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COVID angels fighting daily demons? Mental well-being of healthcare workers and religiosity☆

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ABSTRACT

Relying on a unique survey of more than 15,000 healthcare workers conducted from June to August 2020 in Italy, we show that religious priming caused participants to have a less dramatic recollection of their distressful experience during the first wave of COVID-19. Consistent with the view that religiosity serves as a coping mechanism, this effect was stronger for those who were more exposed to the virus categories during the first wave of the pandemic (*e.g* hospital workers) and for respondents who faced more stressful situations, such as being reassigned due to the COVID-19 emergency, or working in a COVID-19-related specialty (*e.g*, emergency care). All things being equal, the effect was found to be stronger among nurses, who indeed were identified as "COVID angels" during the intense media campaign of the first wave. We find no evidence that the results are sensitive to either the timing of the survey response or distance from the main events recollected.

1. Introduction

An increasing number of studies show the negative impact of the COVID-19 pandemic on mental well-being regardless of the different institutional contexts and responses to the emergency, as is apparent in evidence from the US (Giuntella et al., 2021; Adams-Prassl et al., 2022), the UK (Oreffice and Quintana-Domeque, 2020; Proto and Quintana-Domeque, 2021), and several other countries (Belot et al., 2021). In light of these results, the literature shows that the experience of healthcare workers, who are more exposed to health emergencies, is even more dramatic. Consistent with the effects detected in the overall population and evidence from past disease outbreaks (*e.g.*, severe acute respiratory syndrome—SARS) (Patel et al., 2018; Shah et al., 2020; Gershon et al., 2016; Lu et al., 2006; Lee et al., 2018; Phua et al., 2005; Senga et al., 2016), by the end of the COVID-19 first wave (spring 2020),

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healthcare workers had experienced a dramatic deterioration of their mental well-being and showed clear signs of post-traumatic stress disorder (PTSD) and burnout (Muller et al., 2020; Pappa et al., 2020; Cabarkapa et al., 2020; Vindegaard and Benros, 2020; Preti et al., 2020; Giusti et al., 2020).

Understanding the role of potential coping mechanisms (*e.g*, sports, social support, sharing experiences, meditation, religiosity) in the stress triggered by traumatic situations has important consequences, both directly for the well-being of healthcare workers, and indirectly for that of the general population (Bohlken et al., 2020; Xiao et al., 2020; Labrague and De Los Santos, 2020; Cai et al., 2020; Chew et al., 2020; Shechter et al., 2020; Maraqa et al., 2020; Dong et al., 2020). Moreover, the potential implications of this evaluation go beyond the specific traumatic situation of the COVID-19 pandemic and could be applied to other distressing events. This paper assesses the effectiveness of one specific coping mechanism for dealing with past traumatic events: religiosity. The propensity to use religiosity to cope with negative events is known as religious coping (Pargament, 2001).[1] We are not the first to investigate the role of religiosity as a mechanism for coping with mental distress. However, previous studies have failed to estimate the precise magnitude of the role played by religious coping, limiting their discussion to descriptive analyses of small samples.[2]

Isolating the effects of religiosity on health presents notable empirical challenges: in some contexts such as the US, religious people are generally wealthier, enjoy higher levels of education and are in more stable marriages (Gruber, 2005b; Bentzen, 2021). All these characteristics are expected to positively affect individual (objective or self-assessed) physical and mental health. To overcome these empirical challenges, we ran an online experiment through a web survey that was administered to healthcare workers in Italy between June 15 and August 31, 2020, when the pandemic was still a salient worrisome contingency, especially for healthcare workers given the lack of a vaccine. The experiment directly manipulates the salience of individual religiosity through the implicit priming technique of Benjamin et al. (2016) before participants answer some retrospective questions about their mental health status during the first wave of the COVID-19 pandemic.

Hence, our original survey included two versions of the same 50-item questionnaire, one with religious priming (*i.e*, a sentence-unscrambling task containing "sacred" words) and the other with neutral priming (*i.e*, a sentence-unscrambling task containing neutral words).[3] Participants were randomly assigned to one of these two versions. Overall, we collected more than 15,000 questionnaires, from approximately 5000 physicians and more than 9000 from nurses. We construct our main outcome of interest, *Recalled Distress*, using the self-reported frequency of depressive and anxious symptoms during the first wave of the pandemic (*e.g*, feeling very frequently or constantly depressed or anxious). In addition, to better capture workers' general well-being, we measure their level of *Recalled Concerns*, which groups workers' worries into several domains that may induce distress (*e.g*, being concerned for your relatives' health or being concerned about the level of stress in the workplace). Both measures refer to the period from the end of February to June 15, 2020. Hence, our estimated effects refer to coping with past traumatic events, in the same spirit as the literature on PTSD, which uses specific event-related anchor time points to help respondents to remember their health status (Reuben et al., 2022; Tracy et al., 2011b; Galea et al., 2008a).[4]

We show that priming religiosity leads to the recollection of fewer episodes of mental distress by 9.1% in the full sample (out of the baseline mean of recalled distress), with the overall recalled level being 0.876. When looking at the single components of the *Recalled Distress* measure, we find that the main effect among physicians comes from the reported frequency of depressive symptoms and sleeping problems. In contrast, the effect on nurses is generated by all the dimensions of recalled distress, including the fear that something bad is about to happen and the sense of anxiety. These findings are robust to controlling for demographics and the socioeconomic characteristics of the respondent, the characteristics of her work status (*e.g*, working in the public or private sector, working in shifts), her own experience with the virus (*e.g*, testing positive or working with COVID-19 patients), and the experience of her colleagues (*e.g*, becoming infected with or dying from COVID-19). The results are also robust to the use of regional fixed effects. This is relevant since the Italian healthcare system is organized at the regional level (20 regions), and the intensity of the COVID-19 first wave differed remarkably across regions. Moreover, the effects on *Recalled Distress* are confirmed by the level of *Recalled Concerns*, especially regarding workers' concerns due to *Stress in the workplace*, *Personal health*, and *Relatives health*.

Overall, our results are robust to the use of alternative definitions of our outcomes of interest, such as the use of principal component analysis and the use of different thresholds of frequency in the recollection of experiences of feelings of distress (*e.g.*,

[1] The idea is that people seeking to reduce the distress generated by certain events find support in spirituality (Folkman and Lazarus, 1984). This tendency is in turn explained by existential insecurity theory: religious beliefs and practices equip people with rules and habits that are helpful for coping with problems (Immerzeel and Van Tubergen, 2013). Moreover, religious allegories and parables provide psychological support (Stolz, 2009; Zapata, 2018) and decrease ambiguity (Brandt and Henry, 2012). In addition to these effects, the literature shows that religion can provide social support through its community dimension (Ellison and George, 1994; Lim and Putnam, 2010), enhance pro-social behaviors (Shariff et al., 2016), and provide reassurance about death anxiety by promoting the immortality of the soul (Solomon et al., 1991; Vail et al., 2010). Previous research has also widely documented a rise in religiosity because of natural disasters or economic insecurity (Sinding Bentzen, 2019; Bulbulia, 2004; Belloc et al., 2016; Sibley and Bulbulia, 2012; Zapata, 2018; Chen, 2010). In the Italian context, researchers have found that individuals who were more exposed to COVID-19 contagion presented higher religiosity, expressed through either individual prayers or attendance at services (Molteni et al., 2020).

[2] See for example Koenig and Larson (2001), Brandt and Henry (2012), Prazeres et al. (2021), Schmuck et al. (2021), Pirutinsky et al. (2020), Thomas and Barbato (2020). Previous studies have also investigated the relationship between religiosity and socioeconomic outcomes (e.g., Campante and Yanagizawa-Drott (2015), Miller et al. (2014), McCleary and Barro (2006), Gruber (2005a), Guiso et al. (2003), Inglehart et al. (2003), Koenig et al. (1998) and Evans et al. (1995)).

[3] In line with the previous work by Benjamin et al. (2016), we include "sacred" words not strictly related to a specific religious belief (*i.e.,* spirit, divine, God, sacred, and prophet).

[4] Indeed, asking questions about participants' health status during the first wave of the COVID-19 pandemic – as we did in our study – will likely provide more accurate answers than asking about their health status in the preceding three months (Barsky, 2002b; Pearson and Ross, 1992), as explained in Section 4.1.

feeling frequently, very frequently or constantly depressed or anxious). To check whether the accuracy of recollection might have been affected by distance from the main traumatic event, we also test the robustness of our baseline results to the use of the distance from the anchoring event and the day of the response fixed effects, which do not affect our initial outcome. Interestingly, the effect observed on the mechanism defining the main outcomes, does not hold for recollection of having experienced a panic attack, as explained in Section 5.1. We also show that the effects cannot be due to the use of leaves by the treated.

Based on the assumption that the priming effect should be stronger when the traumatic experience has a potentially deeper impact, we address the role of religiosity as a coping mechanism in two ways. First, we reproduce the baseline analysis by subcategories of workers who are expected to present different risks of developing mental distress; second, we perform a heterogeneity analysis based on the workers' experience during the COVID-19 first wave, mostly identifying those who suffer the most stressful situation. When considering different worker subgroups, we focus on gender (females vs. males), type of employer (hospital vs. nonhospital workers), and area of work (north vs. center/south). Each of these subgroups may have had a strong reaction to religious priming but for very different reasons (e.g., in northern regions healthcare workers suffered from the intensity of the pandemic, but in Southern regions they were under stress due to the lack of means of their healthcare facilities).

In this first analysis, women recalled fewer episodes of mental distress by 9.4%, hospital workers by 10.6%, and professionals working in the northern and central/southern regions by 8.7% and 9.2%, respectively, while no significant effect was detected among men and nonhospital workers.

In the heterogeneity analysis based on how stressful the respondent's personal experience was during COVID-19 (*e.g.,* when their colleagues tested positive for COVID-19 or died from the virus or when they worked in a COVID-19 ward), the effect of religious priming is stronger among workers experiencing more stressful situations. When we analyze these heterogeneous effects separately by profession, we observe a profession-specific (physicians vs. nurses) response to the priming. Ex ante, respondents' socioeconomic characteristics could be expected to mitigate as well as to increase the stress due to the pandemic, through, for instance, concerns for the worker's relatives. Nevertheless, they do not trigger a differential impact of religious priming.

To clarify how the coping mechanism can be activated for different types of individuals (Akerlof and Kranton, 2000), we consider the different degrees of religiosity/spiritual identity of the respondents. We measure such degrees by considering either a subjective measure (*i.e*, self-classification as a religious person) or an objective proxy (*i.e*, prevalence of religious weddings in the province of birth - administrative data). Given the reasonable expectation that the presence of the Vatican could increase the responsiveness of respondents working in the region (i.e., Lazio) where it is located, we also test for a heterogeneous effect between respondents working in Lazio and in other regions. We check the results for the full sample as well as for physicians and nurses, observing that more religious respondents and respondents working in Lazio report stronger effects of the priming (*i.e*, they recollect significantly fewer episodes of mental distress when treated). However, this finding holds uniquely in the subsample of physicians, while nurses are all equally affected. We interpret the result for nurses as in line with the qualitative evidence from the media campaign of the first wave of the pandemic, which named and portrayed them as *COVID Angels* (see Section 2.3 and Appendix C).

Our results contribute to the literature on the mental well-being of healthcare workers during COVID-19 and to the discussion of religiosity as a coping mechanism. Recent publications have highlighted a growing interest in religiosity in times of distress; for instance, Google searches on religious topics increased by 50% during the COVID-19 first wave at a global scale (Bentzen, 2020). Descriptive evidence has also suggested that Italians who were more heavily exposed to COVID-19 during the outbreak or who were religious relied more on religious coping during the COVID-19 first wave (Molteni et al., 2020).[5] We improve on the existing evidence by priming religious identity to test the channels and magnitudes of its effects on healthcare workers' well-being in times of a distressing situation: we show that activating the religious identity of healthcare workers induced them to have a less dramatic recollection of past traumatic events as they remembered fewer episodes of depression, fear, anxiety and sleeping problems. This could be beneficial for mental health moving forward for a few reasons. Memories and future thoughts are related to well-being (Conway and Pleydell-Pearce, 2000), and negative thinking is often seen as a risk factor for developing psychological disorders (see Watters and Williams (2011) for review).[6] Since our analyses do not focus on specific interventions related to COVID-19 (*e.g.,* restrictions on mobility) but rather are applied to a stressful situation that is out of an individual's control, our findings could potentially be generalized to other unexpected traumatic events.

