Economic Notes

WILEY

ORIGINAL ARTICLE OPEN ACCESS

Understanding Happiness Amidst COVID-19: Exploring Relations, Religion and Trust

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Received: 9 February 2024 | **Revised:** 5 November 2024 | **Accepted:** 19 December 2024

Keywords: COVID-19 | happiness | religiosity | social relations | trust

ABSTRACT

In recent literature, various social implications arising from the COVID-19 pandemic have been extensively deliberated upon. In this study, we introduce an ordinal random effects model designed to explore the changes in individual perceived happiness during periods of lockdown. We delve into the impact of diverse factors such as social and family relationships, spirituality, religiosity, and trust in institutions, alongside a range of demographic and economic variables. Our data set comprises responses from 1212 individuals in the United States gathered between March and April 2020. The findings reveal an anticipated decline in overall happiness during the COVID-19 crisis, particularly noticeable within specific demographic and behavioural segments: social connections, trust, and religiosity exhibit nuanced variations, contingent upon the level of spirituality and the specific institutions under consideration.

1 | Introduction

At the onset of the COVID-19 epidemic, as entire countries grappled with alarming death tolls and implemented stringent lockdown measures, numerous scholars and policymakers anticipated an impending crisis of happiness and general well-being that would inundate societies (see e.g., Fiorillo and Gorwood 2020). However, contrary to these expectations, emerging evidence has revealed an unexpected trend: average happiness has exhibited remarkable resilience throughout the pandemic months, and notably, for sizable segments of the population, it has even shown improvement (Zhou et al. 2022; Cornell et al. 2022). In some countries, the nation-wide level of happiness, as indicated by the World Happiness Report, has actually shown an upturn in 2020 (Helliwell et al. 2022). What led to this unforeseen occurrence? This paper seeks to firstly present empirical evidence of this unexpected outcome by utilising original data collected during the US lockdowns. Furthermore, it aims to explore key determinants of happiness and well-being that enabled many individuals to navigate the challenges posed by these lockdowns. Specifically, our focus revolves around three pivotal determinants: the extent to which individuals encountered lockdowns within a structured context of *social relations*, the influence of their *religiosity* in comprehending and coping with the situation, and their level of *trust*. It's essential to note that while an overall slight improvement in mean happiness might be observed, there might be larger and opposing shifts in various quantiles. While many families may have experienced better outcomes on average due to a combination of these factors, others might have faced significant challenges for contrasting reasons.

This paper is situated within the well-established domain of happiness studies (Helliwell et al. 2022; Michalos 1980; Bruni, De Rosa, and Smerilli 2021; Lin et al. 2024). Over recent decades, this field has systematically explored the determinants of subjective well-being, revealing its connection to various factors, including (beyond GDP per capita) social support, healthy life expectancy, freedom to make life choices, generosity, and perceptions of corruption. These factors can be summarised

within the broader concept of Social Capital, which (Field 2008) defines as 'the intangible resources of community, shared values, and trust upon which we draw in daily life'. The recent paper thus focuses on its primary determinants: *social relations* (Grover and Helliwell 2019; De Rosa 2018), *religiosity and spirituality* (Gundlach and Opfinger 2013), as well as *trust* (Helliwell et al. 2022). These elements appear to be strongly interrelated and mutually reinforcing. Among others, the study of (Veenstra 2002) shows that religiosity is a strong predictor of trust and generates, while being sustained by, a robust network of social relations. This dynamic closely mirrors the patterns observed in the context of civic associations.

Why have we chosen to delve into these determinants of happiness, particularly within the specific context of COVID-19 lockdowns?

The initial stages of the COVID-19 epidemic witnessed the abrupt implementation of strict lockdowns in many countries (Rossouw, Greyling, and Adhikari 2021), creating a sudden shock that imposed physical detachment and isolation. These conditions posed substantial challenges to the fabric of social ties between individuals. Religiosity was profoundly affected as regular religious celebrations became inaccessible. Moreover, the epidemic undermined the trust in public and health institutions, as well as in neighbours and family members who suddenly became potential carriers of an unknown and fatal disease.

Furthermore, the lockdown measures enforced during the COVID-19 pandemic presented a unique opportunity for conducting a natural experiment to address the endogeneity issues often observed in happiness studies (Becchetti, Pelloni, and Rossetti 2008; Growiec and Growiec 2014). In this context, the pandemic served as an intriguing exogenous shock that facilitated the disentanglement of the causal relationship between happiness and some of its determinants. Lockdowns presented an almost perfect scenario for social sciences by distinctly segregating individuals subjected to restrictions with their family members from those compelled to endure solitude.

To study this natural experiment, we conducted an original survey at the end of April while numerous US states were still enforcing strict lockdowns[1].

The paper is organised as follows. In Section 2, we review the literature that is connected with this study. In Section 3, we present the evidence from our original data set. In Section 4, we display the analytic model and computational details. In Section 5, we provide the results and the last section concludes.

2 | Literature Review and Research Questions

The research spans various streams, notably exploring COVID-19's effects, particularly the repercussions of lockdowns. These measures enforced significant social isolation (Sayin Kasar and Karaman 2021), amplified economic insecurity (Normand, Marot, and Darnon 2022), and triggered heightened levels of anxiety, mental illness, and loneliness (Fordyce 1988; Lepinteur et al. 2022). Early investigations by Son et al. (2020) highlighted increased stress, anxiety, and depressive thoughts among Texas students enduring lockdowns. Similarly, Czeisler et al. (2020) observed a considerable rise in anxiety and depressive disorders in the United States during lockdown months. Comparable adverse effects were reported in the United States by Pierce et al. (2020).

In a meta-analysis encompassing 158 studies out of a pool of 5511 examining psychological distress and well-being post-2020 pandemic (Blasco-Belled et al. 2024), noted a substantial surge (2–8 times) in depression, anxiety, and stress rates since the outbreak. However, intriguingly, they found that well-being prevalence surpassed psychopathological indicators, suggesting protective mental health components amid the pandemic. Nonetheless, scholars and practitioners have shown unequal interest in monitoring positive mental health facets post-COVID-19 (Fan et al. 2021; Özgüç, Kaplan Serin, and Tanriverdi 2024).

