [40]. Regarding perceived susceptibility, it was asked how much they felt susceptible during the pandemic and at the present time. All the participants reported their perception of susceptibility, although several groups felt more vulnerable in different aspects. For instance, the perception of physical susceptibility (code 2a) was mainly declared by older adults (9 F, 11 F, 12 M), while in non-frontline healthcare professionals, entrepreneurs, and students the perception of high vulnerability emerged in only one participant per group (20 F, 24 F, and 2 M respectively). In the frontline healthcare professionals, none of the participants reported a perception of physical susceptibility: *"For example, if we talk about vulnerability, I felt and I still feel vulnerable- but, I think, this is a perception that I also have as far as the community I*

Table 2 Investigated themes, code families, and codes

QUESTIONS PRESENTED DURING FOCUS GROUPS	THEMES ($n = 8$)	CODES ($n = 52$)	*N* CODES FOR EACH THEME
Information search			12
In the course of the pandemic did you search for information about the virus, its mechanisms of contagion and containment measures? if so, how much time did you spend on it and what channels of information did you use?	1. Information search	a. High frequency of searching for emergency status information	
		b. Decrease in frequency of finding infections numbers	
		c. Planning research of information	
		d. Search for information to understand health risks	
		e. Negative outcomes related to information search	
		f. Hope to read improvements in the data	
		g. Trust in official/institutional sources	
		h. Search for information from institutional/official channels	
		i. Search for information through WhatsApp groups	
		j. Search for information on the Internet and social media	
		k.Search information on traditional media	
		l. Information exchange between colleagues	
Perception of susceptibility and severity			8
In the course of the pandemic how much did you feel susceptible and how severe did you perceive the situation? And at the present time?	2. Perception of susceptibility	a. Perception of physical susceptibility	
		b. Not perception of physical susceptibility	
		c. Perception of psychological susceptibility	
		d. Perception of socio-economic susceptibility	
		e. Perceived susceptibility of the healthcare system	
		f. Fear of infecting others	
		g. Lack of facilities (e.g. masks, sanitizing gel, gloves) that generates a perception of susceptibility	
		h. Decreased perception of susceptibility due to the vaccine	
	3. Perception of severity	a. Higher perception of severity at pandemic onset	4
		b. Lower perception of severity at pandemic onset	
		c. Decreased perception of severity today	
		d. High perception of severity for the socio-economic situation	
Changes caused by the pandemic	4. Changes caused by the pandemic	a. Positive changes caused by the pandemic	5
What changes have you noted (positive/negative) since the pandemic has begun in your relationships with your health, your work, and your relationships with others? Do you think these changes will last over time? How much, returning back, would you use the same ways of coping with changes?		b. Negative changes caused by the pandemic	
		c. Changes that will last over time	
		d. Changes that will not last over time	
		e. I would use the same strategies that I used to cope with changes	
	5. Negative psychological and social outcomes related to the pandemic	a. High perception of psychological distress	6
		b. High presence of contrasting information on Covid-19 that destabilize	
		c. Negative social outcomes	
		d. Avoidance of social situations for fear of covid that generates suffering	
		e. Isolation that generates suffering	
		f. Need to detach from the flood of information about Covid-19	

Table 2 (continued)

QUESTIONS PRESENTED DURING FOCUS GROUPS	THEMES ($n=8$)	CODES ($n=52$)	*N* CODES FOR EACH THEME
Preventive behaviors and Social distancing			10
How much have you been able to implement preventive behaviors against the spread of the virus? What are the benefits and costs of such preventive actions? How did you cope with the social distancing? What did you do to cope with not being able to see friends or relatives? Have these strategies been helpful in your opinion?	6. Preventive behaviors and Social distancing	a. Benefits associated with preventive behaviors	
		b. Preventive behaviors that became automatic during the second wave of pandemic	
		c. Decreased of preventive behaviors during the second wave of pandemic	
		d. Social distancing as a cost	
		e. Mask usage as cost	
		f. Preventive behaviors as socio-economic cost	
		g. Difficulty in getting others to comply with preventive behaviors	
		h. Internet as a socializing vehicle to cope with distancing	
		i. Preventive behaviors to protect others	
		j. Preventive behaviors not experienced as a cost	
Future			3
What do you expect from the future? What do you expect to happen?	7. Future	a. Expectation of increased well-being in the future	
		b. Expectation of increased resources in the future	
		c. Expectation of new issues in the future	
Vaccine			4
How did you experience the vaccine? What emotions are associated with having to get vaccinated?	8. Vaccine	a. Conflicting information about the vaccine	
		b. Fear of vaccine	
		c. Vaccine as a vehicle for reconnection	
		d. Convincing others to get the vaccine	