The paper is organized as follows. Section 2 describes the main features of the Italian healthcare system, the spread of the COVID-19 pandemic in the country and the institutional/governmental response to it. Section 3 provides a description of our survey and of the related religious priming, while Section 4 defines our outcomes of interest and illustrates our dataset. Section 5 presents our econometric specification, the baseline results and related robustness checks. Sections 6 and 7 examine for whom and when religiosity played a stronger role as a coping mechanism, while Section 8 further investigates the relationship between religious priming and individual spirituality. Section 9 concludes.

[5] One-quarter of the U.S. adult population reported having a stronger faith because of the pandemic (Gecewicz, 2020), while in Italy, there was an increase in prayer during the first wave of COVID-19. The data for Italy come from the preview of the survey by Garelli (2020), available at http://www.settimananews.it/chiesa/virus-religiosita-degli-italiani/.

[6] Recent studies of the Covid-19 pandemic have confirmed this hypothesis, as they identified time spent reading news/updates about COVID-19 as a risk factor (Fullana et al., 2020; Huang and Zhao, 2020), and found that a higher frequency of positive recall biases was related to lower levels of depressive symptoms (Niziurski and Schaper, 2023).

2. Institutional background

2.1. The healthcare system

In Italy, healthcare services are managed at the local level, with 20 regions in charge of providing services to their residents. Although bound to national standards set by the central government, regions enjoy wide discretion in regulating and organizing healthcare delivery within their borders (Ferré et al., 2014). This has resulted in the creation of public hospital networks based on different combinations of hospitals managed by local health authorities (LHAs), independent (*e.g.*, teaching hospitals) and private accredited hospitals (Anessi-Pessina et al., 2004). The gatekeepers are general practitioners (GPs) for the overall population and pediatricians for people younger than 16. Healthcare workers in public hospitals, GPs, and pediatricians are directly employed by an LHA, and all public hospital workers can work only in one facility under the so-called exclusivity clause. Healthcare workers also work in nursing homes for elderly or disabled people, in agencies that specialize in emergency care, and in local clinics (*e.g.*, in charge of implementing vaccination campaigns, conducting screenings, or offering counseling). In addition to physicians and nurses, healthcare workers include professional figures such as dentists, laboratory technicians, obstetricians, and rehabilitation staff. Despite regional heterogeneities, ownership of healthcare facilities is predominantly public, and public hospitals account, on average, for 86% of the overall available beds (83% in Lombardy, which is one of the regions with the largest private-sector presence) (Istat, 2015).

2.2. The COVID-19 first wave: The spread of the virus

The first wave of COVID-19 in Italy officially started with the national government's declaration of the state of emergency on January 31, 2020. However, the acquisition of both invasive and noninvasive instruments and ventilation devices and the allocation of protective masks to healthcare workers took place only about a month after the declaration of the state of emergency; at the time of this declaration, many still considered COVID-19 a nonharmful virus.[7] By the end of February 2020, the number of reported positive cases had increased dramatically. From the beginning of March until mid-May, dramatic restrictions on economic activities and people's mobility were introduced throughout the country, with the closure of schools, shops, and industrial activities and the adoption of strict quarantine measures (Sebastiani et al., 2020).

As a whole, Italy was deeply affected by the first wave of COVID-19. From the end of February 2020 to mid-June 2020, the total number of assessed cases was 237,290, leading to the deaths of 34,371 people.[8] The northern part of the country was the most affected, with remarkable regional variations in the incidence of COVID-19 mortality, as shown in Fig. 1.[9] A more comprehensive view of the hardship of the COVID-19 first wave comes from the comparison of the total mortality during the months of the COVID-19 first wave with the average mortality registered in the same months during the period 2015–2019. As shown in Fig. 2, the mortality in January–February 2020 was smaller than that in previous years, while starting from March 2020, there were variations of more than 100% against the levels in 2015–2019 for the same periods.

2.3. The COVID-19 first wave: The response to the virus

The principles and criteria for containing and mitigating the epidemic through case detection, contact tracing, isolation, physical distancing, and mobility restrictions, as well as equipment expansion and staff redeployment, were nationally formalized. However, each region organized the implementation in its own way and at its own pace (Binkin et al., 2020). Consequently, regional responses to the COVID-19 first wave differed considerably in terms of investment and timing. For example, clear differences existed in the use of swab testing and in contact-tracing procedures.[10]

Since nearly 20% of hospitalized patients needed two weeks or more of intensive care (ISS, 2020), and 88% of those admitted to intensive care units (ICUs) needed mechanical ventilation (Grasselli et al., 2020), enormous efforts were made to increase the number of beds in ICUs through, for instance, the conversion of hospital wards into ICUs and the creation of temporary hospitals for the intensive care of COVID-19 patients. As shown in Figure A1, at the peak of the COVID-19 first wave, the saturation rate of ICU beds in the country was approximately 75%, with some regions (e.g. Lombardy and Piedmont) being close to 150% (Fanelli et al., 2020).[11] These transformations meant that a substantial portion of healthcare staff needed to be reassigned from old tasks to new duties overnight and not always with clear guidelines.

[7] Some politicians, such as the mayors of the cities of Milan and Bergamo (both located in Lombardy) and representatives of political parties or business associations encouraged the public to adopt a "business as usual" approach.

[8] These figures are taken from the Ministry of Health website: http://opendatadpc.maps.arcgis.com/apps/opsdashboard/index.html#/b0c68bce2cce478eaac82fe38d4138b1.

[9] In exploring the geography-specific intensity of the COVID-19 outbreak, we consider the COVID-19 mortality rate adjusted for demographic differences between provinces and expressed as 100,000 inhabitants.

[10] With respect to contact tracing, the national protocol required notifying the related LHA of all new cases; in the LHAs, explicitly trained nurses and health staff carried out the so-called epidemiological interview. In addition, LHAs had to follow up, isolate and put under surveillance all recent and close contacts of interviewed cases.

[11] Contextually, to control for the entry of highly infectious patients into hospitals and reduce the risk of intrahospital contagion, regional and local authorities also activated special emergency numbers and made agreements with the Red Cross and with nongovernmental organizations to recruit additional staff and emergency devices. They allowed only urgent cases to directly access hospitals, and they organized pretriage pathways outside hospitals (De Filippo et al., 2020) and created the Special Unit for the Continuity of Care (USCA) to handle the home care of less severe cases. Additionally, resident physicians in other disciplines and generically licensed physicians were called upon to replace or support GPs who had fallen ill or had been quarantined (Barili et al., 2022).

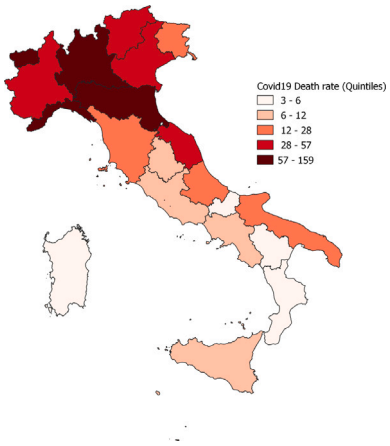


Fig. 1. COVID-19 death rate by region. Notes: Average COVID-19 death rates by region are computed by ISTAT together with the Istituto Superiore di Sanità (ISS) on administrative data (Istat and Iss, 2020). The index *death rate*, which refers to the period of January–May 2020, represents the mortality rate of COVID-19 standardized according to the demographic characteristics of the resident population in each province (values expressed per 100,000 inhabitants).

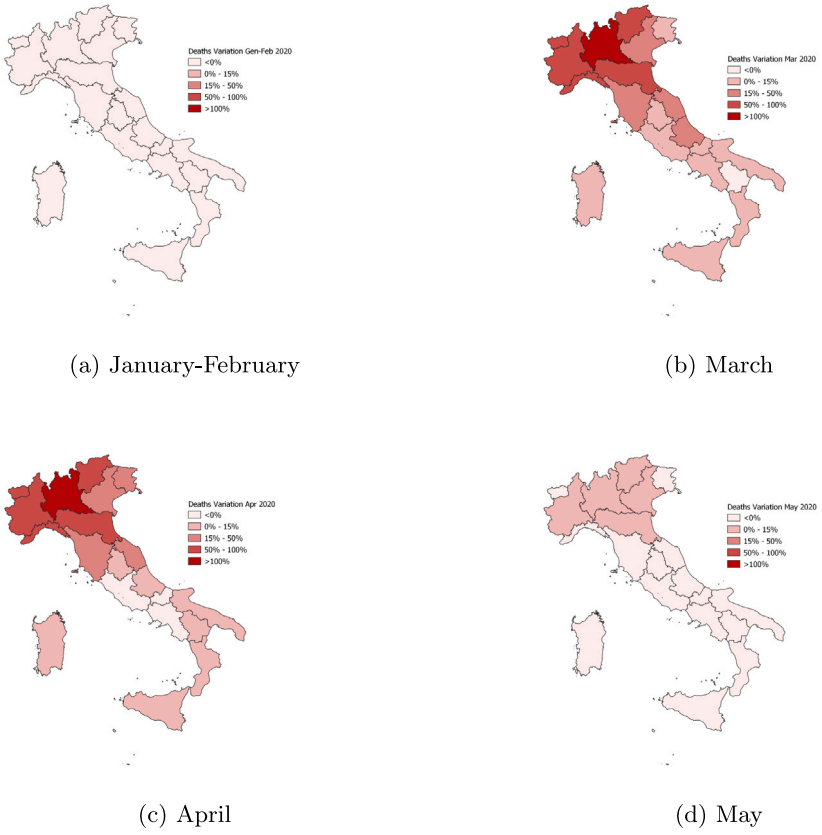


Fig. 2. Variations in death rates by period-region (2020). Notes: Variations in *death rates* are measures computed by ISTAT together with ISS on administrative data (Istat and Iss, 2020). They describe the percentage variation in death rates observed in the relevant month in 2020 in comparison with the corresponding average rate reported in the period 2015–2019.

During the COVID-19 first wave, healthcare workers faced an unprecedented emergency situation. The numbers of positive cases rapidly depleted local resources, especially in the northern regions, making it necessary to reassign some medical personnel as contact tracers (Barili et al., 2022). The government had to ask retired staff to return to work and to allocate extra funding for the recruitment of 20,000 workers. The daily-life of healthcare workers was also threatened by shortages of protective supplies (*e.g.*, gloves, medical masks, goggles, and gowns), further increasing their risk of infection, and by continuous changes in health protocols.

Moreover, their higher risk of contagion was overlooked for most of the COVID-19 first wave.[12] In contrast to the general public, healthcare workers were also excluded from the preventive quarantine measures prescribed after having been in contact with a COVID-19-positive patient, and they could stop working if they had respiratory symptoms or tested positive (Barili et al., 2022).

For all the above reasons, the resilience, extraordinary effort and commitment shown by Italian healthcare workers soon came into the spotlight. Many pictures of nurses with bloodied and bruised faces from their heavy duties or from falling asleep at their desks circulated online (Figure A2). Social media feeds filled with encouraging, heartfelt and grateful messages. During the hardest times of the stay-at-home orders, when healthcare workers were among the very few categories of workers allowed outside, newspapers, TV news programs, and talk shows constantly referred to healthcare workers as *heroes* and *angels*. Public figures, such as Pope Francis, thanked all Italian healthcare workers for their heroic service.[13] One image showing a nurse with angel wings cradling the Italian peninsula in her arms, a *COVID angel*, became symbolic of healthcare workers' dedication during the COVID-19 first wave (Figure A3). The same image was painted over the walls of one of the most heavily affected hospitals in Lombardy, one of the most affected regions, as a sign of gratitude for the extraordinary work done by these workers.[14] This unexpected public reaction mainly underscored the sense of community and gratitude, possibly giving meaning to the hardships of an exhausting job. A qualitative study on texts and videos posted by nurses on professional social media platforms from February 23 to May 3, 2020, showed that nurses perceived themselves as angels and heroes, receiving gifts, flowers and food during their shifts and receiving the gratitude of patients; thus they had a perception of being recognized for their work. Nurses highlighted that they appreciated this positive feedback Fontanini et al. (2021).