The pandemic's multifaceted nature has presented numerous negative impacts on individuals and societies. During the COVID-19 pandemic, global lockdown measures were implemented by many governments to curb virus transmission. While these measures aimed to limit physical harm from the virus, they impacted individual well-being. Data from the global Gallup World Data Poll and Eurobarometer reported a slight global and European decrease in happiness, respectively (Helliwell et al. 2022). The World Happiness Report noted minimal declines in life satisfaction but marked decreases in positive emotions and increases in negative emotions globally. Research shows that witnessing disasters like COVID-19 negatively impacts mental and physical health, social relationships, and happiness (Brodeur et al. 2021). Lockdowns led to a decrease in happiness, elevated negative emotions, and a surge in online searches related to negative feelings. In the United States, 'stay at home' orders affected about 95% of the population, restricting daily activities and potentially impacting well-being. Joblessness, isolation, and lack of freedom, consequences of lockdowns, are known risk factors for happiness. This period saw increased reports of negative emotions like tension, agitation, sadness, anxiety, and loneliness, contributing to a decline in happiness levels in the United States (Mervosh 2022). Crucially, demographic factors such as age, gender, and socioeconomic status significantly predict how individuals have been affected by these restrictive measures. This intricate interplay between lockdowns and happiness underscores the need for a comprehensive understanding that acknowledges diverse experiences across different groups.

Here, we would like to contribute to this debate focusing on several aspects, starting from the following research question.

Q1: Did mandatory lockdowns have an effect on happiness?

The level of individual perceived happiness is intricately influenced by other various factors, each playing a distinct role in shaping subjective happiness. Social relationships act as a cornerstone, offering a sense of belonging, support, and emotional stability. The quality of these connections, especially during challenging times like the COVID-19 pandemic, may significantly impact one's happiness. Similarly, religion and

spirituality may contribute by providing frameworks for meaning-making, offering solace, and fostering a sense of community. These facets offer a space for emotional and psychological fulfilment, potentially bolstering one's overall happiness. Moreover, trust in institutions—be it in governance, healthcare, or societal structures—holds significance. High levels of trust often correlate with reduced anxiety and increased feelings of security, positively influencing an individual's sense of happiness. Understanding the complex interplay among these factors is crucial in comprehending the multifaceted nature of individual happiness during turbulent times.

2.1 | Social Relationships

The lockdown experience encompassed a complex interplay of emotions. For many, it brought forth a sense of isolation, leading to feelings of loneliness and a distinct unease, accompanied by a profound sense of being disconnected. This solitude, whether voluntary or imposed, could have evoked discomfort, insecurity, and an undercurrent of fear, resulting in an overall decline in happiness (Smith and Lim 2020). Paradoxically, lockdowns also offered an opportunity for increased family interaction. Families became a sanctuary, providing solace and protection, particularly for vulnerable members, re-establishing a sense of security that the pandemic had challenged. The dynamics of enforced cohabitation, however, might have unveiled less favourable behaviours, especially amid emotional distress, fear, and potential economic challenges triggered by the pandemic (Lu and Lin 2021). At the same time, people experienced prolonged isolation working from home, and limited contact outside their households. This raised concerns about how the pandemic affected social connections. The literature presents contrasting views on this. Some studies suggest that being with family and friends during this time increased happiness levels (Giménez-Nadal, Molina, and Velilla 2023). Relationships are consistently linked to well-being, providing support and buffering against stress during uncertain times. Studies indicate that, on average, relationships didn't deteriorate during the pandemic and were even cited as sources of comfort during crises (Williamson 2020). However, there were observations of a decline in marriages in the United States compared to previous years, hinting that some marital relationships might have been less satisfying during the pandemic. In light of these observations, our inquiry poses a pertinent question:

Q2: How did pre-lockdown social relationships influence individuals' perceptions of happiness during the lockdown?

2.2 | Religion and Spirituality

The relationship between happiness and religion has been extensively explored across numerous studies over the years. Results have showcased a mixed landscape: while some demonstrate a positive correlation (Abdel-Khalek 2006; Mookerjee and Beron 2005; Popova 2014), others refute such connections (Dezutter, Soenens, and Hutsebaut 2006). Notably, these varied outcomes are influenced by the diverse metrics used to gauge religiosity (attitude, conversion, behaviour, and attendance) and happiness (Lewis and Cruise 2006). Furthermore, the benefits religion imparts on happiness extend to well-documented medical outcomes. For instance, a positive correlation exists between prayer and reduced levels of anxiety, indicating a profound intertwining of mind and body. Psychological health, overall well-being, and consequently, happiness, may experience improvement through prayer, perhaps even via a placebo effect (Lewis and Cruise 2006).

A sense of community belonging, coupled with engagement in the activities and rituals intrinsic to religiosity, can serve as a balm during challenging periods such as the pandemic, potentially alleviating unhappiness and fostering a positive correlation between religion and happiness (Ellison 1991). However, certain studies hint at a weak negative correlation in cases where religion triggers anxiety, fear of death (Pressman et al. 1992), or guilt (Hood 1992).

Similarly relevant in influencing happiness is spirituality. Those who report a strong closeness to a higher power tend to exhibit twice the happiness levels compared to those more distanced (Stark and Maier 2008). Spirituality often intertwines with positive emotions like gratitude, love, and awe (Smith et al. 2013), while showcasing less correlation with emotions like pride and amusement (Van Cappellen et al. 2016). This association might contribute to an enhanced perception of happiness. In times of elevated uncertainty, worry, anxiety, and stress—traits commonly associated with the pandemic—individuals often seek solace in spirituality, finding comfort in faith. This inclination transcends religious boundaries, being shared across continents and income levels (Bentzen 2021).

With respect to this stream, we are going to test if:

Q3: Being part of a religious community, attending church-related activities and

Q4: Having a high level of spirituality, measured in terms of trust into Church's dogma improve the perceived happiness.

2.3 | Trust in the Institutions

Trust, in its broad spectrum, promotes greater happiness by cultivating positive emotions like altruism and civic engagement, while simultaneously reducing negative feelings such as anxiety and anger (Yagi 2017).