Table 3 Examples of significant quotations

CODES	
2c. Perception of psychological susceptibility	*"Speaking with people that I am able to attend through the association, obviously there are a lot of vulnerabilities and concerns. The main concern is that people's lifestyles have changed so much compared to what we were used to doing. The lifestyle has changed for the worse, obviously, and so many people are feeling lonelier and are living in a completely different way. I think that it will be very difficult to be able to go back to having a lifestyle as we had before. So, here, this thing is to emphasize the restlessness that I perceive in people and also in myself"* (Participant 10 F, older adults).
2d. Perception of socio-economic susceptibility	*"Imagine my situation, employees laid off for a total of almost two years, and every time we had the feeling of starting again, then we had to stop and close again, having to talk to these people, their families. I felt vulnerable from a business perspective, from a job perspective"* (Participant 25, entrepreneurs).
2 f. Fear of infecting others	"*[…] even the fact that one risked bringing it home, being the agent who made loved ones sick or could make them sick"* (Participant 22 M, non-frontline healthcare professionals).
3b. Lower perception of severity at pandemic onset	*"At first, regarding the perception of severity, I did not perceive it until we had the first case of Covid-19"* (Participant 20 F, non-frontline healthcare professionals).
4a. Positive changes caused by the pandemic	*"In my opinion, the most positive change was the opportunity to rethink our lives, our working lives, relationships, school lives from a different point of view. New strategies have been adopted, not only in university and school, but also in terms of work and smart working"* (Participant 6 M, young adults). *"A good change has been the increased employment of healthcare professionals, even if in a temporary way as for me. But it's better than nothing because before, anyway, at least when I graduated, there were very few and no concourses, instead now anyway they give you a chance to work. Before there were several years where there were very few concourses anyway. So, at the occupational level I see it as a positive thing"* (Participant 14 F, frontline healthcare professionals). *"I hope that a new culture has arisen, respecting other healthcare professions, what the nurse is, what the socio-health care worker does, and what the physician does. I hope greater respect has arisen toward other professions, such as psychologists. Making psychologists available for this pandemic was so helpful. I mean, making the world aware of the health figures is a very positive thing. Especially, prevention was talked about, even on television, which was something that very few people knew"* (Participant 14 F, frontline healthcare professionals). *"So, I've noticed changes within the groups, more cohesion, more collaboration. And so that's a positive thing, right? I've seen a sense of dedication in the group, including all professional figures, such as physicians, nurses, social health workers. And so, I mean, there was a positive change in the interpersonal and interprofessional relationships"* (Participant 15 F, frontline healthcare professionals). *"Among the positive changes, certainly, there were many and bigger resources that also led to buying a lot of new machinery, a lot of things that we didn't have. So, from that point of view, it was definitely something positive".* Participant 19 F (non-frontline healthcare professionals): *"The positive aspects of course are the discovery by health workers of personal protective devices because before, in short, there was a lot of resistance".* Finally, one older adult said: "*Now we are understanding that so many things are better in video conferencing. Why? Because there is a little bit more respect for each other's speech turn as well as a little bit more respect for each other. When we are together, we interrupt each other, as we are used to doing, no?"* (Participant 17 F, frontline healthcare professionals).

Table 3 (continued)

CODES	
4b. Negative changes caused by the pandemic	*"My university path changed 100% and unfortunately I couldn't socialize".* (Participant 4 F, young adults). *"What I experienced a lot with my roommates, but in general I also used to see with others, is that in the first lockdown we completely lost the conception of time, we never knew what time it was, what day it was. Sometimes we would stay up until 5:00 in the morning. […] we found ourselves completely unregulated and even in our mood afterward we saw that it had impacted us anyway"* (Participant 8 F, young adults). *"I am aware that there will be a lot of difficulties because as long as we have to use a mask and as long as we haven't lost the mistrust of closeness, it will be difficult to overcome. Now, we mistrust approaching a person"* (Participant 9 F, older adults). *"Thinking about health, work, and relationships, the absence of security and stability represents a negative change. Everything varies, the same work changes from one day to another because something happens. Similarly, in relationships with others, one is no longer able to make plans or schedules"* (Participant 17 M, frontline healthcare professionals). *"The work has deteriorated from a quality point of view and also because we do tasks that are not ours to do I mean I have to be a physician; I have to visit people. And visiting people has remained a very peripheral part of my job because I basically sit at the computer and do certificates, answer the phone, write things, do things that are not my responsibility. But unfortunately, you got into this situation, though"*(Participant 18F, non-frontline healthcare professionals). *"Undoubtedly there have been changes. I saw so many clients who were always fearful. Initially, they were afraid of coming into the store. Thus, we always left our big door open, even when it was colder, just to give a sense of security. But there was always hesitancy, there was always fear. You could see it in the people who quickly came in and then walked away"* (Participant 23 F, entrepreneurs). *"So many things have become difficult, at least in our job. Placing orders feels like you're always on a treasure hunt because you never know what you're going to find, when and where you're going to find the stuff, and with price increases, it feels like we're back in the 90's, when every time stuff came in and you were concerned about the price lists. But now, here we are changing price lists every 10 days, more or less, with things that are even disappearing from catalogs because they are not being restocked and overstocked. This is killing us"* (Participant 24 F, entrepreneurs). *"With the pandemic, everything changed for us, literally. Customer behavior has changed, staff behavior has changed, a lot of people have changed.[…] No one wants responsibility anymore".* (Participant 25 M, entrepreneurs).
4c. Changes that will last over time	*With masks, we have much fewer pathologies and this is probably something that will remain. We will learn to do things like countries with a high population density where one who has a cold, wears a mask so as not to infect others. So I believe this will remain" (*Participant 18 F, non-frontline healthcare professionals).
4d. Changes that will not last over time	*"Regarding interpersonal distancing, I am optimistic, so that once it is understood that it can also be done in substantial safety, this will return to characterize our relationships"* (Participant 22 M, non-frontline healthcare professionals).
8a. Conflicting information about the vaccine	*"I got vaccinated, not so relaxed because unfortunately there is a bombardment of information"* (Participant 23 F, entrepreneurs).

belong to - I felt more threatened and more worried [for my physical health] at the beginning of the pandemic" (Participant 12 M, older adults). Furthermore, six young adults (3 F, 4 F, 5 F, 6 M, 7 M, 8 F) and two entrepreneurs (23 F, 25 M) declared that they did not perceive themselves physically susceptible (code 2b): *"So, vulnerability in the sense of fear of contagion is not something I experienced very much because I felt that I was part of the youngest population, of those who risk less"* (Participant 3 F, young adults).