3. Survey

3.1. Participants and general procedure

We perform the experiment between June 15 and August 31, 2020, which, given the end of the main mobility restrictions on June 3, should be considered the immediate postfirst wave period in Italy. Before launching the survey, we collected the email addresses of potential participants from different sources: the provincial boards of physicians and nurses repositories (108 provinces), hospital websites, and representative associations, some of which advertised and promoted our survey (see Appendix A, Figure A5 and Table A1). Our final contact list contained approximately 265,000 email addresses. Each contact received an initial invitation by email followed by 2 reminders (1 and 2 weeks after the first invitation). In each email, we explained that the survey was about the working conditions of healthcare workers in Italy and that participation was possible using any electronic device (*i.e.*, PC, tablet or smartphone) with an internet connection. Potential participants were also informed that the expected completion time was approximately 15 min.

During the first week of the survey – between June 15 and June 22 – we ran a pilot with approximately a 2% share (*i.e.*, 5000 contacts, randomly selected) of the full sample to check whether the invitation email and the length and structure of the survey were sufficiently comprehensible and effective to collect valid responses. No particular concerns arose during the pilot; therefore, starting on June 22, we invited healthcare workers to participate in our survey on a rolling basis.[15] Hence, the first and second reminders were sent after the expiration of the same time window from the initial invitation (i.e., 1 and 2 weeks) for each participant rather than on the same day for all. Figure A6 shows the timeline of the survey (subfigure (a)) and the trend of completed questionnaires (subfigure (b)).

3.2. Experiment: Religious priming

The experiment was conducted through an online survey that included two versions of the same questionnaire: one version incorporated religious priming (see Section 3.2), whereas the other version had neutral priming. We followed the approach implemented and empirically validated by previous scholars who showed that the priming technique significantly increases the salience of participants' religious identity (Srull and Wyer, 1979; Shariff and Norenzayan, 2007; Benjamin et al., 2016). Hence, one version of the questionnaire makes salient the participants' religiosity through implicit religious priming (the treated group), while the other version makes no particular identity salient with neutral priming (the control group). The priming mechanism consisted of a sentence-unscrambling task in which the subjects had to unscramble 10 five-word sentences by dropping an extra word from each sentence and creating a four-word phrase that made grammatical sense. To make the priming subtle enough, five of the scrambled sentences contained religiosity-related words (*i.e*, *spirit*, *divine*, *God*, *sacred*, and *prophet*), while the remaining sentences contained only neutral words. The neutral priming treatment used only neutral words in all sentences. This task made

[12] For most of the COVID-19 first wave, the hazard associated with both asymptomatic and presymptomatic cases was not yet generally recognized. At the end of the COVID-19 first wave, up to 10% of Italy's confirmed COVID-19 cases were healthcare workers, and between March 11 and May 8, 178 physicians died of COVID-19 (FNOMCeO, 2020).

[13] https://www.vaticannews.va/en/pope/news/2020-06/pope-francis-audience-doctors-health-care-priests-covid-pandemic1.html.

[14] Positive initiatives directed in particular at nurses (such as the #WEWITHNURSES campaign) continued even during the second wave. For instance, the company Barilla changed the packaging of one of its products (*i.e.*, its Abbracci ["Hugs"] cookies) to promote a charity campaign to sustain nurses affected by COVID-19 and their families (Figure A4).

[15] In the empirical analysis, we pooled the data from the pilot with the full-sample observations since no substantial changes were made to the survey after the pilot.

the participants' religious identity salient by using religious words since their semantic relatedness sparked the participants' mental associations with religiosity. To check for any experimenter demand effect of the priming, at the end of the survey, the participants were asked to speculate on the objectives of the study. No one reported anything related to their religious identity. We reproduced the task proposed and validated by Benjamin et al. (2016).

To guarantee that the two groups were comparable, we performed a randomization by respondent on the overall sample of participants to one of these two versions through a random redirect tool compatible with the Google Forms platform, which was used to design the survey.[16] Overall, the questionnaire contained 50 short questions, of which the English translations are available in Appendix B. After being exposed to the treatment, respondents were asked questions about their mental distress and their main concerns during the COVID-19 first wave, as described in Section 4.

The relevance of a priming treatment (its efficacy) can be explained in light of self-categorization theory in psychology (James, 2007; Turner, 2010), also formalized in economics (Akerlof and Kranton, 2000): every individual has multiple social identities based on her religiosity, gender, occupation, etc., and at a particular moment, individual behavior can be influenced more by the norms of the salient identity than by the nonsalient ones. Therefore, by using priming to make one identity more salient, it is possible to activate identity-salient norms, shedding new light not only on their effects on behavior but also on which norms are associated with the primed identity. Regarding, religious identity in Italy, the National Institute of Statistics reported that in 2019, 79.6% of the resident population self-classified as Christian (74.6% Catholic), 15.3% as not religious, and 5.1% as religious but not-Christian (when looking only at Italians, 82.2% self-classified as Christian (80.1% Catholic), 16.3% as not religious, and 1.5% as religious but not-Christian).

3.3. Experiment: Group comparability and representativeness

The main testable implication of our identification strategy is that since the treated and control groups are randomly generated, they should be comparable in all observable and unobservable characteristics. We test this implication by running balance tests in Table A2 for the full sample as well as for physicians and nurses separately since the members of the two professions obviously differ (see Table A3). The table shows that the available observables are balanced between the treated and the control groups. In particular, the individual characteristics accounted for are standard demographics (*i.e.,* gender, nationality, age, marital status, and having at least one child) and elements that might have affected mental well-being in the aftermath of the COVID-19 first wave (*i.e.,* being a religious person, housing dimension, whether the respondent lived alone, and presence of other healthcare workers in the family of origin).[17] The housing dimension (square footage of the respondent accommodation) provides valuable information in at least two ways. On the one hand, it is an indirect measure of wealth that is not necessarily captured by workers' income (which we control for): an individual earning a low salary could still belong to a wealthy family. On the other hand, it is a good proxy for feasible social distancing among cohabitants, which might affect the level of concern and distress within the household. Living alone may also capture different aspects of the pandemic experience: if a worker lived alone, she might have been more (psychologically) overwhelmed, but at the same time, she could have been less concerned about the well-being of others, since there was no risk of infecting cohabitants. The presence of other healthcare workers in the family of origin may have been an additional source of concern since workers' relatives, if they were active health professionals, were exposed to a higher risk of infection; at the same time, sharing the same profession and challenges might have aided workers in coping with distress through this extra source of support.

Regarding the representativeness of our sample, our main focus was on the northern regions since they were the most affected by the COVID-19 first wave. The geographical distribution of the survey responses is shown in Fig. 3(a) for the full sample, which includes 5059 physicians distributed as in Fig. 3 and (b) 9069 nurses distributed as in Fig. 3(c). In Fig. 4, we report the number of respondents per profession (*i.e.*, physicians vs. nurses) out of the total number of professionals working in both the private and public sectors (Istat, 2015). Overall, the coverage rate in the northern regions was approximately 6.6% for physicians and 4.5% for nurses.[18]

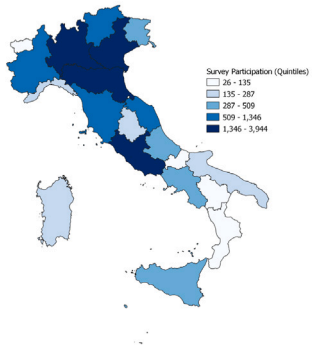
Table A2 shows that on average, 66% of our respondents reported working in a hospital, 6% in a teaching hospital, and 10% in the private sector, and 57% reported self-classifying as religious (practicing or not practicing). Nurses are more likely to be younger than physicians and female. Consistently, nurses are also less likely than physicians to have children, to be married or cohabiting, and to live in a large accommodation. At the same time, they are more likely to have changed their workplace in the past to work in a hospital (especially in a nonteaching hospital) and in the private sector. Physicians are less likely to be subject to work shifts, but they reported performing more overtime work during the COVID-19 first wave.

Since there are no available comprehensive administrative data on the population of healthcare workers in Italy, it is challenging to develop a comparison between our sample and the population of healthcare workers in several dimensions. However, it is possible

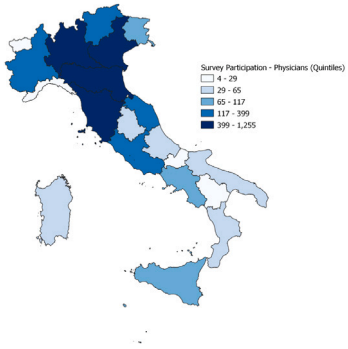
[16] The Google Forms platform was chosen to ensure a user-friendly interface to reduce the impact of formatting on response times, and on the probability of making mistakes, thereby avoiding jeopardizing participant engagement and response validity. Unfortunately, Google Forms collects and stores information only for completed questionnaires. Hence, we do not know the completion rate, defined as those who started and ended the questionnaire.

[17] See Liu et al. (2020), Amerio et al. (2020) and Husky et al. (2020).

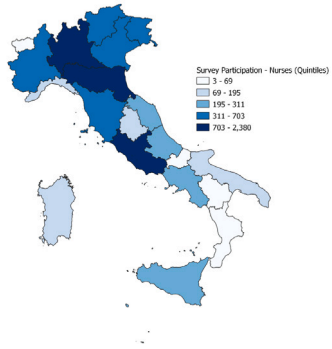
[18] The coverage for physicians ranges between a minimum of 2.7% in Friuli-Venezia-Giulia and a maximum of 11.6% in Veneto, while that for nurses ranges between 0.5% in Valle d'Aosta and 7.2% in Trentino-Alto Adige. Considering the entire country, the response rate was 5.7%, meaning an average coverage of approximately 0.2% and 0.9% for physicians and nurses, respectively. This difference in survey responses across Italian macro areas is quite common (Simione and Gnagnarella, 2020; Mazzoleni et al., 2019; Albano et al., 2020). Overall, it is not possible to compare our response rate and coverage with those of previous studies, as our survey potentially targeted all Italian healthcare workers rather than workers in specific hospitals or geographical areas.



(a) Overall

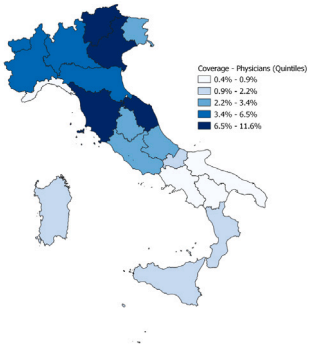


(b) Physicians

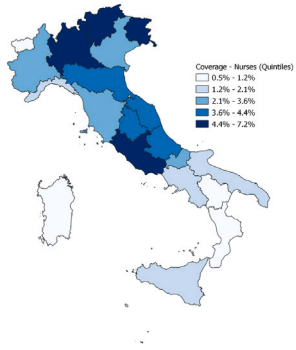


(c) Nurses

Fig. 3. Response rates by region. Notes: The response rate is computed as the number of responses received from each region (20) and professional category out of the total number of individuals contacted in that region per category. In line with previous studies (Simione and Gnagnarella, 2020; Mazzoleni et al., 2019; Albano et al., 2020), northern regions report higher response rates.



(a) Physicians



(b) Nurses

Fig. 4. Regional coverage by professional category. Notes: Regional coverage is computed as the absolute number of responses received from each region (20) and professional category out of the total number of professionals registered with official boards in that region per category.

to contextualize our sample at least in terms of its gender and age composition. Moreover, we recovered some information on the distribution of wages and the working experience of the population. Our sample ensures a good representativeness of genders compared to the Italian population and to genders by profession at the regional level (Table A4). According to a report based on national data by the Ministry of Health in 2019 (Ministero della Salute, 2019), women represented 48% of the labor force among physicians in the public healthcare sector, while they represented 78% of the labor force among nurses. In our sample, approximately 50% of the physician respondents were female, and approximately 73% of the nurse respondents were female. In terms of age, the

average age of physicians in our sample is higher than the average age of nurses at the national level. However, our sample is slightly younger since the physicians on average are 49 years old and nurses are 40 years old, while the national averages were 51 and 47 for the two groups, respectively (Ministero della Salute, 2020). Regarding wages, the national monthly average income was approximately €1700 among nurses, and approximately 4200€ among physicians (Ministero della Salute, 2019), which is in line with 52% of the nurses in our sample earning between €1500 and €2000 and 58% of physicians earning more than €2500. Finally, our sample shows an average of 18 years of working experience, which is consistent with national healthcare workers' average experience of 18.3 years (Ministero della Salute, 2019).