In periods of crisis, such as wars, terrorist attacks, or severe economic recessions, the *rally-around-the-flag effect* consistently emerges as an empirically observable phenomenon (Zoch and Wamsler 2024; Lehrer et al. 2023; Esaiasson et al. 2021). This effect describes the tendency of the public to temporarily set aside political divisions and rally in support of the incumbent authorities (Zoch and Wamsler 2024) by placing greater trust in them. While traditionally studied within the US political context, where it manifests as increased approval of the sitting president (Baker and Oneal 2001), the effect is generalisable

across different political systems and geographies (Dinesen and Jæger 2013). Notably, the rally effect has also been observed in the aftermath of health crises, with the COVID-19 pandemic providing additional evidence of this dynamic. During the pandemic, a surge in public support for governing authorities was reported in most affected countries (Bol et al. 2021) and even preemptively in some nations where the virus had not yet been detected (Bol et al. 2021). However, such increases in trust tend to be short-lived, occurring predominantly in the initial stages of the crisis. As the crisis persists, public trust in authorities often declines, potentially falling below precrisis levels or, in some cases, stabilising at a higher point (Zoch and Wamsler 2024).

The rally effect can be largely explained by social identity theory (Tausch, Schmid, and Hewstone 2011), which posits that crises strengthen in-group solidarity and support for shared symbols in response to a perceived common threat, thereby enhancing social cohesion (Hogg et al. 2007) and consequently trust. Additionally, other psychological factors such as perceived threat and anxiety play a role. While the perception of threat tends to increase trust in authorities, heightened anxiety appears to reduce it, necessitating an evaluation of their combined net effect on public sentiment (Lehrer et al. 2023). In multiparty political systems, variations in the rally effect are influenced by the political alignment of the parties, with governing parties typically experiencing different level of trust compared to opposition parties. In coalition governments, the magnitude of the effect may vary depending on the relative importance and public visibility of the individual parties within the coalition (Lehrer et al. 2023).

Individuals inclined toward trust in their government are more likely to adhere to prescribed guidelines and regulations aimed at controlling virus transmission. Conversely, those harbouring distrust are less inclined to comply with these guidelines. Similarly, faith in scientific institutions fosters greater acceptance and adherence to recommendations provided by public health officials and medical experts (Bol et al. 2021; Jennings et al. 2021).

Countries exhibiting high levels of institutional trust have adeptly coped with the pandemic, strengthening compliance with adopted policies, yielding more effective outcomes in terms of cures and reduced mortality rates. This, in turn, has contributed to a heightened sense of happiness (Helliwell et al. 2022).

At an individual level, varied levels of trust exist across different institutional types. The decisions made by these institutions during the COVID-19 pandemic significantly shaped individual experiences, underscoring their pivotal role.

Given the constraints of our data set, this study aims to explore how institutional trust impacts individual well-being during pandemic crises.

Specifically, we examine whether:

Q5: Trust in the US President,

Q6: Trust in Political Parties, and

Q7: Trust in the healthcare system fosters a sense of reassurance and subsequently enhances individuals' perceived happiness.

3 | Data

3.1 | The Database on Happiness

Historically, data regarding happiness have often stemmed from surveys (see e.g., Ng 1996.) conducted at fixed intervals, typically annually, featuring a broad yet rather generalised set of inquiries. Consequently, the existing databases gauging happiness currently lack the ability to comprehensively assess the impact of COVID-19 on individual well-being. Moreover, these databases fall short in probing the intricate roles played by family relationships, religion, and institutional trust in modifying individual perceived happiness.

To address these limitations and delve into our research questions, we designed and administered a customised questionnaire in the first quarter of 2020, aiming to gauge perceived happiness alongside a spectrum of individual variables. The School of Civil Economics (www.scuoladieconomiacivile.it) undertook this data collection initiative, capturing responses from 1212 US citizens spanning 48 states (excluding Vermont and Rhode Island), along with detailed socio-demographic characteristics.

Before delving into the data set's composition, it's crucial to elucidate our definition of happiness utilised in this analysis. Happiness isn't a quantifiable metric; rather, it's an entirely individualised perception that exhibits considerable heterogeneity across individuals. This diversity in perception may be partially explicable by observed variables, yet there's a likelihood of omitted information influencing these perceptions, necessitating acknowledgement in any comprehensive modelling framework.

The data set derived from this survey is cross-sectional, signifying the collection of a singular observation per individual. Additionally, it possesses a hierarchical structure, with individuals grouped within States, sharing certain state-specific characteristics—some observable and others potentially unobserved—that may contribute to the shaping of perceived happiness. Understanding and accounting for these hierarchical and clustered dynamics are critical for a nuanced analysis of the data set.

3.2 | Sample Characteristics

Our data set encompasses information from 1212 US citizens, with a gender distribution of 51.57% female and 48.43% male. The average age stands at 40.92 years (with a standard deviation of 13.58). Representation spans across 48 US States, with notable percentages from New York (12.13%) and California (13.37%). The data set portrays a diverse array of religious affiliations, including Catholics, Protestants, Muslims, Jews, as well as individuals identifying as agnostic or atheist.

In addition to religious demographics, we gathered data concerning employment status and political orientation. Among

participants, 62.22% are engaged in traditional, home, or domestic occupations, while 23.27% identify as unemployed or disabled. Students represent 8.57% of the data set, and 5.94% are retired. In terms of political leanings, 35.31% align with the Republican party, 39.19% with the Democrats, and 25.50% classify themselves as Independent.

The data set showcases a significant level of educational attainment, with around 60% holding a bachelor's degree or higher. Approximately 10% of participants have attained a lower level of education, such as lower secondary or primary schooling. In terms of living arrangements, the majority (60.27%) reside with someone, while 39.73% live independently. Summaries are given in Table 1.

3.3 | Description of the Variables

The survey includes two specific questions about the level of happiness, one about its perceived level before the COVID-19 pandemic and one, our dependent variable, about the change in the perceived happiness ('worsening', 'equal', 'improving') during the pandemic. Thus, to answer to $Q1$ we look at the estimated effects of the (endogenous) initial level of happiness before the COVID-19 pandemic. Of course, other variables and co-founders may play a role; thus, we extend our investigation to further research questions, as described in Section 2.

We feel that social relationships may have an impact on happiness during the hardest times of the pandemic, due to physical constraints imposed to contain the spread of the virus, and may influence individual feelings, like happiness. The survey includes two specific questions on these aspects: meeting friends and meeting family members, measured in terms of meeting frequency.

