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RELIGION, COVID-19 AND MENTAL HEALTH

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MACROECONOMICS AND GROWTH

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RELIGION, COVID-19 AND MENTAL HEALTH

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Religion, Covid-19 and Mental Health *

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Abstract

Covid-19 and the resulting lockdowns affected various aspects of people's lives, including their mental health. Recent literature suggests a causal link between religiosity and mental health. Using data from an online survey, we investigate the role of religiosity in mediating the effect of Covid-19 on mental health. From February–March 2021, we conducted online surveys in the USA among 5178 individuals. These surveys elicited responses on (i) the incidence of Covid-19 infections among the respondents or their immediate social networks, (ii) religious beliefs and practices, and (iii) mental health. Employing the CES-D scale, which tests for depression in clinical settings, we find that while the incidence of a Covid-19 infection is associated with significantly worse mental health, this negative association is significantly smaller for religious people. We posit that the mental health benefits of being religious emanate from the ability to participate in religious activities. Indeed, the ameliorative effect of religion is higher in low-strictness counties, where Covid-related lockdown policies were enforced less strictly, but not in high-strictness counties. We also document an increased uptake of online religious services, a substitute for in-person religious gatherings during the lockdown. Crucially, the ability to attend online religious services weakens the association between Covid-19 and worse mental health.

JEL Codes: L14, E23, E32

Keywords: Religion, Religiosity, Mental health, Covid-19, Pandemics

1 Introduction

The Covid-19 pandemic and the measures are taken to control its spread affected people's lives in multiple ways. An important negative consequence of the pandemic was the significant worsening of mental health across the world. Studies have found evidence of worsening mental health in the US, UK, Canada, Germany, and China, among others (Adams-Prassl et al., 2022; Banks and Xu, 2020; Armbruster and Klotzbücher, 2020; Beland et al., 2022; Wang et al., 2020). Most of these studies focus on the negative consequences of lockdowns, however, some studies also show the effect of actually contracting Covid-19 oneself, or having people around oneself catch the disease (Renaud-Charest et al., 2021; Saracoglu et al., 2020). Studies also look at various demographic factors that mediate this effect of Covid-19 on mental health including gender, ethnicity, age, income, and employment (Etheridge and Spantig, 2020; Proto and Quintana-Domeque, 2021; Bhatia, 2020; Adams-Prassl et al., 2022). In this paper, we investigate how religiosity mediates the effect of Covid-19 on mental health.

Religion is widely prevalent globally. The Pew Research Center found eight in ten people identify with a religious group (Hackett et al., 2012). Nearly 65% of Americans believe religion plays a significant role in their daily lives (Crabtree, 2010; Newport, 2015).[1] Religiosity and mental health have been studied in various contexts. In economics, a recent study by Fruehwirth et al. (2019) establishes a causal relationship between religion and mental health, finding that an increase in religiosity decreases the probability of being depressed in adolescents. Hence, it is conceivable that religiosity would play a role in how Covid-19 affected people's mental health.

The pandemic and subsequent restrictions on religious congregations have also led to a change in religious practices. A Pew Research Center survey in 2020 found that more Americans, compared to other economically developed countries, increased their religious faith during the Covid-19 outbreak (Sahgal and Connaughton, 2021). Approximately three in ten American adults stated that the pandemic had increased their religiosity. Over half of all Americans prayed to God to end the Covid-19 outbreak (Sahgal and Connaughton, 2021). At the same time, public health measures, such as lockdowns and social distancing, significantly limit the ability of religious groups to assemble regularly at places of worship.

This paper analyzes the relationship between Covid-19 incidence in an individual's social network on their mental health and the role of religiosity in this relationship. We do so by conducting a survey of 5178 individuals in the United States between February and March 2021. The survey sample was designed to broadly

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[1]36% of Americans attend a religious service weekly (PewForum 2021).

reflect the distribution of demographic characteristics like age, gender, income, education, and religion. Respondents answered questions about the incidence of Covid-19 in their immediate social network. They also answered a standard questionnaire designed to elicit their mental health on the Centre for Epidemiological Studies Depression scale, or the CES-D scale. Additionally, they also answered questions about their past and current religious activities, which were used to create an index of pre-Covid religiosity including elements of religious belief as well as those of religious practice.

We first find that almost half of our respondents who reported an incidence of Covid-19 among themselves, family, or friends had worse mental health than those who did not, controlling for various demographic and environmental variables. This finding is in line with previous studies and the size of the effect is comparable to the difference between employed and unemployed individuals. We also find that religious people, on average, have better mental health than non-religious people. And finally, we find that the negative association between Covid-19 and mental health is much smaller for religious people. We find that the worsening of mental health associated with Covid-19 was around 60% higher for non-religious individuals compared to individuals with similar characteristics having average levels of religiosity.

We find that the benefits of religiosity are mainly attributable to religious attendance and not to belief and prayer. We also show that a loss of access to in-person religious activities due to Covid-19 induced social restrictions could have inhibited the potential gains. We compare counties where government policies towards Covid-19 were less strictly enforced compared to more strict counties and find that the positive associations between religiosity and mental health are only observed in the low-strictness counties.

We also document a high uptake of virtual religious services during the lockdown, suggesting that individuals substituted in-person religious gatherings with online religious interactions. Indeed, we find access to online religious activities reduces the negative association between Covid-19 and mental health.

We qualify our key results by emphasizing that these findings are correlational; we do not make any causal claims. We contribute to two strands of literature.

First, we add to the growing literature on the effect of the pandemic on mental health. Most of the studies have looked at the effect of mobility restriction on mental health. As we have data on the incidence of Covid-19 on the respondents and their social network, we are able to demonstrate an association between the incidence of Covid-19 and worse mental health.

Second, we contribute to the understanding of the role that religion plays in determining mental health. Given the unique context of the pandemic, we are able

to show not only that religious people have better mental health overall, as other studies have done, but that religiosity is able to mitigate some of the negative effects of Covid-19 incidence.

The next section presents a review of the literature linking religiosity to mental health. Section 3 describes the online survey that the study draws on. Section 4 describes the data used, both from the survey as well as from other secondary sources. Section 5 presents the empirical specification and the results. Section 6 concludes.