In addition to nurses and physicians, other health workers – safety inspectors, controllers, administrative personnel, biologists, and researchers – were invited to participate in the survey. This was done to capture the impact of the COVID-19 first wave on these professionals, who were often reassigned as contact tracers during the COVID-19 first wave, and to more accurately account for regional disparities in the availability of healthcare workers. However, this component should be considered residual in the paper, being approximately 1.129 respondents.

4. Outcomes

4.1. Outcome definitions

Reliance on self-reported symptoms is part of the standard medical practice in the domain of mental health (Chan, 2009). Validated measures used in psychology are based on the discretion of the patient in recollecting her feelings in a predefined period preceding the interview. The main idea of this kind of protocol to assess mental health is that while everyone might at a certain point have any type of mental issues (from feeling anxious to feeling overwhelmed to having problems sleeping), only a certain frequency of those issues (from never to every day/always) over a preset prolonged period should be considered sufficient to cause alarm (e.g., having some sleeping problems for a week is not enough to state that you have sleeping problems). In the literature on mental health, there is no strong consensus on the optimal length of such a period. The Patient Health Questionnaire (PHQ-9) test, which is a validated test based on the recollections of the interviewed patient related to a list of both objective and subjective phenomena, focuses on the 4 weeks before the test to examine the relevance of the depressive symptoms captured by 9 questions (Kroenke and Spitzer, 2002). The same period is used in the Generalized Anxiety Disorder (GAD-7) test, which comprises 7 questions that are used to screen generalized anxiety disorders (Spitzer et al., 2006). However, to assess the impact of major traumas, other periods are also used. For instance, Galea et al. (2008b), conducted a survey between February and July 2007 to assess participants' experiences of Hurricane Katrina (Mississippi) approximately 18 to 24 months after the event occurred in August 2005. In the same way, Tracy et al. (2011a) used a survey conducted 2 to 5 months after Hurricane Ike (Texas) to ask respondents about their experiences with and feelings about the hurricane in the month prior to the interview. Finally, Reuben et al. (2022) run a survey between August 2019 and April 2020 to assess the impact on mental health of the water crisis in Flint, Michigan, which took place from 2014 to 2017.

Following the literature, to capture mental distress episodes, our study focused on 4 dimensions: *Depression*, *Anxiety*, *Fear*, and *Sleeping problems*, which are considered the main dimensions of poor mental well-being.[19] For each dimension, we collected self-reported ratings defined on a 5-point Likert scale (i.e., "never", "rarely", "often", "very often", and "always"). The selection of these dimensions is similar to that in the validated Primary Care Evaluation of Mental Disorders (PRIME-MD) questionnaire. The PRIME-MD is based on 2 items of the PHQ-9 test (Kroenke et al., 2003), and 2 items of the GAD-7 test (Kroenke et al., 2007). Previous studies have shown that a positive answer to just one of these four items of the PRIME-MD is enough to be positive for a more complex test for related disorders (Whooley et al., 1997; Spitzer et al., 1994).

Furthermore, we created a corresponding dummy telling us whether the respondent had experienced that specific feeling (*e.g.* feeling depressed) *very often* or *always* in a period of about 15 weeks between the beginning of the COVID-19 first wave and June 15, 2020. Although the approach of using past recollection is widely used, problems that might stem from such use should not be underestimated. According to the literature, recollection accuracy is improved when an anchor point is provided (Barsky, 2002a). We use as an anchor point "the beginning of the COVID-19 emergency", which for most of the Italian population and healthcare workers corresponded to the beginning of March 2020. At that time, the national government enacted a decree that isolated the Lombardy region and imposed the curfew and massive limitations on mobility.[20] One should keep in mind that in June 2020, the emergency situation was milder than the situation in March–April 2020 but not than the pre-COVID-19 situation.[21] In other words, the pandemic was a salient and worrisome issue, especially for healthcare workers, who were provided with a vaccine only after Christmas 2020.

The final aggregated outcome, *Recalled Distress*, is computed as the linear sum of these 4 dummies resulting in a categorical variable that ranges from 0 (*i.e*, no frequent mental distress episodes) to 4 (*i.e.*, very frequent mental distress episodes).

[19] Experiencing *Sleeping problems* is a common self-reported symptom among patients diagnosed with PTSD (Spoormaker and Montgomery, 2008). Studies performed in different contexts have proven the high degree of co-occurrence of the four dimensions considered herein Stein et al. (2018).

[20] As stated by Barsky (2002a): "the seriousness of the event, and its singularity or novelty, makes it more likely to be recalled consistently and reliably". The COVID-19 pandemic was indeed a remarkable event because of the policy measures adopted in Italy.

[21] For instance, in August 2020, the number of new daily cases in Italy was rising again: https://www.iss.it/documents/20126/0/Rapp_Istat_Iss_FINALE+2020_rev.pdf/b4c40cbb-9506-c3f6-5b69-0ccb5f015172?t=1609328171264.

Table 1
Main outcomes – Validation.

Panel A: Internal validation			
	Recalled Distress	Recalled Concerns	Health Status
Recalled Distress	1.000		
Recalled Concerns	0.612	1.000	
Health Status	−0.085	−0.080	1.000
Panel B: External validation			
	Recalled Distress	Recalled Concerns	Depressive Symptoms
Recalled Distress (Regional avg)	1.000		
Recalled Concerns (Regional avg)	0.714	1.000	
Depressive Symptoms	0.318	0.333	1.000

Notes: Panel A: Correlation table between the main outcomes (control group only) and measures for health status. *Health status* is a categorical variable that describes the self-classified health status of respondents as bad/not good, good, very good, or excellent. Panel B: Correlation table between the Regional average of the main outcomes (control group only) and *Depressive Symptoms* as external measures of mental well-being. *Depressive Symptoms* corresponds to the number of individuals (15 years old and older) with depressive symptoms per 100 inhabitants in the respondents' region of work. This rate refers to the year 2019 and is publicly available through the database Health For All Italy produced by ISTAT.

Similarly, the secondary outcome, *Recalled Concerns* refers to 7 areas of concern: *Stress in the workplace*, *Personal health*, *Relatives health*, *Couple problems*, *Nobody to talk to*, *Financial problems*, and *Family problems*. The questions were taken from the ad hoc questionnaire developed in the "Covid-19 Health Care Workers (HEROES)" study that measured experiences, fears, and concerns about COVID-19 in several countries (Mascayano et al., 2022). Specifically, the respondents were asked to express the frequency with which they experience each of these feelings using the same 5-point Likert scale adopted for depressive symptoms (i.e., "never", "rarely", "often", "very often", and "always"). Again, for each type of concern, we create a dummy capturing whether that specific situation had *very often* or *always* been a cause of concern for the respondent between the beginning of the COVID-19 first wave and June 15, 2020. *Recalled Concerns* is expressed as the result of the linear summation of these 7 dummies; thus it is a categorical variable ranging from 0 (*i.e*, no frequent concerns) to 7 (*i.e*, very frequent concerns).

The areas of concern are related to both the working conditions and the daily life of workers and potentially represent the main causes of mental distress. Hence, it is not surprising that our two outcomes (*i.e.*, *Recalled Distress* and *Recalled Concerns*) are positively and strongly correlated (correlation equal to 0.6). For this reason, our primary interest is in the study of *Recalled Distress*, whereas we use *Recalled Concerns* to provide further evidence of the dimensions of the psychological burden recollected by healthcare workers.

To test the internal validity of both indexes, we checked how well they correlate with self-reported health status as measured in our survey through the dummy *Good health status*, which takes a value of 1 when respondents self-classified as in either good or very good health.[22] Then, we also externally validate our outcomes using the rate of depressive symptoms available at the regional level from the "Health for All" dataset compiled by the Italian Institute of Statistics (ISTAT). This rate is computed as the number of individuals (15 years old and older) with depressive symptoms per 100 inhabitants at the regional level as reconstructed through the European Health Interview Survey (EHIS) administered by ISTAT in 2019. Overall, our results are both internally and externally valid. Better health status is associated with a recollection of fewer distress episodes and concerns (Table 1, Panel A), and the regional averages of our outcomes are positively correlated with the incidence of depressive symptoms in the participants' region of work (Table 1, Panel B).

In Table A5, Appendix A, we provide a more detailed definition of each outcome and related components, while Section 5.1 provides alternative aggregations of the indexes.

4.2. Descriptive statistics

As shown in Fig. 5, physicians tend to report a recollection of fewer distress episodes and concerns than nurses. Table A6 shows that the same also applies to male respondents compared to female respondents and to nonhospital workers compared to hospital workers. Overall, respondents recalled having suffered the most from episodes of *Anxiety* and *Sleeping problems* among the components of *Recalled Distress*. With respect to *Recalled Concerns*, *Relatives' health*, *Personal health* and *Stress in the workplace* were the most relevant dimensions.

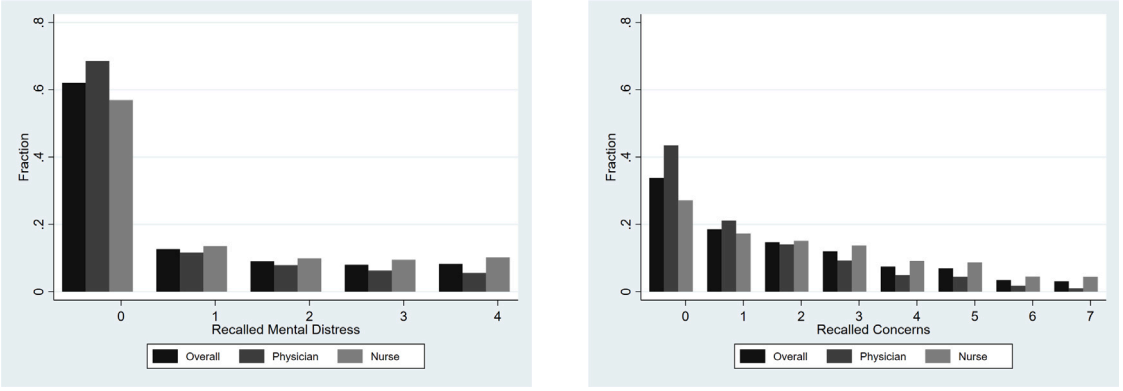
If we examine the distribution of respondents' answers to each dimension of both *Recalled Distress* and *Recalled Concerns*, it is apparent from Fig. 6 that the share of respondents who selected "always" ranges between slightly less than 2% for *Depression* and 7% for *Sleeping Problems*, while that for "very often" varies between 12% for *Depression* and 22% for *Anxiety*. With respect to the components of *Recalled Concerns*, the share of "always" is between 6% for *Couple problems*, *Nobody to talk*, *Family problems* and *Financial problems* and 23% for *Relatives' health*. Similarly the share of respondents who answered "very often" is lowest for *Nobody to talk to* and *Financial problems* (i.e., 9%) and highest for *Relatives' health* (i.e., 29%).

[22] The general question was "How would you say your general health condition is?", and the available answers were excellent, very good, good, not very good, bad (drawn from Bergner and Rothman (1987)).

Table 2
Individual controls.