Similarly, we include two variables as proxies to capture the effects of religion and spirituality in the analysis. The first focuses on how the religion has been lived by people and formally measured by how often people attend religious ceremonies; the second, instead, relates to the spirituality itself and the faith in the religion, measured as trust into Church's dogma.

During the epidemic, timely decisions were necessary. Politics played a fundamental role in managing the epidemic and be the north star for the citizens. Similarly, medical practitioners and the health care system, in general, were under pressure and their work was crucial to save people's lives and reduce the impact of COVID-19 on day-life activities. We introduce three variables to measure the trust in the US President, the Political Parties and the Healthcare System to evaluate their impact on the perceived happiness (measured on a 1–10 scale).

4 | Methods

As we discussed in Section 2, the reasons why people feel happy and how the current epidemic changes their perception are complex and multidimensional. Thus, in a statistical analysis of

TABLE 1 | Summary statistics.

Variable	Freq.	Percent
Gender		
Female	624	51.57
Male	586	48.43
Living status		
Living with someone	700	60.27
Living alone	493	39.73
Employment situation		
Employed	733	62.22
Unemployed	191	16.21
Disable (not able to work)	83	7.06
Student	101	8.57
Retired	70	5.94
Education		
Primary	71	6.10
Lower secondary	59	5.07
Upper secondary	220	18.92
Tertiary	134	11.52
Graduate (i.e., bachelor degree, master)	541	46.52
Postgraduate (i.e., PhD)	138	11.87
Meet with friends		
More than once a week	320	26.80
Once a week	276	23.12
A few times a month (less than 4)	309	25.88
A few times a year	168	14.07
Never	61	5.10
I do not have friends	60	5.03
Meet with family		
More than once a week	375	31.38
Once a week	242	20.25
A few times a month (less than 4)	308	25.77
A few times a year	206	17.24
Never	49	4.10
I do not have family	15	1.26
Go to Church		
Every day	78	7.17
A few times a week	199	18.29
Once a week	253	23.25
A few times a month (less than 4 times)	121	11.12
A few times a year	180	16.54
Never	257	23.63
General trust		

(Continues)

TABLE 1 | (Continued)

Variable	Freq.	Percent
Other people can be trusted	288	24.39
It is better to be very careful	893	75.61
Variable	**Mean**	**Std.**
Age	40.92	13.58
Trust in President	5.5945	3.4829
Trust in Political Parties	5.185	2.7401
Trust in the Healthcare System	6.7826	2.649
Trust in Church	6.6602	3.0366

such a phenomenon, estimation bias is likely to occur due to omitted covariates and heterogeneity.

In this section, we propose a random effects model by defining an ordinal regression model, including a latent structure which accounts for both omitted covariates and unobserved heterogeneity, for the change of happiness due to the COVID-19 epidemic. The model tackles the clustered nature of the data (i.e., individuals are clustered in US States, sharing some common unobserved state-specific factors) along with an explicit treatment of endogeneity issues related to the initial happiness conditions before the COVID-19 epidemic, measured by a discrete-scale variable.

The model is presented in its general form and applied to the distribution of the change in the happiness during the COVID-19 lockdown to examine the extent to which individual characteristics affect this perceptions, also controlling for State-specific effects.

Let us introduce a random variable Y_{ij}, $i = 1, ..., I_j$, $j = 1, ..., J$, representing the change in the happiness for individual i in the US state j and taking values in a finite set $m = 1, ..., M$. In our context, the response variable takes the ordered values 'worsening', 'equal', 'improving', that is, $M = 3$. Let $\pi_{ijm} = \Pr(Y_{ij} = m)$ denote the probability that the ij-th response falls in the m-th category. Assuming that the response categories are mutually exclusive and exhaustive, we have $\sum_{m=1}^{M} \pi_{ijm} = 1$ for each i and j. Let us a consider a set of P covariates $x_{ij'} = \{x_{ij1}, ..., x_{ijP}\}$ and a further endogenous variable, Z_{ij}, representing the initial happiness level, to be included in the linear predictor for π_{ijm}. The simplest approach to ordered data is to model the the cumulative probability of the response being in a category higher than m:

$$\Pr(y_{ij} > m \mid x_{ij}, z_{ij}, u_j) = H\left(\sum_{p=1}^{P} x_{ijp}\beta_p + \alpha z_{ij} + u_j - \gamma_m\right), \tag{1}$$

where $\boldsymbol{\beta} = (\beta_1, ..., \beta_P)$ is a vector of regression parameters, α represents the effect of the endogenous variable, u_j a set of State-specific random effects, assumed to be drawn from a known parametric distribution, say $\mathcal{G}()$, and the cutpoints are $\gamma_1, ..., \gamma_{M-1}$. $H(\cdot)$ is the logistic cumulative distribution function that represents cumulative probability. In our parameterisation, a constant term is not directly included because its effect is absorbed into the cutpoints.

From Equation (1), we can derive the probability of observing category m as

$$\pi_{ijm} = \Pr(Y_{ij} = m \mid x_{ij}, z_{ij}, u_j, \boldsymbol{\gamma})$$

$$= \Pr\left(\gamma_{m-1} < \sum_{p=1}^{P} x_{ijp}\beta_p + \alpha z_{ij} + u_j + \epsilon_{ij} < \gamma_m\right)$$

$$= \Pr\left(\gamma_{m-1} - \sum_{p=1}^{P} x_{ijp}\beta_p - \alpha z_{ij} - u_j < \epsilon_{ij} < \gamma_m - \sum_{p=1}^{P} x_{ijp}\beta_p - \alpha z_{ij} - u_j\right)$$

$$= H\left(\gamma_m - \sum_{p=1}^{P} x_{ijp}\beta_p - \alpha z_{ij} - u_j\right) - H\left(\gamma_{m-1} - \sum_{p=1}^{P} x_{ijp}\beta_p - \alpha z_{ij} - u_j\right),$$

where $\gamma_0 = -\infty$, $\gamma_M = +\infty$, and the errors ϵ_{ij} are distributed as logistic and are independent of u_j.