Moreover, young (2 M, 3 F, 6 M, 7 M) and one older adult (10 F) reported perceiving psychological susceptibility (code 2c), e.g. *"I didn't know how we were going to keep up with this situation, also because we know it very well, unfortunately… from a psychological perspective, the psychological effects are always noticed a little too late and they are also the ones that may last, last the longest and are often also the last ones that are taken into consideration".* Other significant examples are reported in Table 3.

Also, two young adults (5 F, 6 M) and all participants in the entrepreneurs' group (23 F, 24 F, 25 M) reported a perception of socio-economic susceptibility (code 2d), e.g. *"But there was not so much a fear for the health aspect, because we really had few cases, but there was clearly a fear at the commercial level. So, yeah, it was more like this"* (Participant 23 F, entrepreneurs). Other significant examples are reported in Table 3.

Finally, one young adult (3 F), one older adult (9 F), and one frontline healthcare professional (16 M) reported perceived susceptibility of the healthcare system (code 2e), e.g. *"So, let's say there was a state of anxiety, of alertness significantly higher than now regarding the home care service. In terms of vulnerability, at the beginning we felt even more vulnerable because we were afraid to make more mistakes, being a new experience and a new field. After all, previously, infectious diseases had never been treated at home, so there were protocols never used or tested, so the vulnerability was pretty high"* (Participant 16 M, frontline healthcare professionals).

Associated with the perceived susceptibility of the healthcare system, one frontline (19 F) and one non-frontline healthcare professionals (18 F), and one older adult (9 F) declared the lack of personal protective equipment (e.g., masks, sanitizing gel, gloves) as a cause of the perception of susceptibility (code 2 g): *"I'll just say one thing. So, I initially got gloves and a mask from a dentist friend of mine because we didn't have anything. Then I went for a hospice visit and they gave me three or four pairs of gloves because they didn't have them either. Then a surgeon friend of mine from the hospital brought me a mask and two pairs of gloves, so, this is just to point out. In the beginning, we were at these levels"* (Participant 18 F, non-frontline healthcare professionals).

Moreover, most of the young adults (2 M, 3 F, 4 F, 6 M, 7 M, 8 F), two frontline (14 F, 17 M), and three non-frontline healthcare professionals (18 F, 21 F, 22 M) reported fear of infecting others (code 2f). An example of this code is: "*So, yes, at the beginning we were extremely vulnerable and, let's say, anxious about anything we might do wrong… When you had made a mistake… If you had made a mistake, you could see after ten days, so in those ten days we were anxious about the contact with others, with our family members. At the beginning we were in a fairly anxiogenic perception of the whole situation"* (Participant17M, frontline healthcare professionals). Other significant examples are reported in Table 3.

Finally, the decreased perception of susceptibility due to the vaccine (code 2 h) emerged as a specific code among one frontline (22 M) and two non-frontline (19 F, 20 F) healthcare professionals.

Perception of severity

Participants were asked to express how severe they perceived the situation during the first phases of the pandemic (e.g., lockdown) and how severely they perceive the situation at the present time. A higher perception of severity at the pandemic onset (code 3a) was reported only by some older adults (10 F, 12 M), frontline (15 F, 16 M), and non-frontline (18 F, 19 F) healthcare professionals' groups, e.g. *"And then we also began to understand the severity, especially when there were five hundred dead, one thousand dead, all the coffins… At that point, it was really clear that the thing, at least for what concerns me, was very serious"* (Participant 18 F, non-frontline healthcare professionals' group).

One frontline (15 F) and two non-frontline (18 F, 20 F) healthcare professionals declared a perception of low severity at pandemic onset (3b), e.g. *"Yes, it's true, in the beginning, at least in my opinion, since we didn't know what it really was, it had been taken lightly"* (Participant 15 F, frontline healthcare professionals' group). Other significant examples are reported in Table 3.

Moreover, three individuals from three groups out of five (*young adults* = 7M; *older adults* = 12M; *non-frontline healthcare professionals* = 18 F) reported a decreased perception of severity at the date of evaluation (code 3c), whereas three individuals from two groups out of five (*older adults* = 12M; *entrepreneurs* = 23 F; 25 M) declared to perceive a severe socio-economic condition (code 3d).

Changes caused by the pandemic

Positive (code 4a) and negative (code 4b) changes caused by the Covid-19 pandemic were investigated by asking which changes might be last (code 4c) or not (4d) over time. Four participants belonging to the young adult (1 F, 2 M, 4 F, 6 M), one older adult (9 F), four frontline healthcare professionals (14 F, 15 F, 16 M, 17 M), and one non-frontline healthcare professional (19 F) highlighted various positive changes. A young adult said, *"In my experience, the remote education may have had some benefits certainly for students, working students, or even for those who perhaps attend the university remotely because they live far from the campus"* (Participant 2 M, young adults). Other significant examples are reported in Table 3.