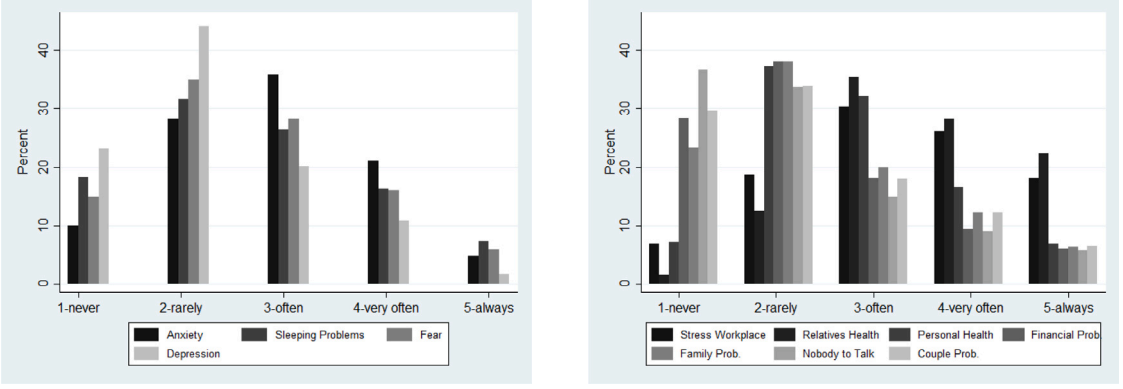
Socio-economic	Contract and workplace	COVID-19 related
Age group	Contract: Work-shifts	COVID-19 exposed
Children	Effective response	COVID-19 infected
Female	Good quality facility	COVID-19 -infected colleagues
Good health status	Hospital worker	COVID-19 mortality rate
Health worker in family	Lack of personnel	COVID-19 overtime
House dimension	Nurse	Deceased or hospitalized colleagues
Italian	Physician	Reassigned
Living alone	Prompt response	Working with COVID-19 patients
Married	Wage	
Religious	Workplace: never changed	
	Workplace: private	
	Workplace: University hospital	

Notes: See Table A7 for a detailed description of the variables.



(a) Recalled Distress (b) Recalled Concerns

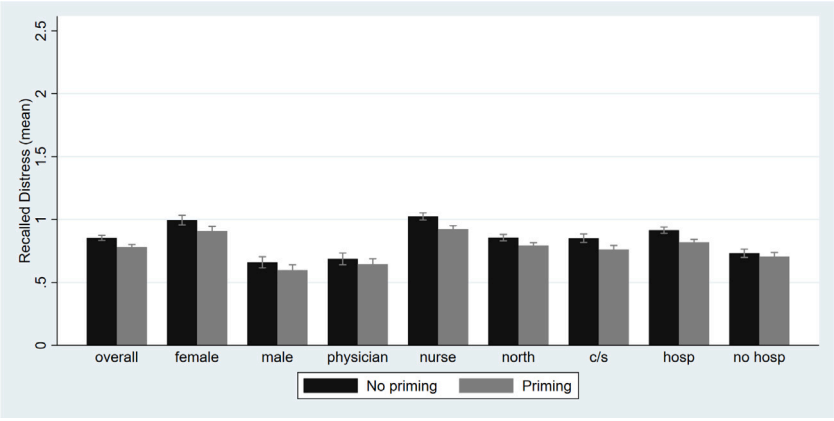
Fig. 5. Descriptives: Main outcomes. Notes: The figures reports the distribution of the main outcomes in the *Overall* sample and divided by profession (*Physician*, and *Nurse*). The statistics presented refer to the control group only.



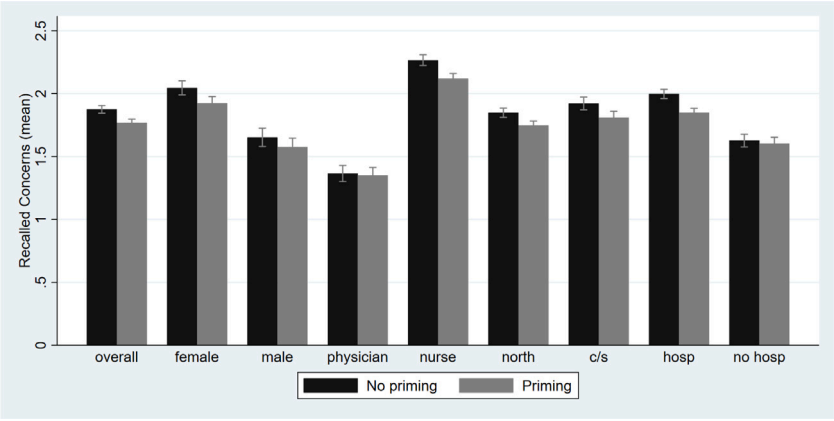
(a) Recalled Distress (b) Recalled Concerns

Fig. 6. Descriptives: Main outcomes by components. Notes: The figures reports the distribution of the original answers to the components of the main outcomes, *Recalled Distress* and *Recalled concerns*. The statistics presented refer to the control group only. Each component is measured on a 5-point Likert scale (*i.e.,* never, rarely, often, very often, always).

Finally, Fig. 7 reports the distribution of *Recalled Distress* and *Recalled Concerns* across treatment groups and by various subgroups. Overall, we find a significant difference in both outcomes between the treatment and the control groups. Healthcare workers who received religious priming self-reported fewer episodes of distress and concerns than the control group. In considering the distinction between physicians and nurses, we see that this difference comes mainly from nurses, while the effect is smaller for physicians. The treatment effect seems to not vary much based on workers' geographical area. *Recalled Distress* appears to



(a) Recalled Distress



(b) Recalled Concerns

Fig. 7. Descriptives: Main outcomes – Subgroups. Notes: The figure reports the means and standard deviations of the main outcomes comparing the *Treatment* and *Control* groups across several sample subgroups. The subgroups considered are: overall sample (overall), gender (female, male), profession (physician, nurse), geographic macroarea of work (north, center-south), workplace (hospital, not hospital), and COVID-19 experience (reassigned to a different ward or not, working with COVID-19 patients or not). Confidence intervals at 95%.

be similar in the northern and central/southern parts of the country. *Recalled Concerns* is slightly higher in the central/southern regions, although the 95% confidence intervals overlap. Considering gender and type of workplace, the main effect of religious priming appears to be driven by females and hospital workers. A similar analysis has been run looking at the population distribution, see Fig. 9.

5. Econometric analysis: Expectations and interpretation of the results

The model presented in Eq. (1) tests the effect of priming religiosity on *recollection* of the high frequency of certain episodes in the past. Respondents might have been more positive about their past experience just because relief was provided by a religious dimension (coping mechanism). As mentioned, the most commonly used tests to assess mental health are based on recollection of the frequency of episodes and symptoms. Hence, we are neither assessing the effect of religious priming on the frequency of memories of past events nor suggesting that recalled frequencies of past events coincided with the true frequencies in the past.

Nevertheless, an accurate effect of religious priming is extremely relevant: mitigating the recollection of the severity of traumatic events as the most dramatic weeks of the pandemic might generate better health outcomes in the long run. Memories and future thoughts are related to well-being (Conway and Pleydell-Pearce, 2000), and negative thinking is listed among the risk factors for developing psychological disorders, such as depression (see Watters and Williams (2011) for review). Individuals who recalled fewer negative experiences related to a traumatic event have been found to exhibit better psychological functioning (e.g., lower depressive symptoms) than their counterparts (Contractor et al., 2018, 2019, 2020; Arditte Hall et al., 2018).[23] At the same time,

[23] For a review see Contractor et al. (2022).

it has been shown that positively reinterpreting negative memories enhances mental health (Speer et al., 2021). Similarly, PTSD is classified as an anxiety disorder because individuals process a traumatic event in a way that leads to a feeling of a present and severe threat (Ehlers and Clark, 2000).[24] Hence, even though our focus is not on the reduction of PTSD per se, healthcare workers might be less at risk of developing PTSD and similar pathologies if religious priming triggers a less dramatic recollection of a past traumatic event.[25]

$$Outcomes_{ir} = \delta Priming_i + X_i^{'}\sigma + \lambda Covid\,Death_p + \tau_r + \epsilon_{ir} \quad (1)$$

For each healthcare worker i working in region r, the above equation allows us to estimate the effect of religious priming ($Priming_i$ –dummy variable that takes a value of 1 for individuals in the treatment group and 0 otherwise–) on the outcomes of interest ($Outcomes_{ir}$), which alternatively identified our primary (*Recalled Distress*) or secondary (*Recalled Concern*) outcomes, as defined in Section 4.1 and described in Table A5.

We control for a rich set of individual information ($X_i^{'}$) and the severity of the COVID-19 first wave in the province of work (108 provinces overall) of the respondent ($Covid\,Death_p$), proxied by the administrative measure for the COVID-19 death rate.[26] The individual controls included in $X_i^{'}$ are grouped into three sets as presented in Table 2 (socioeconomic, contract and workplace, COVID-19 related) and defined in Table A7.

The model includes regional fixed effects (τ_r) to address all time-invariant geographical differences, such as population characteristics, macroeconomic factors, cultural attitudes, organization of the healthcare system, and differences in the management of the response to the COVID-19 first wave.

Fig. 8 graphically presents the estimated δ on the full sample and by profession, which are also reported in Table 3. Making religious identity salient significantly decreases the perception of past mental distress by −9.1% (−0.080 estimated δ out of 0.876, the mean value of recalled distress). When we distinguish between physicians and nurses, the treatment effect is slightly smaller on physicians than on nurses: the magnitude of the effect on physicians is approximately −6.4% (−0.045/0.687), while the effect on nurses is −10.5% (−0.108/1.025). If we consider the different components of recalled distress, the effect of religious priming is stronger on the frequency of self-assessed depression and sleeping problems. At the average value of *Depression*, the treatment triggers a reduction of −12.4% (*i.e.*, −0.023/0.125) overall, −13.7% among physicians, and −19.6% among nurses. The impact on *Sleeping problems* varies between −9% (physicians) and −10.6% (nurses). With respect to *Fear* and *Anxiety*, the observed negative effect in the full sample is driven mainly by nurses. This result is in line with the fact that nurses were more likely to be exposed to the disease and to work with COVID-19 patients, which might have increased their risk of feeling anxious or the fear that something bad was about to occur (Buselli et al., 2020; Giusti et al., 2020; Magnavita et al., 2020; Riello et al., 2020). These results highlight that religiosity acts by allowing the individual to recall fewer stressful events, and has a stronger effect for the most difficult experiences.

As expected given the strong correlation between *Recalled Distress* and *Recalled Concerns*, religious priming also lead to recall of experiencing fewer concerns by −5.4% (−0.103/1.907) in the full sample (Table 3). However, the effect is statistically significant only among nurses and is equal to −6.4% (0.145/2.267). Among the 7 variables defining *Recalled Concerns*, we focus on the three dimensions that show the highest averages: concerns about personal health, relatives' health and the level of stress in the workplace.[27] The greatest effect (a −9% reduction) is observed with respect to respondents' personal health. Recalled concerns about relatives' health and the level of stress in the workplace decrease by −3.7% and −2.5%, respectively. Note also that the overall results are driven mainly by nurses.[28]

5.1. Robustness and validity checks

We prove the robustness of our results through several approaches. We first define the outcomes in alternative ways. Then, we test for the potential role of inaccuracy in reporting the frequency of past experiences. Finally, we control for whether differences between treated and control groups could have been driven by different behavior in facing the emergency.

Our original definition of the outcomes considers dummies based on the frequency of the problem being "very often" or "always". As an alternative, we compute *Recalled distress-broad* and *Recalled concerns-broad* as the linear sum of dummy-components which now assumes a value of 1 if the respondent reported having experienced the status "often", "very often" or "always". This test allows us

[24] Distressing event-related memories is one of the diagnostic criteria used to certify PTSD in the checklist of the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition) (Association, 2013).

[25] Moreover, a growing body of research shows that reminiscence is related to mental health (Cappeliez et al., 2005; Bohlmeijer et al., 2007; Cappeliez and O'Rourke, 2006; Cappeliez and Robitaille, 2010; Hofer et al., 2017). Thus, reminiscence may play a significant role in how people cope with critical life events and traumatic experiences. Few studies have investigated the relationship between reminiscence functions, cognition and emotions associated with traumatic and stressful experiences (Akdag et al., 2023; Kalaycı-Celik and Uzer, 2022; Jiang et al., 2020; King et al., 2015; Korte et al., 2011). For instance, Akdag et al. (2023) showed that self-negative reminiscence indeed predicts posttraumatic stress both directly and through its indirect association with the perceived psychological impact of COVID-19. Similarly, Jiang et al. (2020) showed that negative attention bias and rumination positively affected depression and anxiety symptoms.