Given the model assumptions, the likelihood function conditional on the endogenous variable can be written as follows:

$$L(\cdot \mid z_{ij}) = \prod_{j=1}^{J} \left\{ \int_{\mathcal{U}} \prod_{i=1}^{I_j} f(y_{ij} \mid x_{ij}, z_{ij}, u_j) d\mathcal{G}(u_j \mid z_{ij}) \right\}, \tag{2}$$

where $\mathcal{U}$ is the support for $\mathcal{G}(\cdot)$. As can be easily noticed, the likelihood is defined by integrating with respect to $\mathcal{G}(u_j \mid z_{ij})$; however, this term is unknown, and the parametric form of $g(u_j \mid z_{ij})$ may no longer be coherent with the adopted parametric distribution for the random effects. If the endogenous variable is independent of the random effects in the outcomes equations, we would have $\mathcal{G}(u_j \mid z_{ij}) = \mathcal{G}(u_j)$. However, if this is not the case, the dependence between the random effects and the selection variable should be explicitly taken into account. In fact, to integrate out with respect to $\mathcal{G}(u_j)$ rather than with respect to $\mathcal{G}(u_j \mid z_{ij})$ is likely to produce biased and inconsistent estimates, leading to wrong inferences, as proved, among others by Davidson and MacKinnon (1993). This is usually known in the literature as endogeneity bias. Hence the full likelihood is unavailable. We should estimate all model's parameters by maximising the conditional likelihood (2).

The Gaussian distribution is often taken for granted for the random effects distribution. Nevertheless, under Gaussian assumptions on random effects distribution, the marginal likelihood (2) cannot be written in closed form; to obtain maximum likelihood estimates, we need to adopt numerical integration techniques based on standard or adaptive Gaussian Quadrature (GQ, AGQ).

A more general appealing approach chosen in this paper is to leave $\mathcal{G}(\cdot)$ unspecified, and rely on the theory of nonparametric maximum likelihood (NPML; Lindsay 1983). As long as the likelihood is bounded, it is maximised with respect to $\mathcal{G}(\cdot)$ by at least a discrete distribution $\mathcal{G}_K(\cdot)$ with at most $K \leq J$ support points. The likelihood function can be then written as:

$$L(\cdot \mid z_{ij}) = \prod_{j=1}^{J} \left\{ \sum_{k=1}^{K} \prod_{i=1}^{I_j} f\left(y_{ij} \mid x_{ij}, z_{ij}, u_k \right) p_k(z_{ij}) \right\}, \tag{3}$$

where $p_k(z_{ij})$, with $k = 1, ..., K$, represents the distribution of the discrete random effects u_k, given the endogenous variable z_{ij}. Under the NPML, we allow for a quite general change in the random effect distribution due to the endogenous variable z_{ij}. Rather than using the so-called full shared parameter model (see e.g., Belloc, Maruotti, and Petrella 2011; Alfò and Aitkin 2006), that requires the specification of the joint distribution of the main outcome and the endogenous variable, here we consider an approximate conditional model (Follmann and Wu 1995), that is much easier to implement with minor efforts. Formally, we directly allow the locations and/or the masses of the random effects distribution to be a function of the endogenous variable Z_{ij}.

The basic idea is to re-express the conditional model we are dealing with, by modifying it under the hypothesis that the influence of Z_{ij} on U_j can be fully modelled as a simple location change of the U_j's. Roughly speaking, we have substituted the previous random effect, u_j, with the present one, say u_j^* using the relation:

$$U_j = U_j^* + E[U_j \mid Z_{ij}],$$

where we assume

$$E[U_j \mid Z_{ij}] = \alpha z_{ij}.$$

No matter what the distribution of the random effect and the chosen link function, the posterior expectation $E[U_j \mid Z_{ij}]$ is monotonic in the elements of the endogenous variable, as long as the distribution of this variable given the random effect is totally positive of order 2 (TP2; one class of densities that is TP2 is the exponential family).

An alternative and/or an extension to the approximate conditional modle is to consider a full conditional model where we further assume

$$\Pr(u_j = u_k \mid z_{ij}) = p_k(z_{ij}) = \frac{\exp(\delta_{0k} + \delta_{1k} z_{ij})}{1 + \sum_{k=1}^{K-1} \exp(\delta_{0k} + \delta_{1k} z_{ij})}. \tag{4}$$

Model selection criteria, like the Akaike information criterion or the Bayesian information criterion, can be used to select the best model, in terms of trade-off between model fitting and complexity.

Even if several, computationally and theoretically appealing, alternatives have been proposed (Verbeke et al. 2014), the use of discrete random effects, leading to the well-known finite mixtures model, have some significant advantages over other model specifications; first, the discrete nature of the estimate helps us to classify US states in clusters characterised by homogeneous values of random parameters. Second, since the locations and the corresponding probabilities are completely free to vary over the corresponding support, the proposed approach can readily accommodate extreme departures from the basic (homogeneous) model. The standard Expectation-Maximisation algorithm for finite mixtures applies. As a prerequisite for maximum likelihood estimation, we should assume that the mixture is identifiable, that is, that two sets of parameters which do not agree after permutation cannot yield the same mixture distribution. Finite mixtures of multinomial distributions are not identifiable; however, this result entails finite mixtures of multinomial distributions, but does not apply to the regression setting (Grün and Leisch 2008) discuss identifiability in random effects models for multinomial responses.

5 | Results

In model selection involving discrete random effects, an additional step is necessary due to the uncertain support of these distributions, requiring evaluation based on their goodness of fit. However, despite this complexity, numerous advantages offset these challenges. First, the random-effect model simplifies into a computationally manageable finite mixture model, allowing for easier likelihood function computation. Second, the approach sidesteps potentially incorrect and untestable parametric assumptions regarding the random effects' distribution. Third, the outcomes cluster into distinct latent classes, resembling typical process regimes, offering a clearer interpretability of the examined process. These benefits underscore the utility of discrete random effects despite the added selection intricacies.

Moreover, we would like to find a parsimonious model, where the effect of the endogenous model could be on the locations or masses only of the random effects distribution, rather than on both. Selecting the most suitable model involves considering various model selection criteria. AIC, defined as

$$\text{AIC} = -2 \times \log L + 2 \times \#\text{par},$$

balances model fit log-likelihood, $\log L$ against the number of parameters #par. Conversely,

$$\text{BIC} = -2 \times \log L + \#\text{par} \times \log(I),$$

introduces a stronger penalty for complexity #par than AIC, often favoring models with fewer parameters. Though AIC captures fit more flexibly, BIC tends to prioritise parsimonious models in most applications due to its emphasis on the penalty term. The choice between AIC and BIC relies on the trade-off between model complexity and goodness of fit. Accordingly, we compare several model specification and comment to the *best* according to the AIC/BIC criteria. In detail, we consider three different specifcations, following the modelling approach described in Section 4: a model where the endogenous variable affects the expected value (the locations) of the random effects

distribution only; a model where the endogenous variable affects the masses (the probabilities of the locations) of the random effects distribution only; a model where both the previous aspects are accounted for. According to both selection criteria we choose the approximate model where the endogenous variable affects the expected value (the locations) of the random effects distribution only with $K = 2$.