2 Why Should Religiosity Matter for Mental Health During a Pandemic?

The relationship between religiosity and mental health has been examined in various fields like psychology, sociology, neurobiology, and economics (see Iyer and Rosso, 2022 for details). Traditionally, psychologists have argued that religion enhances irrational beliefs (Ellis and Murray, 1985) and neurotic defenses (Freud et al., 2012), thus ultimately negatively impacting mental health. Early empirical studies supported this idea (e.g., Martin and Nichols, 1962). However, the recent literature has reported positive and negative mental health implications of religion, where the effect varies depending upon the type of religion (Pargament, 2002; Koenig and Larson, 2001) and other factors. This existing literature has conceptual and methodological limitations (Williams et al., 1991) as most studies use cross-section designs, making it challenging to detect causal relationships. Some argue that researchers have paid insufficient attention to the foundational processes by which religion can affect health status and the measurement of the religious variable itself (Williams et al., 1991). The psychological literature has thus yet to reach a consensus on this matter.

A growing body of literature in sociology views religion as both a resource and a schema (Schnabel and Schieman, 2021). In addition to being a source of comfort, religion provides a social structure through which people view the world via a set of norms and teachings (Ammerman, 2020; Ogland and Bartkowski, 2014). Emerging research regarding the Covid-19 outbreak has indicated that more religious Americans, especially Evangelicals, experienced less distress than secular Americans (Schnabel and Schieman, 2021). Recent literature regarding subgroups within the U.S. suggests that religion may be a coping mechanism during the Covid-19 pandemic (Pirutinsky et al., 2020). This strand of literature complements the body of economic research, which has discussed the religious coping hypothesis and its buffering effects (Fruehwirth, Iyer, and Zhang (2019)).

Sociological research has also indicated that social support protects against adverse mental health (Cohen and Wills, 1985; Szkody and Mckinney, 2019). The belonging hypothesis (Taylor et al., 2012) and the evolutionary theory of loneliness (Cacioppo et al., 2006) posit that humans are social creatures and create support networks to protect themselves from external factors. Research emerging from past pandemics, such as Ebola and HIV/AIDS, found that social support was associated with lower rates of mental health complications (Oppong Asante, 2012; Chew et al., 2020). There was also an increase in worry and fear during the Covid-19 pandemic (Mertens et al., 2020). Simultaneously, social distancing requirements limited the availability of social support. Recent studies have found that Covid-19-induced worry is associated with depression and anxiety in adult students (Liu et al., 2020). Further, perceived or received social support is associated with higher psychological health (Szkody et al., 2021). Our study, therefore, also contributes to this literature which is interested in the mental health implications of reduced social support networks during Covid-19 enforced restrictions.

Neurobiological studies have highlighted an inverse association between religiosity and depression. Miller et al. (2014) used cortical thickness measurements to find that religious individual had a lower depression risk. The frequency of church attendance was not associated with cortical thickness. Rather, after controlling for personal importance, the individuals who attended religious services were at an increased risk for depression. This implied that some participants might attend religious services to manage depressive symptoms. Hence, religion's positive effects may be due to a combination of extrinsic and intrinsic practices (Fletcher and Kumar, 2014). The economic (Bentzen, 2019) and neurobiological findings (Miller et al., 2014) align.

Since Azzi and Ehrenberg (1975), the economics of religion has grown into a significant body of research (Iannaccone, 1998; Iyer, 2016). This recent and growing literature illustrates the connection between religiosity and a range of social behaviours (Ellison, 1994; Iannaccone, 1998; Berman, 2000; Hungerman, 2020; Becker and Woessmann, 2018). One of the early studies of the economics of religious participation modeled participation in church activities based on the idea that people derive enjoyment from church activities (Azzi and Ehrenberg, 1975). More recent studies have focused on the outcomes of religious participation (Dehejia et al., 2007). In particular, there is a large body of literature that analyses the correlation between religious participation and well-being (Diener et al., 1999, Pargament, 2002, Smith et al., 2003). Religious organizations provide ex-post insurance for individuals affected by negative events. For example, individuals impacted by the Asian financial crisis were more likely to increase their religious participation (Chen, 2010). This finding also aligns with the literature that sug-

gests religious participation provides comfort after an adverse shock (Chen, 2010; Auriol et al., 2020). The Covid-19 pandemic and subsequent restrictions have led to a focus on mental health studies. In particular, there is emerging literature concerning the increase in religiosity and aspects such as pro-sociality (Bentzen, 2020; Caicedo et al., 2021).

Religion and mental health have been a particular focus of interest (see Iyer and Rosso, 2022 for a recent overview of this field). For example, Fruehwirth, Iyer, and Zhang (2019) provides a causal relationship between religiosity and depression. Using peer religiosity to predict an individual's religiosity, they find a one standard deviation increase in religiosity decreases the probability of being depressed by 11%. Further, more depressed individuals benefit more from religiosity than less depressed individuals. There is a limited amount of economic research regarding causal links between religiosity and a range of social behaviors (Hungerman, 2020). In addition, many studies in sociology and psychology focus on correlation rather than causality.

Religiosity may help deal with depression through the provision of coping mechanisms. The literature has emphasized the religious coping hypothesis (Bentzen, 2019). This dates back to Marx and Freud, who suggested that in times of hardship, all religions provide individuals with a higher power that provides comfort (Clark, 1958). There is also evidence to suggest that people turn to religion in times of crisis. After the 9/11 attacks, nine out of 10 Americans coped with their distress by turning to religion (Schuster et al., 2001). During Covid-19, Google searches for prayer increased to record-breaking levels (Bentzen, 2020). Over half of the global population prayed to end the pandemic (Bentzen, 2020). Not only did people resort to prayer during the pandemic as an alternative means of practicing religion, but the demand for religion also increased. This finding indicated that we use religion to cope with adversity (Bentzen, 2020). In our study, around 60% of the respondents accessed one or more forms of contactless religious services. We also test whether individuals from counties that allowed religious gatherings during lockdowns had better mental health outcomes relative to individuals from places that did not make such an exception.