[26] $Covid\,Death_p$ represents the mortality rate of COVID-19 standardized according to the demographic characteristics of the resident population of each province (values expressed per 100,000 inhabitants), as computed by ISTAT. See Section 2.2 for more information about the spread of the virus during the COVID-19 first wave in Italy.

[27] Overall, 50.6% of the respondents declared that they were extremely (*i.e*, very often or always) concerned about their relatives' health during the COVID-19 first wave, while 44.2% were extremely concerned about the level of stress in their workplace and 23.5% were concerned about their personal health.

[28] The results for the remaining components of *Recalled Concerns* are presented in Table A8 in Appendix A.

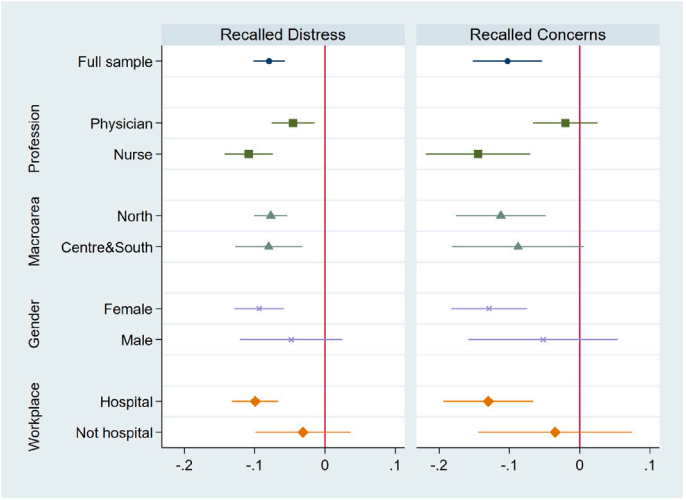
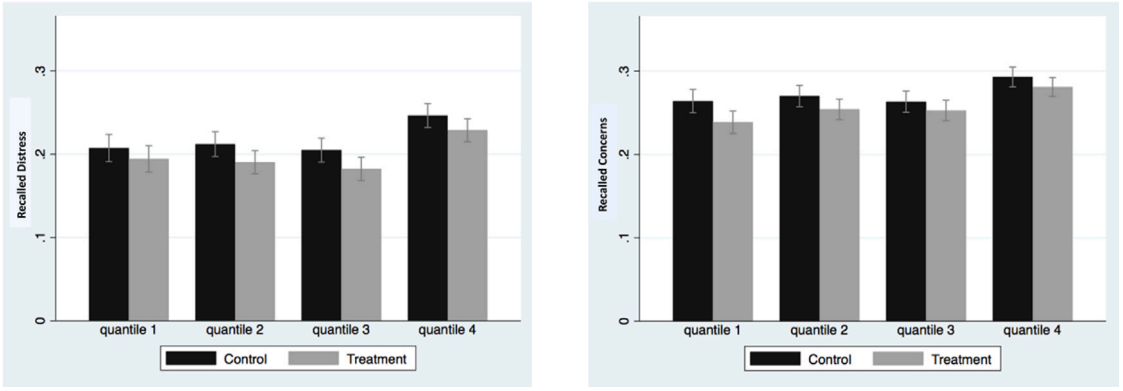


Fig. 8. Main outcomes: Subsamples. Notes: The figure presents the treatment estimated effects for the preferred specification across population subgroups. As described by Eq. (1), all specifications include: individual controls, response date fixed effects, province of work fixed effects, and region of residence fixed effects. See Table A7 for a detailed description of *Individual Controls*. Standard errors are clustered at the region of work level. Confidence intervals at 95%.



(a) Recalled Distress (b) Recalled Concerns

Fig. 9. Descriptives: Main outcomes — Population density. Notes: The figure reports the means and standard deviations of the main outcomes comparing the *Treatment* and *Control* groups across quartiles of population density in the region of work (quartile 1: lowest density; quartile 4: highest density). The figure highlights no significant differences. If anything, individuals in the lower quartile (i.e., quartile 1) seems to respond more to the experiment (i.e., larger difference between Control and Treatment means). Confidence intervals at 95%.

to check whether the effect is mainly on the recollection of extreme mental distress or broadly defined measures. In the same spirit, we calculate the mean value across all components for each main outcome (i.e., *Recalled Distress-mean* and *Recalled Concerns-mean*), and we apply principal components analysis (PCA) to define the outcomes (i.e., *Recalled Distress-PCA* and *Recalled concerns-PCA*) rather than relying on the linear sum. Finally, we also use an alternative definition of *Recalled Concerns* (i.e., *Recalled concerns-main components*) based only on the three dimensions that the respondents recalled having experienced the most as is apparent in Fig. 6 (Subfigure b) (i.e., *Relatives' health*, *Personal health*, and *Stress in the workplace*). As shown in Table 4, changing the definition of the outcomes does not affect our results with the exception only of physicians' *Recalled distress - broad*. In this case, the direction of the effect is confirmed, but it is no longer statistically significant. If anything, for the group of physicians, our baseline effects apply to the recollection of extreme mental distress.

Recollection of the past might be subject to inaccuracy. Such inaccuracy could have been a threat to our results if and only if (i) the inaccuracy was only in the direction of underestimating the mental issues, and (ii) all respondents who were inaccurate (in underestimating) ended up in the treatment group. These two joint conditions do not seem to be likely, given the random assignment to the treatment. Most sociodemographic characteristics have been found to be unrelated to recall accuracy. Nevertheless, Coughlin (1990) stresses that some studies observed a higher recall accuracy among more highly educated respondents (Joslyn, 2003) and a lower accuracy among older respondents than younger ones (Schmier and Halpern, 2004; Warrington and Silberstein, 1970; Yarrow et al., 2003). These observables should not be a problem in our setting, since they are balance distributed across samples and we

Table 3
Recalled Distress & Recalled Concerns & Related components.

	Full sample	Physicians	Nurses
Outcome A: Recalled Distress			
Treatment	−0.080***	−0.045**	−0.108***
	(0.012)	(0.015)	(0.016)
Mean Dep. Var.	0.876	0.687	1.025
Avg treatment effect	−9.1%	−6.4%	−10.5%
Outcome B: Anxiety			
Treatment	−0.019***	−0.002	−0.031***
	(0.006)	(0.009)	(0.007)
Mean Dep. Var.	0.259	0.216	0.296
Avg treatment effect	−7.3%	−0.9%	−10.0%
Outcome C: Sleeping problems			
Treatment	−0.021***	−0.018**	−0.028***
	(0.004)	(0.008)	(0.007)
Mean Dep. Var.	0.236	0.188	0.274
Avg treatment effect	−8.9%	−9.0%	−10.6%
Outcome D: Fear			
Treatment	−0.017***	−0.012	−0.020***
	(0.005)	(0.009)	(0.007)
Mean Dep. Var.	0.219	0.167	0.258
Avg treatment effect	−7.7%	−7.2%	−7.8%
Outcome E: Depression			
Treatment	−0.023***	−0.013*	−0.029***
	(0.004)	(0.007)	(0.006)
Mean Dep. Var.	0.125	0.095	0.148
Avg treatment effect	−12.4%	−13.7%	−19.6%
Outcome F: Recalled Concerns			
Treatment	−0.103***	−0.020	−0.145***
	(0.024)	(0.022)	(0.036)
Mean Dep. Var.	1.907	1.365	2.267
Avg treatment effect	−5.4%	−1.2%	−6.4%
Outcome G: Relatives' health			
Treatment	−0.019*	0.001	−0.028***
	(0.008)	(0.016)	(0.009)
Mean Dep. Var.	0.514	0.409	0.584
Avg treatment effect	−3.7%	0.5%	−4.8%
Outcome H: Stress in the workplace			
Treatment	−0.011*	−0.015	−0.011*
	(0.006)	(0.011)	(0.006)
Mean Dep. Var.	0.447	0.359	0.513
Avg treatment effect	−2.5%	−3.9%	−2.1%
Outcome I: Personal health			
Treatment	−0.022**	−0.006	−0.029***
	(0.007)	(0.006)	(0.009)
Mean Dep. Var.	0.247	0.163	0.301
Avg treatment effect	−9%	−3.1%	−9.6%
Number of Obs	14,728	4829	8828

Notes: As described by Eq. (1), all specifications include individual controls and region of work fixed effects. See Table A7 for a detailed description of *Individual Controls*. Standard errors are clustered at the region of work level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

always control for them. However, the distance from the anchoring event (i.e. the end of the pandemic) could have equally affected the accuracy of recollection. To provide evidence that such distance is not a problem, we improved on the estimated model by adding to Eq. (1) both separately and jointly, a control counting the days that passed from the start of the survey and the day of its completion by respondents (i.e., *Distance from the 15th*) and response date fixed effects. This check also excludes that accuracy might have been affected by what has happened between the anchoring event and the response date (since the pandemic was still ongoing). Our baseline results are robust to these tests, as shown in Table 5.

A further validity test has to do with the nature of accuracy in the recollection of past events. Our outcomes obviously deal with recollecting the frequency of phenomena that are subject to the discretion of the respondent. We tested the impact of priming religiosity on recollecting the occurrence of a panic attack, *Recalled panic attacks*, which is a dummy equal to one if the respondent declared that she had experienced at least one panic attack and zero otherwise. The idea is that healthcare workers are professionals,

Table 4
Robustness checks: Alternative definitions of the main outcomes.

	Recalled Distress			Recalled Concerns			
	Broad (1)	Mean (2)	PCA (3)	Broad (4)	Mean (5)	PCA (6)	Main components (7)
Panel A: Full sample							
Treatment	−0.076***	−0.053***	−0.102***	−0.111***	−0.043***	−0.105***	−0.052***
	(0.010)	(0.008)	(0.017)	(0.033)	(0.012)	(0.030)	(0.014)
Mean Dep. Var.	1.984	2.606	2.961	3.601	2.706	4.089	1.208
Avg treatment effect	−3.8%	−2%	−3.4%	−3.1%	−1.6%	−2.6%	−4.3%
Number of Obs	14,728	14,728	14,728	14,728	14,728	14,728	14,728
Panel B: Physicians							
Treatment	−0.023	−0.032***	−0.062***	−0.044	−0.019	−0.042	−0.019
	(0.019)	(0.010)	(0.019)	(0.051)	(0.014)	(0.034)	(0.025)
Mean Dep. Var.	1.711	2.450	2.692	3.007	2.460	3.512	0.931
Avg treatment effect	−1.3%	−1.3%	−2.1%	−1.4%	−0.8%	−1.2%	−2%
Number of Obs	4829	4829	4829	4829	4829	4829	4829
Panel C: Nurses							
Treatment	−0.114***	−0.073***	−0.138***	−0.157***	−0.059***	−0.142***	−0.068***
	(0.021)	(0.010)	(0.018)	(0.033)	(0.016)	(0.038)	(0.018)
Mean Dep. Var.	2.187	2.726	3.170	4.010	2.873	4.484	1.398
Avg treatment effect	−5.2%	−2.6%	−4.4%	−3.9%	−2.1%	−3.2%	−4.9%
Number of Obs	8828	8828	8828	8828	8828	8828	8828

Notes: The table reports the estimated treatment effects for alternative specifications of the outcomes (see Section 5.1 for more details regarding outcomes definitions). As described by Eq. (1), all specifications include: individual controls and region of work fixed effects. See Table A7 for a detailed description of *Individual Controls*. Standard errors are clustered at the region of work level. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 5
Robustness checks: Alternative specifications.