We comment on and summarise the results displayed in Table 2 referring to the research questions introduced in Section 2.

Result 1: The mandatory lockdowns have a negative effect on modifying the measure of happiness: if the initial level of happiness was very high, it is more likely that it has worsened as a result of the lockdown.

According to the World Happiness Report, which draws on data from the Gallup World Poll, global trends reveal a slight decline in life satisfaction. However, there has been a more significant drop in positive emotions, coupled with a noticeable increase in negative emotions (Helliwell et al. 2022). The work of Bonanno et al. (2010) leave no doubt that when people witness the occurrence of a national or global disaster, such as COVID-19, their mental and physical health and social relationships are negatively impacted (Bonanno et al. 2010).

A note of caution should be made on the nature of our data. Indeed the questions about the level of happiness *before* and *during* the lockdowns have been made at the same time during the lockdown (the question about the period before is retrospective) and this might bias the ability of the subjects to assess correctly the difference in the level of happiness with respect especially for those individuals who were particularly unhappy during the pandemic and who might thus particularly overestimate their level of happiness before the pandemic[2].

There are more potential contributing factors: individual experiences can vary widely based on personal circumstances, coping mechanisms, and the specific impacts of the lockdown on different aspects of life. Understanding these dynamics can help tailor interventions and support strategies to mitigate the negative effects of lockdowns on well-being.

Result 2: Having or not having social relationships did not affect the perception of happiness.

The second result of the present analysis states that the level of happiness is not a function of previous social relationships. At first glance, this result may be not in line with the literature, though mixed, on this aspect of happiness during the epidemic. For instance, it contrasts with the findings of Vargo et al. (2021), Giménez-Nadal, Molina, and Velilla (2020), who found that digital technology use during the COVID-19 pandemic, such as video communication platforms, helped individuals maintain social ties and adapt to restrictions, thus contributing to increased levels of happiness and social connectivity. Our finding, however, could be attributed to the adaptability of individuals in maintaining social connections despite physical restrictions. Throughout the pandemic, people utilised various communication tools and social networks to sustain relationships. Despite the absence of

TABLE 2 | Regression model (DV: Happiness change).

Variable	Coeff.	Std. Err.	*p*-value
Happiness before	**−0.5933**	**0.3767**	**0.0000**
Social relationships			
Meet with friends			
A few time a month		Benchmark	
More than once a week	−0.1671	0.2051	0.415
Once a week	−0.0286	0.1993	0.886
A few times a year	−0.1252	0.2223	0.573
Never	−0.0849	0.3828	0.824
I do not have friends	0.1065	0.3789	0.779
Meet with family			
A few time a month		Benchmark	
More than once a week	−0.0060	1.1968	0.976
Once a week	0.0582	0.2086	0.78
A few times a year	0.2004	0.2128	0.347
Never	−0.4522	0.6484	0.486
I do not have family	0.0414	0.4268	0.923
Religion			
Go to church			
A few time a month		Benchmark	
Every day	0.9654	0.3826	0.012
A few times a week	−0.1861	0.2422	0.442
Once a week	−0.2448	0.2671	0.359
A few time a year	−0.6969	0.2606	0.007
Never	−0.2421	0.2617	0.355
Trust in Church	0.0215	0.0338	0.524
Trust			
Trust in President	0.0846	0.0261	0.001
Trust in Political Parties	−0.006	0.3537	0.866
Trust in the Healthcare System	0.0255	0.0346	0.461
General Trust (Other people can be trusted)	−0.3982	0.1592	0.012
Demographics			
Gender (male)	0.2723	0.1426	0.056
Age	0.0227	0.0058	0.000
Living Alone	0.3380	0.1549	0.029
Unemployment	−0.3205	0.1628	0.049
Education (graduate or more)	0.1277	0.1494	0.392
Constant (γ_{11})	−2.1924	0.4444	0.000
Constant (γ_{12})	−0.9558	0.4393	0.030

in-person interaction, the ability to stay connected virtually likely played a crucial role in sustaining emotional bonds. Humans are inherently social beings, and the effort to maintain these relationships, albeit virtually, might have mitigated the impact of physical isolation on happiness (in line with Giménez-Nadal et al. (2020), where they examine well-being during joint and solo activities amidst COVID-19 lockdowns and highlights how shared activities contribute to immediate happiness, with notable gender differences (Vargo et al. 2021)). Moreover, the constant support and interaction, albeit through digital means, might have provided a sense of continuity and emotional connection, contributing to the stability of individuals' happiness levels during the challenging period of limited physical contact.

Result 3: The devout who attend Church more frequently are happier than those who go only a few times a month. At the same time, those who go only a few times a year have seen their happiness decrease compared to the benchmark.

Result 4: A high level of spirituality, measured in terms of trust in Church dogmas, does not increase perceived happiness.

Our analysis highlighted the significance of religious practices in individuals' happiness. Regular church attendance correlated strongly with increased happiness and social engagement, showcasing its fundamental support in fostering happiness. Amid the pandemic, as physical attendance at religious institutions became impractical, many communities transitioned to online religious services, enabling believers to stay connected and maintain their spiritual connection, which contributed to their happiness. In line with Bruni et al. many realities sought alternatives that allowed the faithful to attend Mass online and continue to stay close to God, thus making them happier (Bruni et al. 2022). Interestingly, our findings emphasised that the impact of religion on happiness stemmed more from attendance than mere belief. While belief in God or an afterlife exhibited only modest correlations with happiness, regular engagement with religious activities such as Bible reading, prayer, or identifying as 'born again' showed similarly modest effects, which were outweighed when considering church attendance. This suggests that supportive congregations and social relationships within religious communities play a pivotal role in boosting happiness as already noted by Ellison et al. (2001), who showed that regular religious involvement is linked to improved mental health and resilience against stress. The sense of continuity and emotional support provided by these communities contributes to stable happiness levels during challenging times (Ellison et al. 2001). Moreover, religious attendance has shown to foster positive perspectives on life, promoting psychological well-being, and providing social support and friendships similarly to Dunbar (2020), who examined how religious community engagement can influence well-being through social bonds and shared values (Stark and Finke 2000). However, the resistance of some religious institutions to comply with public health measures during the pandemic could exacerbate the spread of COVID-19, highlighting a conflict between theological beliefs and public health considerations. Overall, our analysis underscores the social and psychological benefits derived from active participation in religious congregations, showcasing their influential role in enhancing individuals' happiness and well-being, while also emphasising the potential conflicts between religious practices and public health guidelines during critical times like the COVID-19 pandemic.