Also, negative changes were identified by all the populations involved (*young adults* = 1 F, 2 M, 4 F, 6 M, 8 F; *older adults* = 9 F, 12M; *frontline healthcare professionals* = 14 F, 15 F, 16 M, 17M; *non-frontline healthcare professionals* = 18 F; *entrepreneurs* = 23 F, 24 F, 25 M), for a total of nine negative changes caused by the pandemic, including: *"There was a strong decline in the academic performance during the first semester of the second year. That's not the only thing that can measure one's perception of one's own course of study, but I think that is very significant"* (Participant 2 M, young adults). Other significant examples are reported in Table 3.

Regarding identified positive or negative changes, participants were asked to indicate which would last overtime (code 4c) and which would not (code 4d). One frontline (15 F) and four non-frontline (18 F, 19 F, 21 F, 22 M) healthcare professionals enlightened two changes that they think will last over time: *"Yes, smart working, remote education, came to mind. However, I think they will become a common thing, in short, a usual thing"* (Participant 15 F (frontline healthcare professionals). Other significant examples are reported in Table 3.

Moreover, two non-frontline healthcare professionals (19 F, 22 M) identified two aspects of code 4d regarding changes that will not last over time, e.g., *"Good habits are difficult to acquire, but bad ones are quickly resumed… Certainly during winter, if the system does not force us to do it, we will all start to travel again without a mask, work with cold and do all the good things that we did before the pandemic"* (Participant 19 F, non-frontline healthcare professionals). Other significant examples are reported in Table 3.

Finally, participants were asked if, in hindsight, they would have used the same ways of coping with changes, and only three young adults (2 M, 4 F, 6 M) answered that they would use the same strategies (code 4e).

Negative psychological and social outcomes related to the pandemic

Participants also focused on specific negative psychological and social outcomes that emerged during the pandemic. Specifically, one young adult (1 F), one frontline (14 F) and two non-frontline (18 F, 22 M) healthcare professionals, and one entrepreneur (25 M) declared a high perception of psychological distress (code 5a), e.g. *"The current problem is that we are all in burnout. Now, we represent the Front Office of our patients for everything related to the Covid emergency. […] and so now we feel tired. And on the edge, really"* (Participant 18 F, non-frontline healthcare professionals).

Additionally, some participants from all the groups (*older adults* = 9 F, 13M; *frontline healthcare professionals* = 16M; *non-frontline healthcare professionals* = 18 F, 19 F, 20 F, 21 F; *entrepreneurs* = 23 F, 24 F), except young adults, reported a sense of destabilization associated with the high presence of conflicting information about Covid-19 (code 5b), e.g. *"It happened that on the Internet, but not only, you could hear everything and the opposite of everything. And this is a bit naturally destabilizing for people because they are already in a difficult situation. Hearing conflicting information can obviously generate obvious problems"* (Participant 9 F, older adults).

Also, four young adults (5 F, 6 M, 7 M, 8 F), one older adult (9 F), and one non-frontline healthcare professional (18 F) reported a strong need to detach from the flood of information about Covid-19 (code 5f), e.g. *"I wanted to disconnect a little bit from the coronavirus world, because I was bombarded with news all morning: places in the ICU, lacking masks… In the afternoon or the evening, I was trying to carve space for myself, to be quiet, to not think about the covid that was all we were talking about. Like, I needed a little bit…to disconnect a little bit."* (Participant 6 M, young adults).

One young adult (8 F), one older adult (12 M), and two non-frontline healthcare professionals (18 F, 19 F) also noticed negative social outcomes (5c), e.g. *"[…] the pro-vaxs who distinguish themselves from the no-vaxs, creating situations of opposite logics and social hate within certain categories. This is certainly the cost that we are paying as a society"* (Participant 12 M, older adults).

Finally, two negative psychological outcomes which generated suffering were reported: isolation (code 5e) for two young (3 F, 5 F) and one older (10 F) adults, and avoidance of social situations for fear of contracting Covid-19 (code 5d) only for two older adults (9 F, 10 F). Indeed, a young adult said: *"During the lockdown, your being sick could be perceived by other people [roommates], therefore, you were hiding it. However, not due to contagion per se, rather due to isolation in general"* (code 5e; Participant 3 F), and an older adult reported: *"Because we are islands, because we are isolated, and because we are afraid when we approached other people in person. We go to the restaurant, but we are afraid to take off the mask and so the pleasure of going to eat at the restaurant might end. We can't spend the holidays with everyone we used to share them with. Or you must take a test beforehand. So, I think that the serenity and peace of mind have been taken away and this is one of the biggest costs, at least as far as I'm concerned"* (code 5d; Participant 9 F).

Preventive behaviors and social distancing

Another theme investigated was the implementation of preventive behaviors and social distancing. Participants were asked to discuss how much they had been able to implement preventive behaviors against the spread of the virus and which benefits and costs they associated with these behaviors, with a special focus on social distancing. Finally, they were asked to indicate if they thought those strategies had been helpful against the spread of the virus.