	Full sample			Physicians			Nurses		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Outcome: Recalled Distress									
Treatment	−0.080***	−0.079***	−0.079***	−0.045***	−0.046**	−0.046**	−0.109***	−0.109***	−0.109***
	(0.011)	(0.011)	(0.011)	(0.015)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Mean Dep. Var.	0.878	0.878	0.878	0.687	0.687	0.687	1.025	1.025	1.025
Avg treatment effect	−9.1%	−9%	−9%	−6.3%	6.4%	6.4%	−10.5%	−10.5%	−10.5%
R^2	0.095	0.099	0.099	0.092	0.106	0.106	0.087	0.094	0.094
Outcome: Recalled Concerns									
Treatment	−0.103***	−0.100***	−0.100***	−0.021	−0.015	−0.015	−0.146***	−0.140***	−0.140***
	(0.024)	(0.023)	(0.023)	(0.022)	(0.025)	(0.025)	(0.035)	(0.034)	(0.034)
Mean Dep. Var.	1.907	1.907	1.907	1.365	1.365	1.365	2.267	2.267	2.267
Avg treatment effect	−5.4%	−5.2%	−5.2%	−1.2%	−0.08%	−0.08%	−6.4%	−6.2%	−6.2%
R^2	0.138	0.143	0.143	0.111	0.125	0.125	0.102	0.112	0.112
Number of Obs	14,728	14,728	14,728	4829	4829	4829	8828	8828	8828
Individual controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Distance from 15th June	✓		✓	✓		✓	✓		✓
Response date FE		✓	✓		✓	✓		✓	✓

Notes: See Table A7 for a detailed description of *Individual Controls*. *Distance from 15th* is a continuous variable that identifies the distance in days from the start of the survey (*i.e.,* 15 June, 2020). *Response date FE* adds fixed-effects for the day when each observation is registered. Standard errors robust clustered at the region of work level. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1.

and a panic attack is a physical condition (e.g., an experience quite similar to a heart attack). Table 6 shows that we do not estimate an effect on them. This evidence supports the coping mechanism of priming religiosity. Priming can have a smoothing effect on objective measures that might still be affected by an individual's own recollection. However, it cannot influence objective measures that are outside the realm of recollection, being a psychotic event.

Finally, we check whether a recollection of fewer severe distress statuses could have been driven by the fact that respondents in the treated group might also have decided to take greater advantage of leave options (e.g., sick leave, vacations). Table 6 shows a basic null effect of the treatment on the use of leaves from work.

Table 6
Robustness checks: Alternative outcomes.

	Recalled panic attacks	Leave permits
Panel A: Full sample		
Treatment	−0.009	0.000
	(0.007)	(0.011)
Mean Dep. Var.	0.170	0.348
Avg treatment effect	−5.3%	−0%
Number of Obs	13,499	14,728
Panel B: Physicians		
Treatment	−0.010	−0.012
	(0.009)	(0.015)
Mean Dep. Var.	0.109	0.338
Avg treatment effect	−9.2%	−3.6%
Number of Obs	4600	4829
Panel C: Nurses		
Treatment	−0.008	0.007
	(0.011)	(0.016)
Mean Dep. Var.	0.213	0.342
Avg treatment effect	−3.8%	−2%
Number of Obs	7914	8828

Notes: The table reports the estimated treatment effects for alternative outcomes. *Recalled Panic Attack* is a dummy that is equal to 1 when the respondent recalled having had at least one panic attack during the COVID-19 first wave. Leave permits are permits required for sick leave, vacations, and medical conditions of some of the respondents' relatives (not COVID-19 related). As described by Eq. (1), all specifications include: individual controls and region of work fixed effects. See Table A7 for a detailed description of *Individual Controls*. Standard errors are clustered at the region of work level. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1.

6. For whom the effect counts the most

Our baseline results are consistent with evidence from other fields, such as psychology and psychiatry, which has shown that religiosity could be an effective means of coping with stress since it decreases the activation of distress responses in the human brain (Inzlicht and Tullett, 2010; Inzlicht et al., 2011). From a psychological point of view, the idea is that religious beliefs generally provide alternative interpretations of certain events, giving them specific meanings. These meanings, in turn, provide a sense of purpose or an interpretation that enhances hope and motivation among religious people (Koenig and Larson, 2001). Hence, we further investigate the idea of religiosity as a coping mechanism by focusing on our primary outcome of interest (*i.e*, *Recalled Distress*) and considering the subgroups of workers who were more likely to be psychologically overwhelmed by the emergency (Barili et al., 2022). The general intuition is that if religiosity is a way to cope with stress or, at least in our setting, with self-reported measures of distress, then the effect should be stronger for people for whom the stress factors were higher. In other words, the recollection of the frequency of past traumatic events should be smoothed the most in these subpopulations.

The analysis by subsamples is performed by estimating Eq. (1) for each subsample, considering as discriminant categories gender (female vs. male), employer type (hospital vs. nonhospital workers) and region of work (north vs. center/south). Each of these subgroups may have had a strong reaction to religious priming for very different reasons. Hence, the treatment effects may not necessarily have differed among these subgroups, which is why we analyze them separately.

In general, women are more likely to suffer from depression and anxiety than men. Gender differences in medically assessed depression are one of the most robust findings in psychiatric epidemiology (Astbury, 2001). Such differences have been confirmed both by considering general population studies conducted worldwide (Piccinelli and Homen, 1997) and by more specific analysis performed in clinical or community samples and differentiated by racial groups (Kessler et al., 1994; Gater et al., 1998). Regarding concerns that the observed gap may be driven by artifactual factors (*e.g.,* measurement errors driven by gender differences in the attitude toward reporting mental distress) or social factors (*e.g.,* gender norms, gender differences in experiences that shape individual future development), other scholars have replied that biological factors (*i.e.,* limbic system hyperactivity) predispose women to experiment with anxiety and depressive symptoms (Parker and Brotchie, 2010). They have argued that sociocultural factors act by accelerating or reducing the biological response.

In our context, this means that women are more likely to report a higher frequency of distress episodes, and the activation of a coping mechanism should consequently have a large impact on that group. We cannot, however, exclude the possibility that men could also responded strongly to our treatment. Although less likely to suffer from depression and anxiety, men are more likely than women to hold managerial positions and to hold higher positions. Hence, they could have suffered more from the stress of the responsibility of facing the pandemic. Similarly, hospital workers were more exposed to stressful situations in their workplace during the COVID-19 first wave. However, nonhospital workers were often recruited to set up the USCAs to assist patients with less severe COVID-19 in their home. Thus, we could expect that both subgroups would be strongly affected by religious priming even if

for different reasons. Regarding geographical distribution, workers in the northern regions are expected to be more impacted due to the high intensity of the pandemic in those areas. However, workers in the southern regions might instead have been more affected because the healthcare systems were less prepared to cope with such emergencies.

When we estimate Eq. (1) for these subsamples, our expectations are confirmed by the coefficients plotted in Fig. 8 and reported in Table A9. Religious priming triggers the strongest drop in *Recalled Distress* and *Recalled Concerns* among females and hospital workers, who are also the subgroups that suffered the most from both of these issues. Specifically, a −9.4% (−0.094/0.996) decrease in *Recalled Distress* is observed among females, while no effect is found on males. However, as Fig. 8 shows, even though some gender differences may exist in the treatment, these differences are not significant in our sample. The same applies to hospital and nonhospital workers with only the former being affected by religious priming and reporting a −10.6% decrease (−0.099/0.936). *Recalled Distress* also decreases among workers in both the northern and center/southern regions and to a similar extent (−8.7% in the north vs. −9.2% in the center/south) with also similar overall levels (i.e., 0.885 in the north and 0.865 in the center/south). The analysis of the components of *Recalled Distress* confirms that all of components are significantly affected by the treatment when females and healthcare professionals work in a hospital. Moreover, for the these subgroups and in the northern regions, the strongest decreases are registered for the recollection of sleeping problems and depression, while for workers in the center/southern regions, the only affected components are anxiety and depression.

Consistent results are also observed for *Recalled Concerns*. According to Table A10, a statistically significant effect is registered only in the northern and center/southern regions (−5.9% and −4.5%, respectively) and among females (−6.3%) and hospital workers (−6.4%) but not among their counterparts. The main driver is the recollection of the concern about the respondent's relationship with the partner.

7. When the effect counts the most

At the same time, religiosity could be particularly beneficial for mental well-being when stress is severe or out of control and originates outside the individual (Frankl, 1959; Strawbridge et al., 1998). Hence, we also examine the role of religiosity as a coping mechanism by considering situations that are correlated with the highest levels of workers' mental distress (Barili et al., 2022). In fact, we could reasonably expect a stronger effect of religious priming in circumstances when the stress factors are higher. To this end, we conduct a heterogeneity analysis, as described by Eq. (2).

$$Outcomes_{ir} = \delta Treatment_i + \omega Treatment_i * D_i^* + X_i^{'}\sigma + \tau_r + \epsilon_{ir} \tag{2}$$

Each stressful situation is identified by the dummy variable D_i. This variable alternatively identifies 7 situations: reporting a lack of personnel at the province of work level, being reassigned after the COVID-19 outbreak, having at least one colleague who was infected with or died of COVID-19, being personally exposed to the virus or testing positive, and working in a COVID-19-related specialty before the outbreak. Using these dummies, for which we control in the baseline specification (Eq. (1)), we estimate Eq. (2), to which we add the interaction term $Priming_i * D_{i*}$. Thus, δ represents the effect of the treatment on those not experiencing the additional stress factor and $\delta+\omega$ represents the effect on those experiencing it, while ω indicates whether the difference between the two groups is statistically significant. For instance, δ captures the effect of not being reassigned due to the COVID-19 emergency, $\delta+\omega$ captures the effect on those reassigned, and ω captures the difference between the two groups.

As shown in Table 7, our treatment has a stronger effect when the situation was more stressful to start with (*i.e.*, the estimated ω is mostly negative and statistically significant). For instance, we estimate a stronger effect on those reassigned than on those not reassigned, on those working in a COVID-19 specialty, on those who tested positive for COVID-19, and on those who had at least one colleague who was infected, was hospitalized or died. However, stronger treatment effects among physicians are significant only when they reported a lack of medical personnel in their province of work. In contrast, we find that being reassigned, having colleagues who were infected, were hospitalized or died, and working in a COVID-19 specialty drive the effects on nurses.

In Table 8, we also test for a heterogeneous response based on administrative data on the distribution of ICU beds in 2018. The intuition behind this check is that the effect of religious priming should be stronger in cases where the number of ICU beds was lower to start with. However, even if the estimated effect takes that direction, the difference between the two samples (i.e., having more vs. fewer ICU beds) is statistically significant only for physicians. We find no evidence of different responses to religious priming based on the severity of the outbreak immediately before the participation date.[29]

Finally, we investigate the potential differential effects of religious priming based on the socioeconomic characteristics of respondents such as having or not having at least one child, being married, living in a larger accommodation, and receiving a higher wage. Table 9 shows no significant difference suggesting that our results are not driven by specific socioeconomic characteristics. This might be because we are dealing with highly educated people, who are therefore identified as a specific group. The income driver is significant only for physicians with a stronger effect of the treatment on those with a higher income. This is in line with the positive correlation between being religious and income. Religious people are generally wealthier, enjoy higher levels of education, and are in more stable marriages than nonreligious people (Bentzen, 2021; Gruber, 2005a).

[29] The severity of the outbreak is computed as the average growth in the number of COVID-19 cases in the work province of the respondent during the week before the participation date.

Table 7
Heterogeneity analysis: Stress factors.