Result 5: Individuals who express strong confidence in the US President tend to report higher levels of happiness.

Shockley-Zalabak and Morreale (2021) and Granados Samayoa et al. (2021) suggest low confidence in President Donald Trump during the initial phase of the COVID-19 outbreak. Shockley-Zalabak and Morreale document the public's divided perceptions of Trump's leadership, with many expressing scepticism towards his crisis management (Shockley-Zalabak and Morreale 2021). Similarly, Granados Samayoa et al. explore how trust in Trump versus trust in scientists influenced adherence to social distancing, finding that low trust in Trump correlated with greater compliance with safety measures (Granados Samayoa et al. 2021). Our analysis shows that, during the early stages of the pandemic, those who, by contrast, had high levels of trust in the US President reported greater happiness.

Confidence in a country's leader often reflects a sense of stability and trust in the government's ability to address societal challenges, as described by the well-known *rally-around-the-flag effect* (Lehrer et al. 2023). When individuals perceive effective leadership and governance, it can instill a sense of security and optimism about the future, which extends to interpersonal trust in unknown others (Esaiasson et al. 2021), positively influencing their happiness levels. This perception of effective governance can lead to a greater belief in the country's direction, contributing to a more positive outlook on life (Roccato et al. 2021) and, consequently, higher reported levels of happiness.

The polarisation around the figure of the President has an outsized effect on decision-making and the ability of him to set a direction that individuals will be willing to follow in times of crisis. When people believe in and support the decisions or actions of a leader, it can create a sense of alignment between personal values and government direction, contributing to a more contented mindset. Moreover, during challenging times like the COVID-19 pandemic, President Trump clearly fostered a sense of reassurance and guidance by a clear communicate, with the aim of positively influencing the perception of stability and hope, thereby impacting their happiness (though often neglecting the risks connected with the spread of the epidemic). Trust in institutions, epitomised in the United States by the figure of the President, plays a critical role in fostering social cohesion and promoting a positive psychological state (Poma, Pistoresi, and Giovinazzo 2023). This is particularly significant because trust, like other cultural traits, tends to endure over time (Bjørnskov 2007). Our findings are consistent with those of Lee (2022), who, although focusing on European institutions in general, reports an increase in well-being among individuals with high institutional trust (Lee 2022). This correlation is partly attributed to the expectation of governmental support to offset financial losses. Similarly, Bittmann's study in Germany aligns with our results, demonstrating that individuals with low institutional trust experienced a more pronounced decline in life satisfaction (Bittmann 2022).

Result 6: There is no effect of trusting in the Political Parties on the change of happiness during the pandemic.

The absence of an effect of trusting in Political Parties on the change of happiness during the pandemic might be due to mainly two reasons: the complexity of political trusts, that has lead to its decrease in the last decade (Hetherington and Rudolph 2008), and the shifts in political landscapes, often modified by the presence of a strong leadership, as the one by the US President.

Individuals might have nuanced views on Political Parties, making it challenging to pinpoint a direct effect on their happiness. Similarly, political landscapes often evolve, especially during crises like a pandemic. Trust in Political Parties might fluctuate or be reshaped based on government responses, policies, and public perceptions, making it challenging to establish a direct relationship with changes in happiness. Political trust is an important attitudinal indicator to assess the relationship with the political system. It can be conceptualised as an overall assessment of the functioning of the political system and the rules governing the conduct of political actors, as distinct from satisfaction with individual office holders (Easton and Framework 1965; Hooghe 2011). There is no doubt, however, that in recent decades political parties have become a weaker linking mechanism between citizens and the state in the United States and other advanced democracies, when analysed from the perspective of official membership data and active involvement of rank and file members (Dalton and Wattenberg 2000; Hooghe and Oser 2017). Furthermore, several empirical sources show that party identity has weakened in the United States in terms of a marked increase in those who identify as nonpartisan or independent (Stewart and Clarke 1998; Dalton and Weldon 2007). It is unclear, however, what this increased tendency towards nonpartisan identification implies for attitudinal ties between citizens and the political system, as trust in the political system in the United States has remained persistently low since the Great Society era (Hetherington and Rudolph 2008).

Result 7: There is no effect of trusting in the Healthcare System on the change of happiness during the pandemic.

The lack of an effect of trusting in the Healthcare System on the change of happiness during the pandemic might stem from previous experiences and perceptions about this Institution. Some people might trust it implicitly, while others might have concerns or negative experiences, leading to varied effects on their happiness levels. During a pandemic, individuals might be more concerned about economic stability or social support rather than solely relying on trust in the Healthcare System to influence their happiness. In summary, the surprising absence of a discernible effect of trusting in the Healthcare System could be attributed to the intricate nature of healthcare trust, the diversity of individual experiences, and the dominance of other pressing concerns that might overshadow the direct influence of Healthcare System trust on overall happiness levels. In fact, in the United States, the evident economic and social inequalities are clearly reflected in the healthcare system. The COVID-19 pandemic has exacerbated these disparities, particularly affecting vulnerable populations such as Black individuals and other communities who have faced barriers to healthcare access (Baker 2020). These inequalities highlight the shortcomings of the United States welfare model, which appears not to enhance individual happiness. This hypothesis aligns with research suggesting that the welfare state can influence well-being either positively or negatively, a dynamic that in the United States is likely driven by the limited inclusiveness of the healthcare system (Pacek and Radcliff 2008).