Some participants (*young adults* = 4 F, 5 F, 7M; *older adults* = 11 F; *frontline healthcare professionals* = 14 F, 15 F; *non-frontline healthcare professionals* = 18 F, 20 F, 22 M) reported that they did not experience preventive behaviors as a cost (code 6j), while some others belonging to the same groups (i.e., young adults, 6 M; older adults, 11 F; and non-frontline healthcare professionals, 20 F, 22 M) reported mask usage as a cost (code 6e). Furthermore, various participants (*young adults* = 3 F, 7M; *older adults* = 9 F, 11 F, 12M; *frontline healthcare professionals* = 14 F, 15 F, 16 M, 17M; *non-frontline healthcare professionals* = 19 F, 20 F, 22M; *entrepreneurs* = 23 F) experienced social distancing as a cost (code 6d). Additionally, all the groups (*young adults* = 5 F, 7 M, 8 F; *older adults* = 12M; *frontline healthcare professionals* = 14 F, 15 F, 16 M, 17M; *non-frontline healthcare professionals* = 18 F; *entrepreneurs* = 24 F) reported that they used Internet as a vehicle to cope with social distancing (code 6 h).

Two young adults (4 F, 8 F), two older adults (9 F, 12 M), and two entrepreneurs (23 F, 25 M) also highlighted socio-economic costs of preventive behaviors (code 6f), e.g. *"[...] At the present time, we see much less social cohesion than before. We moved from a situation of commonality to a current situation of disintegration. I use a term but only to make myself understood... Vax, pro vax, no vax, entrepreneurs who are obviously sacrificed in some ways, other economic categories, we are seeing the effects that this pandemic has caused. If at first, they were not obvious, now they have revealed themselves in all their evidence.... But not only on the economic level, I'm talking about the social level. So, we have gone from a social situation of commonality, of sharing, to a situation of real division between different social categories"* (Participant 12 M, older adult).

One young adult (6 M), two older adults (9 F, 12 M), and one non-frontline healthcare professional (18 F) enlightened two benefits associated with preventive behaviors (code 6a), e.g. *"In the end, there are benefits. For example, I still didn't get Covid, in my house nobody got it, so we evidently had benefits"* (Participant 18 F, non-frontline healthcare professionals).

Additionally, four young adults (5 F, 6 M, 7 M, 8 F), one frontline (15 F), one non-frontline healthcare professional (20 F), and one entrepreneur (24 F) highlighted that preventive behaviors became automatic during the second wave of the pandemic (code 6b). e.g., *"Now we're almost used to it, right? To this form of 'elbow greeting', I mean, in my opinion now it has become almost usual, a routine thing"* (Participant 15 F, frontline healthcare professionals) and four young adults (3 F, 4 F, 5 F, 6 M), two older adults (9 F, 11 F), and one frontline healthcare professionals (15 F) also declared a decrease of preventive behaviors during the second wave of the pandemic (code 6c), e.g., *"...And currently I have to be honest, I definitely implement fewer preventive behaviors than before... I mean of the first period... There's less attention, there's less everything, I do a little bit more freely"* (Participant 4 F, young adults).

Furthermore, two young adults (5F, 7 M), one older adult (12 M), and one entrepreneur (25 M) declared that a drive for them to implement preventive behaviors was to protect others (code 6i, e.g. a young adult -Participant 5F- said *"From my point of view, perhaps the greatest impetus to enact certain behaviors was out of respect for the others as well"*), while two non-frontline healthcare professionals (18F, 19F) reported difficulty in getting others to comply with preventive behaviors (code 6 g), e.g., *"And who are in a position of control have to supervise and scold people, '...No more than two, no more than three, put the mask on.', I mean, I find this very stressful because at some point I would say 'Guys, you know that there is Covid and you have to wear masks? You know, but do I have to come to you and say what to do and what not?' That's enough... I mean, you should have understood that"* (Participant 19 F, non-frontline healthcare professionals).

Future

All the groups were asked what they expected to happen in the future. The emerging codes were an expectation of (i) increased well-being (code 7a) by two young adults (2 M, 4 F), (ii) resources (code 7b) by two young adults (2 M,3 F), two frontline healthcare professionals (14 F, 15 F) and one entrepreneur (23 F), and (iii) expectation of new issues in the future (code 7c) by two young adults (2 M, 3 F), one frontline healthcare professional (16 M) and one entrepreneur (25 M). A sample quotation for each code is: *"I hope that this pandemic experience will focus attention not only on physical well-being, but on biopsychosocial well-being, as the World Health Organization said. And then, we'll start to completely understand the well-being of people by including all these three aspects"* (code 7a; Participant 2 M, young adults); *"I hope that we will continue to improve even at the health level, that there will be more concourses, that there will be more stability at the job level, that there will still be continuous training"* (code 7b; Participant 14 F, frontline healthcare professionals), and *"And so.... Well, we expect the* *emergence of new problems basically"* (code 7c; Participant 3 F, young adults).

Vaccine

The last theme investigated during the focus groups was how participants experienced the vaccine, and their emotions associated with having to get vaccinated. One young adult (7 M) and one entrepreneur (23 F) reported the presence of conflicting information about the vaccine (code 8a), e.g. *"I don't exclude that my colleagues had doubts or perplexities simply because... I mean, from people who are not of the field and therefore inform themselves through social networks, Internet, television, the information is conflicting, and you don't have the tools in fact, not being of the field"* (Participant 7 M, young adults). Other significant examples are reported in Table 3.