	Full sample	Physicians	Nurses
Het 1: Lack of personnel			
No: δ	−0.050**	0.062	−0.124**
	(0.024)	(0.042)	(0.050)
Yes: $\delta + \omega$	−0.093**	−0.085**	−0.110**
	(0.013)	(0.027)	(0.012)
Difference: ω	−0.042	−0.146**	0.014
	(0.030)	(0.063)	(0.051)
Het 2: Reassigned			
No: δ	−0.043***	−0.031	−0.056**
	(0.014)	(0.025)	(0.027)
Yes: $\delta + \omega$	−0.229***	−0.123**	−0.288***
	(0.037)	(0.054)	(0.057)
Difference: ω	−0.186***	−0.092	−0.233***
	(0.046)	(0.073)	(0.078)
Het 3: COVID-19 infected colleagues			
No: δ	−0.022	−0.025	−0.015
	(0.034)	(0.073)	(0.033)
Yes: $\delta + \omega$	−0.105***	−0.052**	−0.151***
	(0.012)	(0.023)	(0.018)
Difference: ω	−0.082**	−0.027	−0.136***
	(0.040)	(0.089)	(0.041)
Het 4: Dead or hospitalized colleagues			
No: δ	−0.041*	−0.016	−0.063***
	(0.021)	(0.049)	(0.020)
Yes: $\delta + \omega$	−0.155***	−0.085	−0.214***
	(0.028)	(0.055)	(0.035)
Difference: ω	−0.114**	−0.068	−0.151***
	(0.045)	(0.099)	(0.047)
Het 5: COVID-19 exposed			
No: δ	−0.086***	−0.055***	−0.112***
	(0.010)	(0.018)	(0.017)
Yes: $\delta + \omega$	−0.041	0.050	−0.126
	(0.062)	(0.106)	(0.087)
Difference: ω	0.044	0.104	−0.014
	(0.065)	(0.113)	(0.092)
Het 6: COVID-19 infected			
No: δ	−0.074***	−0.039**	−0.108***
	(0.011)	(0.016)	(0.018)
Yes: $\delta + \omega$	−0.155***	−0.128	−0.150***
	(0.033)	(0.078)	(0.039)
Difference: ω	−0.081**	−0.089	−0.041
	(0.036)	(0.079)	(0.045)
Het 7: COVID-19 specialty			
No: δ	−0.056***	−0.042*	−0.076***
	(0.012)	(0.020)	(0.015)
Yes: $\delta + \omega$	−0.181***	−0.072	−0.227***
	(0.040)	(0.091)	(0.044)
Difference: ω	−0.125***	−0.029	−0.151***
	(0.045)	(0.103)	(0.045)

Notes: δ identifies the treatment effect when the heterogeneity factor assumes a value of 0, $\delta + \omega$ identifies the treatment effect when the heterogeneity factor assumes a value of 1, and ω identifies the difference in the treatment effects between the two heterogeneity categories (i.e., the interaction). See Table A7 for a detailed description of *Individual Controls* and Table A12 for a detailed description of *Heterogeneity Factors*. Standard errors are clustered at the region of work level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

8. Effective religious priming: A channel

As shown in previous studies, responsiveness to religious cues is related to not only to individual religious beliefs and cultural values (Norenzayan et al., 2013) but also to the self-relevancy of priming (Wheeler et al., 2007). Hence, we address the relationship between religious priming and classification of the individual as a religious person. Religious priming should make elements of religiosity and spirituality that are already present in the respondent more salient. However, it could also be that the spiritual/religious identity of the individual is not exclusively captured by involvement in strictly defined religious

Table 8
Heterogeneity analysis: Context.

	Full sample	Physicians	Nurses
Het 1: ICU beds			
No: δ	−0.120***	−0.081***	−0.153***
	(0.035)	(0.024)	(0.053)
Yes: $\delta + \omega$	−0.053***	−0.018	−0.084***
	(0.016)	(0.022)	(0.024)
Difference: ω	0.068	0.063*	0.068
	(0.046)	(0.032)	(0.070)
Het 2: Covid-19 growth			
No: δ	−0.103***	−0.029	−0.143***
	(0.022)	(0.036)	(0.035)
Yes: $\delta + \omega$	−0.065***	−0.058*	−0.090***
	(0.015)	(0.030)	(0.023)
Difference: ω	0.038	−0.029	0.053
	(0.031)	(0.059)	(0.049)

Notes: δ identifies the treatment effect when the heterogeneity factor assumes a value of 0, $\delta + \omega$ identifies the treatment effect when the heterogeneity factor assumes a value of 1, and ω identifies the difference in the treatment effects between the two heterogeneity categories (i.e., the interaction). See Table A7 for a detailed description of *Individual Controls* and Table A12 for a detailed description of the *Heterogeneity Factors*. Standard errors are clustered at the region of work level. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 9
Heterogeneity analysis: Socioeconomic factors.

	Full sample	Physicians	Nurses
Het 1: Children			
No: δ	−0.069**	−0.038	−0.105***
	(0.027)	(0.057)	(0.027)
Yes: $\delta + \omega$	−0.091***	−0.049	−0.122***
	(0.022)	(0.031)	(0.032)
Difference: ω	−0.022	−0.012	−0.017
	(0.045)	(0.082)	(0.050)
Het 2: House dimension			
No: δ	−0.086***	0.006	−0.124***
	(0.018)	(0.031)	(0.019)
Yes: $\delta + \omega$	−0.077***	−0.070**	−0.098**
	(0.018)	(0.026)	(0.039)
Difference: ω	0.009	−0.077	0.026
	(0.030)	(0.049)	(0.048)
Het 3: Married			
No: δ	−0.091***	−0.080*	−0.111***
	(0.025)	(0.046)	(0.031)
Yes: $\delta + \omega$	−0.072***	−0.024	−0.116**
	(0.023)	(0.028)	(0.044)
Difference: ω	0.020	0.056	−0.005
	(0.043)	(0.066)	(0.068)
Het 4: Net wage			
No: δ	−0.059***	0.020	−0.104***
	(0.018)	(0.035)	(0.027)
Yes: $\delta + \omega$	−0.099***	−0.090***	−0.120***
	(0.016)	(0.031)	(0.022)
Difference: ω	−0.040	−0.110*	−0.016
	(0.027)	(0.058)	(0.037)

Notes: δ identifies the treatment effect when the heterogeneity factor assumes a value of 0, $\delta + \omega$ identifies the treatment effect when the heterogeneity factor assumes a value of 1, and ω identifies the difference in the treatment effects between the two heterogeneity categories (i.e., the interaction). See Table A7 for a detailed description of *Individual Controls* and Table A12 for a detailed description of the *Heterogeneity Factors*. Standard errors are clustered at the region of work level. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1.

activities. For instance, the literature underlines how not only participating in religious services but also attending guided meditation classes have beneficial effects on mental well-being, lowering anxiety and depression levels through the reinforcement of spiritual identity (Stanley et al., 2011). Hence, we expect religious priming to have a greater effect on respondents who self-classify as

Table 10
Heterogeneity analysis: Religiosity.

	Full sample	Physicians	Nurses
Het 1: Religious			
No: δ	−0.092***	0.019	−0.167***
	(0.029)	(0.031)	(0.052)
Yes: $\delta + \omega$	−0.075***	−0.093***	−0.076***
	(0.014)	(0.025)	(0.020)
Difference: ω	0.017	−0.112**	0.092
	(0.038)	(0.047)	(0.066)
Het 2: Religious weddings			
No: δ	−0.065***	0.017	−0.124***
	(0.016)	(0.022)	(0.025)
Yes: $\delta + \omega$	−0.106***	−0.139***	−0.099**
	(0.035)	(0.047)	(0.037)
Difference: ω	−0.041	−0.156**	0.024
	(0.046)	(0.062)	(0.053)
Het 3: Lazio region			
No: δ	−0.080***	−0.042**	−0.118***
	(0.012)	(0.016)	(0.018)
Yes: $\delta + \omega$	−0.098***	−0.091***	−0.088***
	(0.002)	(0.009)	(0.004)
Difference: ω	−0.018	−0.049**	0.030
	(0.012)	(0.020)	(0.017)

Notes: δ identifies the treatment effect when the heterogeneity factor assumes a value of 0, $\delta + \omega$ identifies the treatment effect when the heterogeneity factor assumes a value of 1, and ω identifies the difference in the treatment effects between the two heterogeneity categories (i.e., the interaction). See Table A7 for a detailed description of *Individual Controls* and Table A12 for a detailed description of the *Heterogeneity Factors*. Standard errors are clustered at the region of work level. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1.

religious, respondents with a stronger spiritual/religious identity or respondents who generally feel that they are somehow connected to religiosity/spirituality concepts.

We verify this hypothesis by performing a heterogeneity analysis based on self-classification as a religious person (both practicing and not practicing)[30] and based on the prevalence of religious weddings in the province of birth of the respondent.[31] The first measure indicates the respondent's subjective perception of her religious identity, while the second measure underlines the cultural context of her province of origin. We interact the measures with the treatment to estimate any difference in response based on the spiritual/religious identity of the individual, as in Eq. (2). The results are presented in Table 10. When significant, the estimated difference between more and less spiritual/religious types confirms that more spiritual/religious respondents are more responsive to religious priming and thus report lower recollection of mental distress. This is true for physicians, while the distinction is not significant for nurses.

Table 10 also shows a potential differential response when participants reported working in the Lazio region where the Vatican is located. In fact, we could reasonably expect that the presence of the Vatican (e.g., religious people, pilgrims) may somehow have increased the responsiveness to religious priming. Indeed, our results support this intuition, showing a stronger significant effect for respondents working in the Lazio region; however, this is true only among physicians.

Nurses tend to categorize themselves as religious less frequently than physicians. Given the nature of the treatment, this would lead to a lower predicted effect of religious priming on nurses. According to our baseline results, this is not the case. We argue that the effect on nurses is nevertheless consistent with social identity theory due to the media campaign that focused on nurses and exalted them as *COVID angels*. The strongly significant and negative effect estimated for all subgroups of nurses can be reconciled with this intense exposure, since religious priming might have activated their *COVID angels* identity. When remembering the sense of gratitude associated with the media campaign, nurses may have been able to better deal with negative events. This result is very relevant when we think about the potential of an ad hoc public campaign to reinforce the effect of the coping mechanism, especially in times of high distress for specific categories of workers.

[30] Self-classification as a religious person is a subjective measure. It could be biased by personal experiences occurring immediately before the survey or by differences in the value assigned to each option. Indeed, different individuals may label their behavior differently according to the standard that they have in mind (*e.g*, an individual who grew up in a very religious context but does not actually practice that often may classify himself as nonreligious, but may still maintain his religious identity).

[31] The religious weddings indicator is the percentage of religious weddings out of the total number of weddings held in the birth province of the healthcare worker in 2004 (last available year). The data were collected by ISTAT. We define a dummy based on the median value of the distribution to identify *more religious* and *less religious* provinces. Provincial-level information on the rate of religious weddings is available from 2004 onward, thus it is not possible to match each respondent to the specific religious wedding rate of her province of birth registered in her birth year. However, religious weddings are extremely persistent over time: the provincial level rate of religious weddings registered in 2004 and in 2019 are highly correlated (i.e., 0.92).

9. Conclusions

Epidemic outbreaks such as the COVID-19 pandemic, which are negative and highly unpredictable events, generate severe emotional distress. Healthcare workers, who are on the front lines in the treatment of patients and the confinement of the infection, are more at risk of feeling fear, anxiety, and exhaustion and suffering from stress (Preti et al., 2020).

Based on an experimental setting proposed through an online survey directed at Italian healthcare workers, we assess the impact of religiosity on having a less dramatic recollection of past distressful experiences. Although physicians and nurses tend to use different coping mechanisms in emergency situations (Wong et al., 2005), we show that religious coping remains an effective strategy in both groups (Salman et al., 2020; Shechter et al., 2020; Maraqa et al., 2020).[32]

From a policy perspective, recent studies have highlighted the importance of supporting healthcare workers not only in terms of the provision of adequate protective equipment and working environments but also from a psychological point of view. In particular, the WHO has proposed a list of practical tools that can be used to support mental well-being (WHO, 2020). The use of effective coping strategies is considered one of the most important tools that each individual can adopt to preserve her mental well-being. Given the positive results observed for religious coping, the spiritual sensibilities of each individual should always be respected, including in the definition of adequate workplace spaces dedicated to prayers and meditation. Our study suggests that during crises and difficult periods, it would be beneficial for employers to incentivize spirituality (not necessarily only religiosity) to help workers find relief. This suggestion could also be incorporated into the crisis plans of hospitals. Our results are in line with very recent evidence showing the effectiveness of mindfulness-based intervention on self-assessed psychological functioning through an experimental setting, in the general population (Fazia et al., 2020) and in an occupational setting (Fazia et al., 2021). We additionally observe that a community-level acknowledgment of the relevant role played by healthcare workers in saving lives and protecting patients may have strong beneficial effects on their recalled mental status. Honoring care and healthcare workers has indeed been suggested as another tool to reduce the psychological distress of health workers (WHO, 2020).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.euroecorev.2023.104649.

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[32] Doctors mostly use action planning strategies, while nurses resort more to disengagement and distraction activities (Wong et al., 2005).

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