In addition to the previously mentioned results, which address our research questions, it is evident from Table 2 that several other variables have shown significant impacts on the happiness outcome: general trust, living alone, unemployment, gender and age. In normal circumstances, having a high level of trust in others (maybe fostered via high trust in Institutions caused by the pandemic, Esaiasson et al. 2021) is linked to greater happiness and well-being. However, the pandemic has brought about unique circumstances that may have caused individuals with high trust levels to feel less happy. First, for someone who typically trusts others, the pandemic may raise concerns about their own health and that of their family. The apprehension for one's own safety and the safety of loved ones can result in heightened anxiety and stress (Martínez Libano and Mercedes Yeomans 2021). Furthermore, individuals with a strong sense of trust may exhibit increased empathy and concern, not only for their immediate family and friends but also for others grappling with challenges during the pandemic. Additionally, the pandemic has introduced a lot of uncertainty and significant changes in people's lives, irrespective of their trust in others. Coping with these uncertainties and adapting to change can have an adverse effect on overall happiness. In summary, during the COVID-19 pandemic, mutual trust experienced a significant decline, with negative repercussions on individual happiness. Our research demonstrates that many individuals living alone experienced increased happiness, even without the typical sources of support such as emotional support, companionship, and shared experiences. They probably achieved this by staying connected virtually, engaging in social activities, and finding a sense of unity through mutual understanding and shared concerns related to the pandemic. The COVID-19 pandemic had a profound global impact on the economy and job market. This was particularly evident in the United States, where job losses reached levels comparable to those seen during the 2010 recession (Forsythe et al. 2020), resulting in a significant increase in long-term unemployment. States with high unemployment rates during the pandemic generally saw lower levels of happiness. Some studies suggest that unemployment impacts men more severely than women, particularly in terms of self-esteem, due to the loss of identity tied to work, and since self-esteem influences happiness, this can significantly affect overall well-being (Winkelmann and Winkelmann 1998; Clark 2003; Van der Meer and Wielers 2016). The pandemic has brought about a significant change in daily life, with many people being forced to work from home and face new challenges related to managing work, educating children, and household chores. These changes may have increased pressure on women, who are often more involved in domestic activities and childcare and have therefore experienced a decrease in happiness. On the other hand, men may have experienced a reduction in the pressure associated with their traditional roles and, as a result, have seen an increase in their well-being. Senior citizens have a wealth of life experience and a greater capacity to face challenges. This resilience can make them better equipped to adapt to difficult

circumstances and maintain a positive outlook. Older people probably have different expectations compared to younger generations and may have been less affected by the radical changes in daily life brought about by the pandemic, increasing their level of happiness (Gondek et al. 2024; Valérie-Anne, Dawid, and Marieke 2024).

6 | Conclusion

In navigating the tumultuous landscape of the COVID-19 pandemic, our exploration into the multifaceted realm of happiness unveils intricate connections among relationships, religion, trust, and individual well-being. Through our analysis, we've witnessed the intricate dance between various factors and their impact on perceived happiness during these unprecedented times.

The pandemic thrust societies into isolation, disrupting daily routines and challenging social fabrics. Contrary to initial assumptions, our findings suggest that living alone during lockdowns didn't universally diminish happiness; instead, it influenced individuals differently based on their initial happiness levels. Those who began with higher happiness saw a more pronounced decline, highlighting the nuanced effects of isolation.

Social relationships emerged as resilient pillars during the crisis, offering solace and support to many. Contrary to fears of strained relationships, our observations align with literature highlighting the strengthening of familial bonds amidst adversity. Partnerships proved pivotal, buffering pandemic-induced stress and fostering coping mechanisms, reinforcing the immense value of close connections in troubled times.

Religious practices and attendance during the pandemic revealed intriguing dynamics. While beliefs themselves had a modest correlation with happiness, active engagement through religious congregations significantly bolstered well-being. Churches adapting to virtual settings helped maintain spiritual connections, contributing to sustained levels of happiness among adherents.

Surprisingly, while trust in the US President correlated with higher happiness, faith in Political Parties or the Healthcare System didn't exhibit substantial effects on happiness levels during the pandemic. This disparity underscores the complexity of factors influencing individual happiness and the diverse sources from which individuals derive reassurance and contentment.

As we reflect on these nuanced insights, it becomes evident that happiness, a deeply individualistic and subjective experience, weaves a complex tapestry influenced by an array of socio-religious, relational, and political facets. Our study sheds light on the intricate interplay of these elements during a global crisis, emphasising the need for nuanced approaches in understanding and addressing well-being in extraordinary times.

The results of this study carry important implications for public health strategies and policy-making, particularly in preparing for future global crises. Governments, health authorities, and community leaders must prioritise building trust in themselves, as this enhances compliance with regulations and can foster trust in others, ultimately contributing to improved happiness. Additionally, social connectedness should be promoted as it has been proven to protect both mental and emotional well-being during prolonged periods of social restrictions. Furthermore, they should carefully assess the effectiveness of milder lockdown measures to reduce their impact on overall happiness, ensuring that restrictions are proportionate and less damaging to psychological well-being.

This research also highlights the critical role that virtual platforms can play—not only in maintaining social bonds but also in sustaining religious and community engagement, which should be actively strengthened and expanded. These platforms have the potential to mitigate the negative psychological effects of isolation, particularly for vulnerable groups. Enhancing their accessibility and functionality can provide essential support, allowing individuals to stay connected and engaged, thereby reducing feelings of loneliness and improving overall well-being during crises.

Moreover, the importance of transparent and consistent communication from public institutions cannot be overstated. Trust in institutions acts as a crucial buffer against the psychological toll of crises, making it essential that authorities communicate clearly, truthfully, and frequently. This transparency fosters a sense of security and reliability, which helps alleviate anxiety and fear in uncertain times. In addition, tailored communication strategies that resonate with diverse demographic groups could further strengthen trust and engagement.

Ethics Statement

The authors have nothing to report.

Data Availability Statement

The data can be accessed upon request, subject to the authors' approval.

Endnotes

[1]On 13 March 2020, President Trump declared a national state of emergency in the United States. Subsequently, Governors across various states implemented diverse and time-variable restrictive measures. For instance, California (on March 19), New York (on March 20), Michigan (on March 24), and Pennsylvania (on April 1).

[2]We thank an anonymous referee for pointing this out.

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