Two young adults (6 M, 7 M), one frontline healthcare professional (15 F) and one entrepreneur (23 F) also disclosed their fear of getting vaccinated (code 8b). However, some participants (*young adults* = 1 F, 6 M, 7M; *older adults* = 10 F, 12M; *frontline healthcare professionals* = 17M; *non-frontline healthcare professionals* = 20 F; *entrepreneurs* = 24 F), agreed that the vaccine had been a vehicle for reconnection (code 8c), e.g. *"I believe that the majority of the student population experienced the vaccine as a kind of liberation [...] That is, we saw the vaccine as a tool, as a means to get closer, to get close again to normality, this I saw among university students"* (Participant 1 F, young adults). Finally, one young adult (7 M) and one frontline healthcare professional (14 F) stated they had tried to convince others to get the vaccine (code 8d).

Discussion

This paper reports the findings of the first qualitative study conducted within the MOST regional project, a broader research initiative carried out in Tuscany (Italy). The study explored the perception of the consequences of the Covid-19 pandemic in vulnerable groups by focusing on their specific and fundamental needs, opinions, beliefs, and emotional responses. Focus groups involving people representative of five vulnerable subgroups were conducted. Data collection identified eight recurrent themes that helped recognize differences and similarities in subgroups' reactions, perceptions, expectations and behaviors regarding the pandemic.

An overview of the main qualitative results from the focus groups is presented in more detail in an additional table file [See Table 4]. Interesting differences between subgroups emerged in perceived susceptibility and severity of the disease– i.e., two fundamental dimensions that predict the intention to adopt preventive actions according to the HBM. Older individuals expressed fear primarily for the physical health consequences of Covid-19; indeed, only one older participant reported a perception of psychological susceptibility. This evidence aligns with previous studies that found a greater risk perception related to the severity of symptoms in older individuals [58, 59]. Moreover, elderly people did not mention psychological distress as a negative outcome related to the pandemic. Given that evidence suggests older individuals might be at risk of psychological symptoms due to prolonged social isolation [17, 21–24], our findings might indicate that they may underestimate the psychological risk associated with the pandemic. Young adults and entrepreneurs, unlike elderly people, did not perceive themselves as physically susceptible and reported not being worried about contracting the disease. Instead, most young adults expressed concerns about the psychological consequences due to the pandemic and the fear of infecting others. Generally speaking, our results suggest that studies applying HBM during pandemic periods should keep physical and psychological susceptibility separate to investigate which component plays a major role in predicting preventive behaviors also depending on age populations.

Our findings align with Borges and Byrne [60], who showed that undergraduates display higher concern about their loved ones being infected or dying from Covid-19 than about their own health. Moreover, young adults and all entrepreneur groups reported a perception of socio-economic susceptibility. For entrepreneurs, concerns about the economic consequences of the pandemic were greater concerns about health or psychological consequences. Patel and Rietveld [61] indeed highlighted the role of economic instability on psychological distress and pointed out that self-employed individuals are more financially vulnerable in times of crisis compared to wage workers.

Among both frontline and non-frontline healthcare professionals, no concerns about personal disease susceptibility, either physical or psychological susceptibility, were reported, except for one non-frontline healthcare worker who perceived himself as physically vulnerable. However, a fear of infecting others did emerge. Contagion was perceived as a personal mistake that would expose family members to the disease. Consistent with our findings, other evidence suggests that for healthcare professionals, anxiety symptoms are associated with the risk of being the source of contagion for their family members or colleagues [62, 63].

All subgroups identified negative changes caused by the Covid-19 pandemic. Mistrust of closeness, a lack of socialization, and absence of security and stability emerged during the focus groups. Young adults, entrepreneurs, and frontline and non-frontline healthcare professionals reported a high perception of psychological distress, which has been consistently noted since the beginning of the pandemic [3–8, 12]. For young adults,