Religion provides coping mechanisms during pandemics in various ways. First, people do not have to be hit directly by the negative shock to increase their religiosity. Second, religion is more often used as a coping mechanism when the event is unpredictable (Pargament, 2002; Bjorck and Cohen, 1993; Smith et al., 2000). This finding has particular relevance in an epidemic as health events favor emotion-focused coping (Folkman and Lazarus, 1980). Third, intrinsic religiosity is favored over extrinsic religiosity when dealing with adversity (Bentzen, 2020). Among 100 adults dealing with stressful events, the most common coping strategies were found

to be faith in God, gaining strength in God, and prayer. Church participation was less frequently noted (Koenig et al., 1998). We thus examine whether the inability to attend church during the Covid-19 restrictions negatively affected mental health or whether the continued ability to practice intrinsic religiosity mitigated this potential impact. We consider mechanisms through which differential effects on religious individuals may have occurred, with one possibility being the lack of access to physical communal gatherings.

Some studies of religiosity and shocks do suggest a causal link. For example, Cesur et al. (2020) study the causal impact of war deployments on religion and conclude that religiosity may increase mental health through the provision of social support networks, counseling sessions, and regular prayer groups. They exploit the lottery mechanism, which allocates soldiers to specific regions to establish causality. Recent literature has also shown a causal relationship between religious association and the formation of social ties (Murphy et al., 2019).

We also explore whether religiosity contributes to enhanced well-being through religious buffering (Sibley and Bulbulia, 2012). A psychological resource such as religion can "buffer" the effects of stress on health (Williams et al., 1991). Religion salience and spiritual help-seeking, in contrast to attendance at religious events, have been found to have a stress-buffering effect (Schnittker, 2001). This may be due to reduced exposure to stressors (Ellison and Henderson, 2011). A small body of research considers whether religiosity exacerbates the adverse effects of some types of stressors (Ellison et al., 2001).

Overall, there is a growing literature that explores the effect of religiosity on mental health, and how the links between religion and mental health have played out in the context of the recent Covid-19 pandemic.

3 The Survey

We conducted an online survey targeting about 5000 respondents in the US during February and March 2021. We implemented the survey through Qualtrics, which is a leading online survey platform. Figure 1 shows the spatial distribution of the survey respondents across US states and counties.

Figure 1: Distribution of respondents over US states and counties
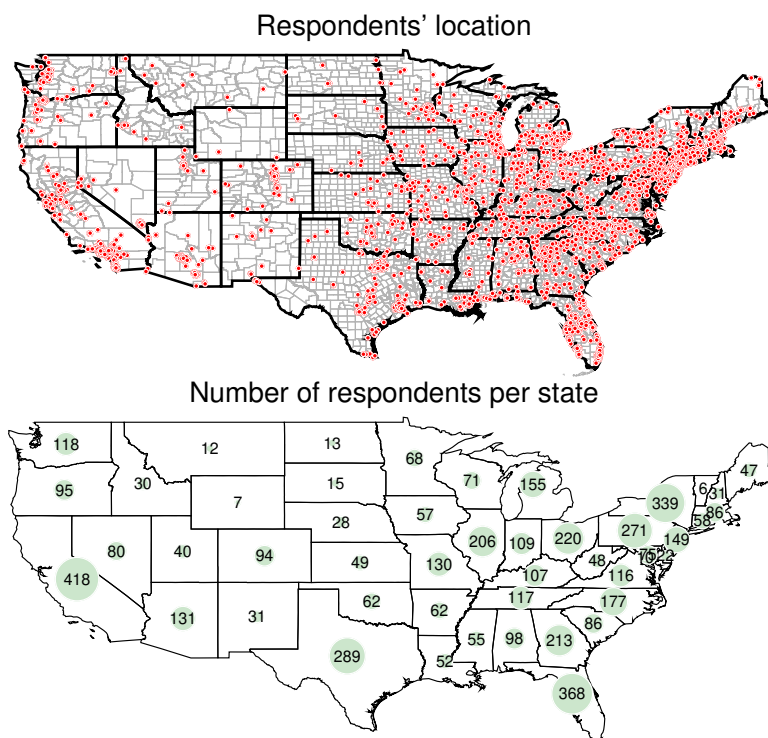
3.1 Sample

To make the survey representative of the US population, we defined three core quotas based on the age, gender, and region (location) of respondents. As table 1 shows, the distribution of our survey respondents very closely matches the population distribution (taken from the US census website) on these three dimensions. Beyond the core quotas, we further aimed to achieve representativeness of the sample based on income, education, and religion. The latter three quotas were a natural fallout based on age, gender, and region quotas. Nonetheless, the distribution of the sample collected on income, education, and religion again closely matches the respective population distributions.

Table 1: Representativeness of the survey respondents

Variable	Groups	Population distribution	Target respondents	Actual respondents
Age	18-24	13.0%	650	676
	25-34	19.0%	950	987
	35-44	18.0%	900	936
	45-54	19.0%	950	970
	55-64	17.0%	850	882
	65+	14.0%	700	728
Gender	Female	51%	2550	2652
	Male	49%	2450	2508
	Other	.	.	19
Region	Midwest	21%	1067	1121
	Northeast	18%	901	1009
	South	37%	1864	1958
	West	23%	1091	1169
Income*	$0-$25k	43%	1760	2150
	$25k-$50k	27%	1500	1514
	$50k-$75k	14%	700	845
	$75k-$100k	7%	350	448
	$100k+	9%	450	612
Education*	Less than HS	10%	251	500
	High School	29%	1450	1581
	Some College	26%	1300	1639
	Bachelors	21%	1050	1143
	Advanced Degree	13%	565	650
Religion*	Protestant	47%	2310	2350
	Catholic	21%	1050	1069
	Jewish	2%	100	114
	Mormon	2%	43	100
	Muslim	1%	50	57
	Other religion	4%	200	238
	No religion	23%	1300	1348

Notes: All population figures were taken from the US Census website (https://www.census.gov/). **Midwest**: IL, IN, IA, KS, MI, MN, MO, NE, ND, OH, SD, WI. **Northeast**: ME, MA, NH, NJ, NY, PA, RI, VT, CT. **South**: AL, AR, DE, DC, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV. **West**: AZ, CA, CO, ID, MT, NV, NM, OR, UT, WA, WY. Income is annual individual income. *Income, education, and religion quotas were natural fallout based on the age, gender, and region quotas.

Table 2: The survey sections

Sl. no.	Section	Nature of questions
1)	Introduction	Information about the survey and consent
2)	Demographics	Sex, age, race, education, income, Covid, etc.
3)	Religion	Respondents' religious identity (if applicable)
4)	Religiosity	The importance of religion (if applicable)
5)	Mental health	The CES-D questionnaire

Notes: To avoid any order effect in responses, the orders of the religiosity and mental health sections were randomized.

3.2 Questionnaire

As table 2 shows, our (online) survey had five sections. The introduction contained basic information about the nature of the survey and obtained consent from the survey respondents to record their responses. The second section, on demographics, asked questions on respondents' sex, age, race, location (state and county), employment status, annual income, level of education, marital status, and the number of household members. In addition, the demographics section also contained the following question on Covid-19:

> *Have you or anyone you know been infected with Covid-19? Please tick all that apply.*
> ☐ *Yes, myself*
> ☐ *Yes, my immediate family member(s)*
> ☐ *Yes, my close friend(s)*
> ☐ *Yes, member(s) of my religious congregation*
> ☐ *No*

Section 3 asks about the respondent's religion with the following options: i) Baha'i, ii) Buddhist, iii) Christian, iv) Hindu, v) Islam, vi) Jewish, vii) Other Religion, or viii) No religion. In case the respondent is a Christian, we further ask about the religious denomination (viz. Catholic, Baptist, among other 19 denominations). Section 3 also asks for the name and location of the respondent's regular place of worship (if applicable).

The last two sections of the survey are on religiosity and mental health. The section on religiosity asks questions on four aspects: the importance of religion, frequency of prayer, frequency of attending religious service, and frequency of attending other religious activities (see Figure A.1). We take this formulation of eliciting religiosity from Fruehwirth, Iyer, and Zhang (2019), which, as a paper looking at the effect of religiosity on mental health, is the closest to our study. We ask these

questions for both the present time, as well as the time before Covid-19. The past religiosity responses will be colored by recall bias but are important to get around potential reverse causality.

The mental health section contains a Center for Epidemiological Studies Depression (CES-D) scale questionnaire that asks how the respondent felt during the last one month from the date of the survey. Figure A.2 lists all questions in the mental health section. CES-D is a widely used measure of mental health first introduced by Radloff (1977). We use the same version of the questionnaire as used in Fruehwirth et al. (2019).

To avoid any order effect in responses, the orders of the religiosity and mental health sections were randomized. That is, roughly half of the respondents answered the religiosity section before answering the mental health questionnaire and the other half answered the mental health section first.

3.3 Quality checks

The survey platform conducts a data review and scrub at 80% of the target (approximately at 4000 individuals) and once again at 100% of this target. The data review involves the following checks.

i) **Flatlining**: Inevitably, there are respondents who do not pay attention to survey questions. Based on the feedback from Qualtrics, such respondents are likely to click the same answer option across the entire matrix. To collect quality responses, we implement a "flat-liner" check for the two mental health questions (see figure A.2). If, for example, respondents select all 'Never/Rarely' across all questions, then their survey is terminated and these responses are not recorded.

ii) **Location/IP address**: The survey platform uses a GeoIP screener to ensure only respondents from the US are able to enter the survey. The screener uses a combination of the longitude, latitude, and IP address of the survey respondent.

iii) **Time spent on survey (speeding and inattention)**: Before implementing the survey, we conducted a "soft launch". The soft launch provides us with a range of response times across all participants. For the actual survey, we set up a speeder check and exclude responses that complete the survey in less than 1/3 of the median duration of the soft launch data.

3.4 Voices from the Survey

In conducting a survey of this kind, the main focus as described above was on our quantitative findings. However, at the end of the survey, respondents were given the opportunity to reflect on the survey if they wished to do so or to offer any remarks on it. Over 50 percent of respondents did comment and what they had to say casts interesting insight into the interactions between religion, Covid-19, and mental health as it occurred during the pandemic.

A few points to note in the survey responses is that nearly 50 percent of the respondents typed something in. Some are irrelevant responses like "no", "good", "thanks", etc. In total, there were 36 responses that provide important information either conforming to our narrative, against it or suggesting how other factors may be affecting people's mental health. A common comment was that non-religious people felt that this survey was not relevant to them and many questions did not have a N/A option when they should. If we assume this issue was also representative of respondents that did not give any comments, then we acknowledge that this may increase the noise/error in our survey. Our estimates may still be unbiased, but we do recognize this as a source of measurement error. Another dominant comment was that there is a difference between being religious and spiritual. Other comments suggested other (confounding) issues: people were low-income earners, there were other events/issues that were affecting mental health (nothing related to religion), recall bias, and so forth.

One of the most poignant comments came from a respondent who said 'I miss going to church and to church-related activities. Used to be a big part of my life. Besides worshiping God, let's not forget that going to church is a social activity, and of course, that's going to be felt under lockdown. People are lonelier now, and not attending church is a big part of that. Sad.' Others wrote about how the pandemic affected their church's activities: 'I have seen that religious services have been impacted by Covid-19 with cancelled in-person service with short notice or the inability to conduct fundraising.'

There was general support for our survey: 'It's an important survey, most people will experience some trauma, PTSD, during the past months.' Another respondent opined: 'Interesting and thought-provoking. I do not attend any type of religious services, as I am spiritual and believe in God. I am not Christian or any other organized religion, cult, etc.'

Others were not as sanguine: 'Unless I was deluded enough to believe Covid-19 was a plague delivered by God, what does religion even have to do with this pandemic?' In contrast, another respondent commented: 'This was an interesting survey. I didn't realize how depressed I felt during the pandemic—and still do —

until I completed this survey.'