Table 4 Summary of the main qualitative results

	Perception of susceptibility and severity	Changes caused by the pandemic	Negative outcome related to pandemic	Preventive behaviors	Information	Future	Vaccine
Young adults	Not perception of physical susceptibility (6); fear for infecting others (6); perception of psychological susceptibility (4), socio-economic susceptibility (2), physical susceptibility (1); perceived susceptibility of healthcare system (1).	Positive (2) and negative changes (5) caused by pandemic.	Need to detach from information (4); isolation (2); high perception of psychological distress (1).	Preventive behaviors not experienced as a cost (3); social distancing as a cost (2); mask usage as cost (1).	Searching for emergency information (3); negative outcomes (2); plan the moment of the search (3) to understand health risk; trust in official sources (5); search on traditional media (5), on institutional channels (2) and on social media (3).	Increased well-being (2); expectation of new issues (2)	Vehicle for reconnection (3): fears of getting vaccinated (2); Conflicting information about vaccine (1).
Older people	Perception of physical susceptibility (3), psychological susceptibility (1), susceptibility of healthcare system (1); high perception of severity for the socio-economic situation (1).	Positive (1) and negative changes (2) caused by pandemic.	Contrasting information on Covid-19 (2); isolation (2); social avoidance (2); need to detach from information (1).	Social distancing as a cost (3); preventive behaviors not experienced as a cost (1); mask usage as cost (1).	Search for information to understand health risk (1); trust in official sources (2); search on traditional media (1), on institutional channels (4), on social media (2) and WhatsApp groups (1).		Vehicle for reconnection (2).
Frontline Health-care Professionals	Fear for infecting others (2); perceived susceptibility of healthcare system (1); decreased perception of susceptibility due to vaccine (1).	Positive (4) and negative (4). changes that will last (1) over time.	High perception of psychological distress (1) and contrasting information on Covid-19 (1).	Social distancing as a cost (4); preventive behaviors not experienced as a cost (2).	Search on traditional media (1), on institutional channels (2) and on social media (1).	Expectation of new issues (1)	Vehicle for reconnection (1). fears of vacccine (1).
Non-frontline Health-care Professionals	Fear for infecting others (3); decreased perception of susceptibility due to vaccine (2); perception of physical susceptibility (1).	Positive (1) and negative (1) changes that will last (4) and not last (2) over time.	Contrasting information on Covid-19 (4); high perception of psychological distress (2); need to detach from information (1).	Preventive behaviors not experienced as a cost (3); social distancing as a cost (3); mask usage as cost (2).	Trust in official sources (1); search on traditional media (2), on institutional channels (1), on social media (3) and on WhatsApp group (4).		Vehicle for reconnection (1).
Entrepeneurs	Perception of socio-economic susceptibility (3), not perception of physical susceptibility (2), high perception of severity for the socio-economic situation (2); perception of physical susceptibility (1).	Negative changes (3) caused by pandemic.	Contrasting information on Covid-19 (2); high perception of psychological distress (1).	Social distancing as a cost (1).	Search on traditional media (2), on institutional channels (1) and on social media.	Expectation of new issues (1)	Vehicle for reconnection (1); fears vaccine (1); conflicting information about vaccine (1).

Notes. *The numbers of participants who endorsed the specific codes is reported between brackets isolation was a source of great suffering, while older people reported that both isolation and the avoidance of social situations affected their well-being. Social distancing was the main cost experienced by all groups, while other preventive behaviors, like mask usage, were not perceived as a cost by many participants. This study highlights that, in the context of the COVID-19 pandemic, the "perceived cost" variable of the HBM model could assume relevance regardless of age when it comes to social costs. These costs might act as a deterrent to taking some specific preventive action (i.e., physical distancing) regardless of age.

All groups, except for entrepreneurs, also identified some positive changes resulting from the Covid-19 pandemic. For some people, the new situation has been an opportunity to implement and consolidate new technology at work or school. Both young and older individuals expressed the benefits that the new forms of online communication brought to their lives and relationships. Healthcare professionals highlighted increased work opportunities, greater attention to protective devices and prevention, and greater public acknowledgment of their role.

Regarding future expectations, young adults, entrepreneurs, and healthcare professionals anticipated the emergence of new issues and problems. However, young adults also expected increased well-being due to a greater awareness of social and psychological aspects of health.

Participants' main sources of information were traditional media and official/institutional channels, followed by social media, WhatsApp groups and, lastly, comparison among colleagues. These findings are comparable with the evidence provided by Borges and Byrne [55], which identified television as the main source of Covid-related information, and family and friends as the least used. During the focus group, young adults expressed a high frequency of searching for Covid-related information, with some of them declaring that they dedicated a specific moment each day during the pandemic to get updates on what happened. For some young people, information research was associated with a sense of hope to read improvements in data or some good news, while for others, it led to negative outcomes and a need to detach from the flood of information. Even though the young adult group seems to be the most focused on finding information, they may be less exposed to contradictory information. All the populations involved in our study, except young adults, expressed a sense of destabilization caused by the conflicting information about Covid-19 to which they were exposed. This sense of confusion and lack of control over information may contribute to decreased adherence to protective health behaviors and increased psychological burden during pandemic, as suggested by Brailovskaia and Margraf [64]. Some participants, indeed, disclosed that conflicting information about vaccine effectiveness and risks affected their vaccination attitudes and intentions. This result suggests that the HBM variable "perceived benefits" (regarding the suggested preventive actions) is a fundamental dimension. Care should be taken to provide consistent information because this variable might moderate the link between perceived susceptibility and severity, on the one hand, and health behaviors, on the other hand.

A recent meta-analysis found a widespread hesitation in vaccination intention in the general population, with 40% of the United States population hesitant to receive the COVID-19 vaccine [57]. Vaccination acceptance is low also in healthcare professionals, with roughly half of them willing to receive the vaccine [65]. Furthermore, vaccination intention seems to have varied throughout the various stages of the pandemic; in fact, it has declined as the pandemic progressed [66]. Consequently, we would have expected a higher rate of hesitance in our population. However, in our study, only four participants disclosed their fear of getting vaccinated. Conversely, we also observed a general positive attitude toward the vaccine: at least one representative from each subgroup perceived the vaccine as a vehicle for reconnection and a return to normality. This attitude toward the vaccine could have been influenced by the group setting, which might foster more socially acceptable answers than an investigation based on self-report measures [67]. On this basis, "vaccination" could be a source of debate, as stated by one elderly participant who perceived vaccination as a polarizing issue and a source of social hate.