Some were clear that it was right for churches to close during the pandemic: 'I don't think churches should be open at all. Virtual until the pandemic is over. No excuses.' Another suggested that not all churches were completely closed during the lockdown, which is in itself a reflection of whether government guidelines were being followed and the strictness of lockdowns: 'Nope, we are part open in our area but continue to do services online, and religious celebrations online.' A second confirmed: 'Many of the churches here never closed/fully switched to virtual meetings.' Others confirmed the importance of virtual services: 'I am only doing virtual church worship, but worship is not limited to a building.' Another respondent concurred: 'I do not attend proper religious services online, but I do expose myself to religious media such as music or virtual sermons.'

The qualitative evidence seems to suggest that respondents were appreciative of the survey and did think carefully about the interactions between religion, mental health, and the pandemic. There was also some support for using virtual services during the pandemic and beyond, although the extent to which all churches followed lockdown rules is debatable.

4 Data

We use data from the survey described in Section 3 to generate our primary variables of interest: Covid-19 incidence, mental health, and religiosity, along with other socio-economic attributes. After discarding incomplete responses, we have a sample of 4980 individuals which we will be using for the analysis for the rest of the paper. We supplement this with county-level secondary data on important variables like past mental health, Covid-19 incidence rates, and lockdown strictness.

4.1 Key variables

Mental health: We construct a measure for mental health using the Center for Epidemiologic Studies Depression Scale (CES-D). The responses to the 19 questions in this section are simply aggregated, to generate a score ranging from 0 to 57. A higher *CES-D score* indicates worse mental health.

Religiosity: Our survey provides information on four aspects of religiosity: the importance of religion, frequency of praying, frequency of attending religious service, and frequency of attending other religious activities. Each sub-measure of religiosity is measured on a scale of 0-3 or 0-4. Following Fruehwirth et al. (2019), we aggregate the responses on these four dimensions to generate the variable *Religiosity* which ranges from 0 to 13. Since it is possible that religiosity changed

during the pandemic, we collect both *past* (before Covid-19) and present religiosity. For the rest of the analysis, we will use measures of past religiosity only, in order to avoid potential reverse causality.

Covid-19 incidence: We know from the survey if Covid-19 was contracted by any of the following: the respondent themselves, their family, their friends, and their religious congregation. We construct the dummy variable *Covid* which takes the value 1 if the respondent reported anyone in these four categories of people as having contracted Covid-19.

4.2 Summary Statistics

Table 3 has the summary statistics of CES-D score, Covid, and Religiosity variables, along with some key demographic variables, for the whole sample. On the 57-point scale of CES-D score, the mean score of the respondents was around 20. Around half of the respondents themselves or someone in their social network had contracted Covid-19.

Table 3: Summary Statistics (Whole Sample)

Variable	Mean	SD	Median	Min	Max	Obs
CES-D	20.54	12.18	20.00	0.00	57.00	4980
Religiosity	6.40	4.18	7.00	0.00	13.00	4980
Covid	0.49	0.50	0.00	0.00	1.00	4980
Age	44.91	16.50	44.00	18.00	93.00	4980
Male	0.48	0.50	0.00	0.00	1.00	4980
Employed	0.51	0.50	1.00	0.00	1.00	4980

[1] CES-D (Center for Epidemiologic Studies - Depression) is a 20-item measure assessing symptoms of depression. Covid is equal to one if anyone in the respondent's social network, including themselves, had contracted Covid-19

Figure 2: Distributions of key demographic variables of the survey
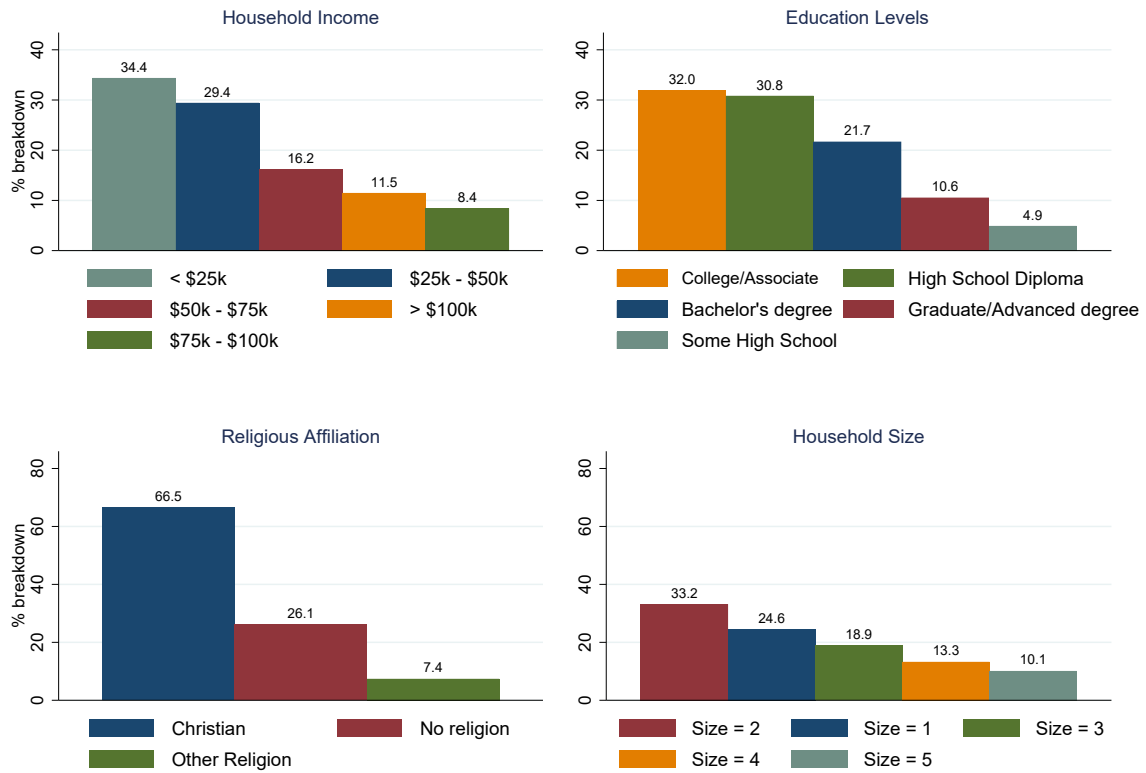
Notes: The above graph plots the breakdown of the values of some categorical variables used in our survey. In the Religious Affiliation graph, Other Religion include — Baha'i, Buddhist, Hindu, Islam, and Jewish.

Figure 2 shows the distribution of some categorical variables, and Table 4 shows the summary statistics of the key variables, by groups based on sex, race, and religiosity. Keeping in mind that lower CES-D scores imply better mental health, we find that men have better health than women. Similarly, "whites" have better mental health than "nonwhites" in our sample. A key motivation for the paper stems from the following observation: although respondents with high religiosity respondents have 10 percentage points more people in their social network that have contracted Covid-19 compared to low religious respondents, they have better mental health than non-religious respondents.

Table 4: Summary Statistics (By Group)

| | Gender | | | | Race | | | | Religiosity | | | |
| | Male | | Female | | White | | Nonwhite | | High | | Low | |
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CES-D	19.17	11.89	21.80[+]	12.31	20.18	12.35	21.85[+]	11.48	19.98	12.16	21.14[+]	12.19
Religiosity	6.23	4.31	6.55	4.06	6.26	4.20	6.90[+]	4.08	9.87	2.05	2.73[+]	2.30
Covid	0.47	0.50	0.51[+]	0.50	0.50	0.50	0.47	0.50	0.54	0.50	0.44[+]	0.50
Age	44.51	16.58	45.28	16.42	47.12	16.20	36.96[+]	15.05	46.00	16.05	43.76[+]	16.89
Employed	0.58	0.49	0.44[+]	0.50	0.49	0.50	0.56[+]	0.50	0.54	0.50	0.48[+]	0.50
Obs	*N=2387*		*N=2593*		*N=3894*		*N=1086*		*N=2560*		*N=2420*	

[1] Male, Female, White, Nonwhite, High, and Low are all binary variables. Religiosity High and Low are dummies based on above and below mean religiosity values respectively.

[+] Indicates a significant t-test at 1% on the means of the analogous group

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4.3 County-level controls

We use our primary survey data, supplemented with multiple states and county-level measures mentioned in the previous section:

Lockdown Strictness Measures: We use Google COVID-19 Community Mobility Reports[2] as the data for calculating lockdown strictness measure. We construct county-level strictness dummies based on Global Positioning System (GPS) data of time spent away from home. The baseline for the Google reports is median values, for the corresponding day of the week, during the 5-week period January 3 – February 6, 2020. We aggregate the number of days (compared to the baseline) that the time spent away from home was beyond a threshold i.e. if the median difference was more than 20%. This can be considered as the number of *high-strictness-days*. We aggregate the high-strictness-days till January 2021, and strictness dummies are constructed from above and below median values of the aggregated high-strictness days.

Figure 3: Lockdown Strictness of US counties
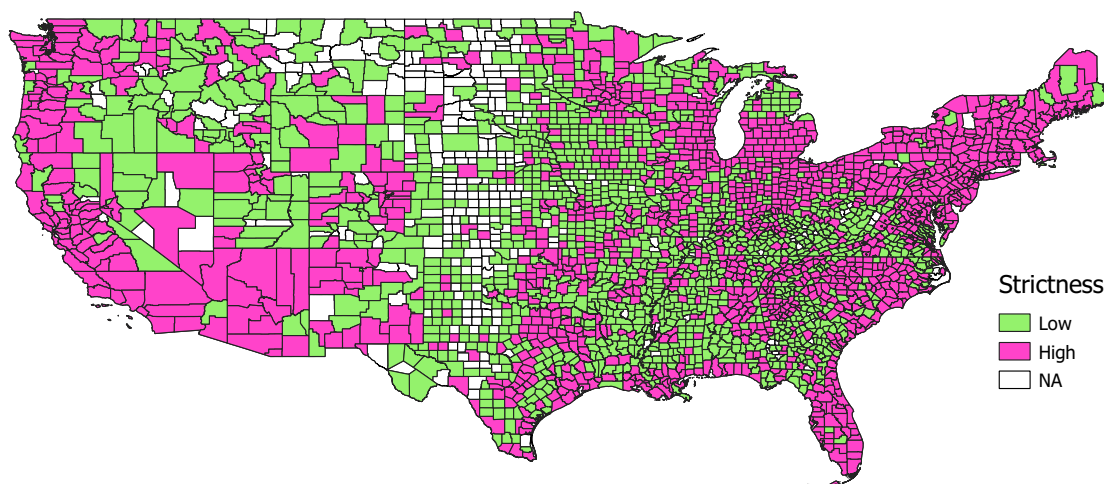
As an alternative measure of strictness, we use data on the stay-at-home orders issued in each county. This is not our preferred measure as data is not available for all counties. However, our results remain robust to this measure as well, presented in Appendix D.

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[2]https://www.google.com/covid19/mobility/

Mentally Unhealthy Days (MUD): In order to account for the past mental health of counties, we obtained mental health data from the 2019 County Health Rankings, University of Wisconsin Population Health Institute. The reliability of this data is high since it is based on the Centers for Disease Control and Prevention (CDC)[3] Behavioral Risk Factor Surveillance System (BRFSS) survey[4]. The exact question asked was *"Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?"*. The survey has over 400,000 responses that are provided as county-level estimates. Figure 4 plots MUD at the county level.

Figure 4: Distribution of Mentally Unhealthy Days over US counties
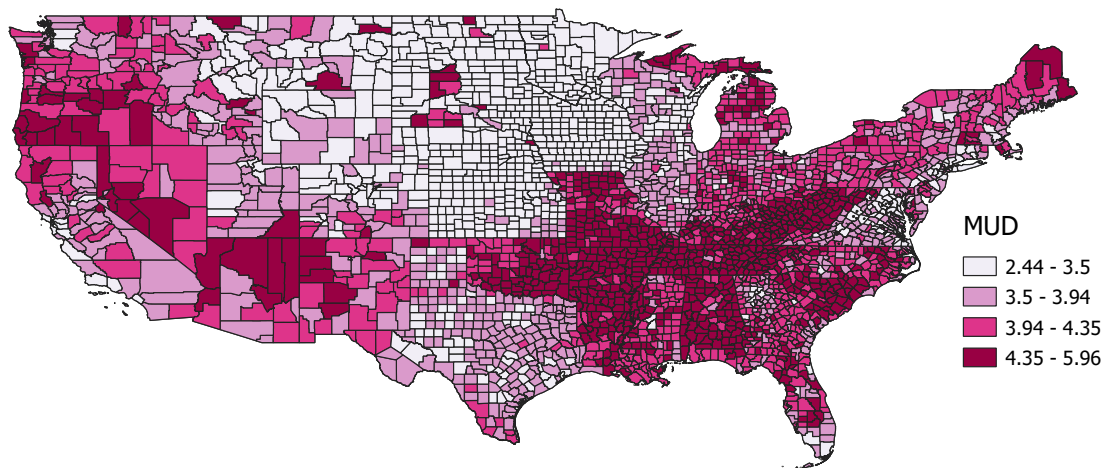
Notes: This map shows the MUD of counties using quantile (equal count) classification.