Implications for the development of a tailored smartphone app and public health promotion strategies

We observed qualitative differences between groups in their perception of vulnerability, one of the main HBM dimensions. Older people seem to be more concerned by the severity of physical symptoms of Covid-19, young adults about the psychological consequences of the pandemic, and entrepreneurs by the socio-economic consequences. Elderly people may underestimate the psychological risk, while young people and entrepreneurs tend to minimize the physical risk. Additionally, we observed that young people and healthcare professionals are more worried about Covid-19's impact on their family members rather than themselves. An intervention based on the HBM should consider these differences in vulnerability perception and emphasize the most salient domain for each population to build effective health-promoting messages. Generic messages referring to the physical consequences of Covid-19 might be ineffective with young adults and entrepreneurs.

Another aspect considered in HBM is the perceived benefit of taking action. We observe that all groups identified social distancing as the main cost of the pandemic. They could be better motivated if they perceive that the suggested preventive actions could bring back, or get closer to, normality from a social point of view.

All groups, except young people, reported feeling confused and destabilized by the flood of information they were exposed to, especially contradictory information about Covid-19, appropriate behaviors, and the vaccine. This lack of clear information might lead to greater psychological distress, and a reduction of health-protective behaviors [64]. Evidence-based information should be prioritized in promoting health interventions. Since traditional channels (i.e., television and newspapers) remain the main source of information, it is particularly important that they provide clear and accurate information regarding the pandemic.

The findings of the present study will be considered during the second phase of the MOST project to develop the contents of a smartphone app aimed at improving people's knowledge and promoting best practices/behaviours to cope with the Covid-19 pandemic and its consequences through the HBM principles. These findings will be used to build psychoeducational interventions targeting the different perceptions and concerns of the considered groups.

Strengths, limitations and future directions

To our knowledge, this qualitative study is the first attempt to assess perceptions, needs and opinions that emerged during the Covid-19 pandemic among specific vulnerable groups, including young adults, older individuals, frontline and non-frontline healthcare professionals, and entrepreneurs. Our results provide useful feedback regarding specific needs and concerns of these groups and identify differences and similarities between them that can help design more effective health promotion interventions based on HBM.

Some important limitations should be noted. First, the sample size was small and thus, our findings may not be generalized to all the individuals from the populations involved in the study. In particular, the entrepreneurs' group included only three subjects. Moreover, men and women were not equally represented in all groups. Second, our research consisted of a single focus group session for each population, and we did not explore changing perceptions in different pandemic stages. Third, the group setting could have influenced participant's responses, producing more socially acceptable answers. This could be particularly true for polarizing issues like vaccination intentions and adopting protective measures [67]. Lastly, the qualitative design of the study provided important preliminary indications of possible differences in groups' perception, but quantitative studies are needed to make comparisons between groups.

Future research should supplement our findings with quantitative data, using larger samples and well-known questionnaires to assess differences in risk perception between young people, older adults, healthcare workers, and entrepreneurs. Additionally, studies on Covid-19 risk perceptions have been conducted in other vulnerable populations, such as psychiatric patients or school personnel [68, 69]. In other groups, such as immigrants or parents of children with disabilities or health problems, differences in risk perception could yet be explored. Future research could assess differences in vulnerable populations in addition to the ones considered in the present study.

Conclusion

Understanding differences in vulnerable populations is critical to building effective health promotion interventions. From our qualitative analysis of focus groups, differences and similarities in vulnerable groups emerged. Young adults, older people, healthcare professionals and entrepreneurs seem to differ in their risk perception of pandemic consequences. All the groups expressed a sense of destabilization due to the flood of contrasting pandemic information, and they all experienced social distancing as the main cost associated with the Covid-19 outbreak. This finding may help shape new, more effective, interventions to promote the well-being of people during a global health crisis by better understanding the specific needs and concerns of vulnerable populations.

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Author contributions

Professor Andrea Pozza coordinated the project, was involved in the recruitment of the participants, conducted the focus groups, and took part in the final editing of the manuscript. Professor Silvia Casale coordinated the project, was involved in the recruitment of the participants, and took part in the final editing of the manuscript. Professor Barbara Giangrasso was involved in the recruitment of the participants and conducted the focus groups. Professor Giulia Fioravanti conducted the analysis of the literature and revised the final version of the manuscript. David Baldo, Andrea Failli, Valerio Vignoli, and Ada Fort took part in the recruitment of the participants and conducted the analysis of the literature. Giovanna Millozzi was involved in the organization of the research project and in the recruitment of the participants. Giacomo Gualtieri and Lore Lorenzi revised the final version of the manuscript. Francesca Gioia and Sara Bocci Benucci supported the coordination of the research project and of the focus groups, and analyzed the qualitative data. Francesco Iocca, Daniele Pugi, and Nicole Loren Angelo were involved in the organization of the research, took part in the production and preparation of the materials, and interpreted the qualitative results. Professor Anna Coluccia coordinated the research study. Fabio Ferretti took part in the interpretation of the qualitative data.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The research protocol of this study was approved by the Area Vasta Sud Est Ethical Committee (Italy) on October 28th, 2021 (Approval code: 20831) and was conducted according to the ethical guidelines for psychological research established by the Italian Psychological Association (AIP) and in accordance with the Declaration of Helsinki. Informed consent was obtained from all subjects and/or their legal guardian(s).

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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