5   Empirical Specification & Results

In this section, we start by describing the econometric model that we estimate. We then present the baseline results followed by some results indicating the channel through which religion influences the relationship between Covid-19 and mental health.

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[3]Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion. Measuring healthy days monograph. Atlanta, GA: Author; 2000

[4]https://www.cdc.gov/brfss/annual_data/annual_2019.html

5.1 Specification

We estimate the following specification

$$CES - D\ score_{ics} = \beta_1 Religiosity_{ics} + \beta_2 Covid_{ics} + \beta_3 (Religiosity_{ics} - \overline{Religiosity}) * Covid_{ics}$$
$$+ \mathbf{X'_{ics}} \beta_4 + \mathbf{Y'_{cs}} \beta_5 + \beta_s + \varepsilon_{ics}$$

The subscripts indicate respondent i in county c in state s. X_{ics} includes respondent characteristics like age, gender, race, religion, income, education, employment, marital status, household size, industry, and occupation of work, and whether or not they were able to work from home. Y'_{cs} indicates county-level controls including past mental health and lockdown strictness. β_s indicates state-fixed effects.

We would expect β_1 to be negative and β_2 to be positive indicating the expected relationship of CES-D score with religiosity and Covid incidence respectively. The religiosity variable in the interaction term is de-meaned so that β_2 denotes the effect of *Covid* on a person with average religiosity. This is done to allow easy comparison with specifications without the interaction term. The coefficient of the interaction term, β_3 is of interest to understand if religiosity mitigated the association between mental health and Covid-19, in which case its sign should be negative.

5.2 Baseline results

We begin by establishing that in our sample religious people have better mental health (lower CES-D scores) as shown in the binned scatterplot, Figure 5 — after controlling for individual characteristics and clustering errors at the state level.

Figure 5: Binned Scatterplot of CES-D Scores and Religiosity
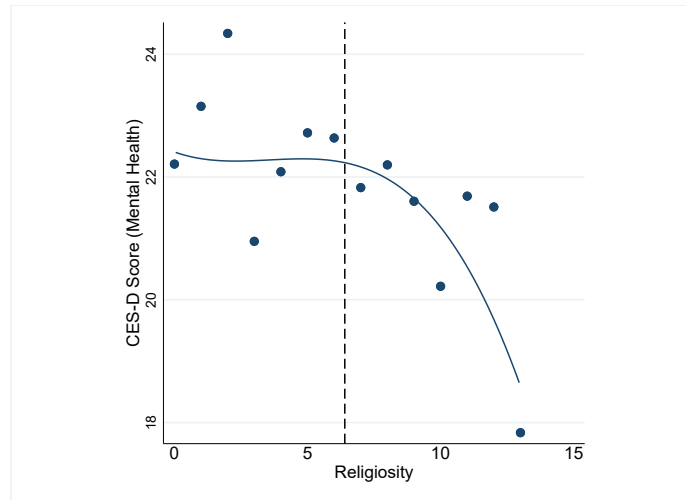
Notes: The figure plots a least squares binscatter with a cubic polynomial fit of the regression. The errors are clustered at the state level. The dotted line shows the mean religiosity of 6.4

In Figure 5 we show that there is an unambiguous relationship between better mental health and religiosity.

Table 5, column 1 reports the relationship between religiosity and mental health. Column 2 introduces *Covid* and a full set of individual controls. Column 3 adds the interaction term between Religiosity and Covid, and column 4 shows the results of our full baseline specification, including county-level controls. All the columns show the OLS estimates with the dependent variable being CES-D scores, with a higher score representing worse mental health. Hence, the negative coefficients are representing factors that contribute to a lower CES-D score, and hence better mental health.

Focusing on column 4, which is our preferred specification, we see that the association between religiosity and mental health is in the expected direction. A person with mean religiosity will have a CES-D score lower by $0.177 * 6.4 = 1.12$ than a non-religious person with similar characteristics. Similarly, the association between contracting Covid-19 and mental health is as expected. The CES-D score of a person with someone in their social network contracting Covid-19 was higher by around 2 points than a person with similar characteristics with no Covid-19 in their social network. The size of the effects of both Religiosity and Covid are comparable to those of other variables like gender and employment.

Finally, the coefficients of the interaction term in columns 3 and 4, indicate that religiosity significantly helps in ameliorating the negative mental health associated with Covid-19. Moving from mean religiosity of 6.4 to zero religiosity, increases the baseline effect of Covid-19 by almost 60%.[5]

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[5]The interaction term coefficient in column 4 is -0.184. This multiplied by a decrease in religiosity by 6.4 would give an increase in the marginal effect of Covid by around 1.2 units. This is 60% of the marginal effect of Covid at average religiosity as given by the coefficient estimate of 2.007.

Table 5: Determinants of Mental Health

|	(1) CES-D score	(2) CES-D score	(3) CES-D score	(4) CES-D score
Religiosity	-0.175**	-0.270***	-0.177**	-0.177**
	[0.075]	[0.068]	[0.082]	[0.083]
Covid		1.954***	1.965***	2.007***
		[0.354]	[0.346]	[0.347]
Male dummy		-2.405***	-2.383***	-2.394***
		[0.309]	[0.310]	[0.309]
Dummy for white		1.209**	1.207**	1.241**
		[0.464]	[0.464]	[0.468]
Dummy for being employed		-1.315***	-1.319***	-1.312***
		[0.423]	[0.424]	[0.423]
Covid $\times$ Religiosity			-0.186**	-0.184**
			[0.077]	[0.079]
Individual-level Controls	No	Yes	Yes	Yes
County-level Controls	No	No	No	Yes
State FE	Yes	Yes	Yes	Yes
Observations	4980	4980	4980	4980
Adjusted R^2	0.003	0.178	0.179	0.179

Standard errors in brackets

[1] All the regressions are OLS estimates. Column 1 is CES-D regressed on Religiosity, as indicated, other Columns have controls. Column 3 and Column 4 show the interaction effect of Covid and Religiosity

[2] County-level controls include GPS and Policy based Lockdown strictness measures, Past mental health, and County-level covid cases and death percapita

[3] Standard Errors are clustered at the state level.

In Figure 6 we present the regression coefficients of Table 5 with a full set of controls included. It is clear that religiosity helps mitigate the effects of covid on mental health. In Appendix C, we show that no other socioeconomic covariates mitigate the effects of covid on mental health other than religiosity.

Figure 6: Impact of different predictors on Mental Health
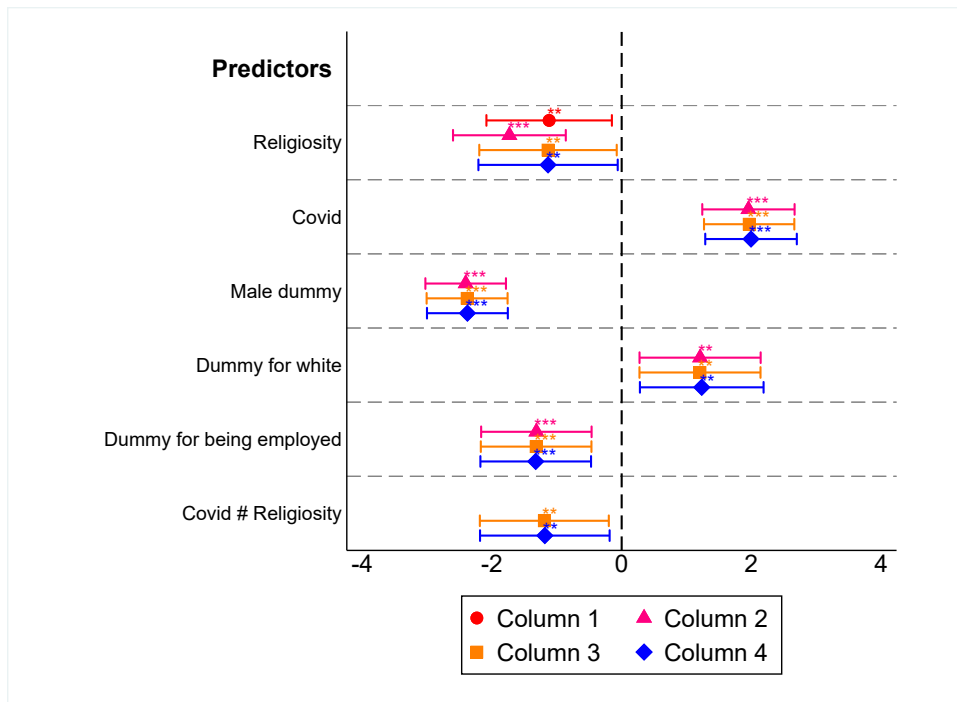
Notes: The figure is a plot of regression coefficients of Columns 1-4 of Table 5, with their confidence intervals. The Religiosity coefficient is scaled by its mean to compare the effects with other coefficients.

5.3 How does religiosity reduce the negative mental health associated with Covid-19?

A natural question we address at this stage is what aspects (discussed in Section 4) of religiosity are driving the results that we have shown above. The answer to this is in Table 6, where we have disaggregated the religiosity measure. It is clear that the results are strongly driven by attendance at religious services.

Table 6: Determinants of Mental Health, Religiosity Disaggregated

	(1) CES-D score	(2) CES-D score	(3) CES-D score	(4) CES-D score
Religiosity	-0.269***	-0.177**		
	[0.067]	[0.083]		
Covid	1.996***	2.007***	2.002***	2.016***
	[0.354]	[0.347]	[0.354]	[0.347]
Covid × Religiosity		-0.184**		
		[0.079]		
Religion (Importance)			-0.233	-0.001
			[0.205]	[0.254]
Religion (Prayer)			-0.356**	-0.418*
			[0.143]	[0.210]
Religion (Attendance)			-1.062***	-0.591**
			[0.237]	[0.289]
Religion (Frequency of Activities)			0.653***	0.420*
			[0.210]	[0.243]
Covid × Religiosity (Importance)				-0.460
				[0.311]
Covid × Religiosity (Prayer)				0.083
				[0.300]
Covid × Religiosity (Attendance)				-0.896***
				[0.327]
Covid × Religiosity (Frequency of Activities)				0.474
				[0.289]
Observations	4980	4980	4980	4980
Adjusted R^2	0.178	0.178	0.181	0.182

[1] All the regressions are OLS estimates with a full set of individual and county-level controls included

[2] County-level controls include GPS and Policy based Lockdown strictness measures, Past mental health, and county-level covid cases and death percapita

[3] Standard Errors are clustered at the state-level

With this result, it is clear that *access* to religious services would be important the mitigating and ameliorating effects of religiosity. However, this would have been difficult when movement restrictions were imposed as part of Covid-19 containment measures. In Table 7, we consider the difficulty in physically accessing

religious services using the lockdown strictness measure that was discussed in Section 4. Column 1 and Column 2 of Table 7 compare the effects of religiosity between

Table 7: Determinants of Mental Health, Physical Access to Religion

	(1) CES-D score	(2) CES-D score	(3) CES-D score	(4) CES-D score
Religiosity	-0.264**	-0.110	-0.177**	-0.222**
	[0.121]	[0.130]	[0.083]	[0.090]
Covid	1.332***	2.797***	2.007***	1.404***
	[0.409]	[0.578]	[0.347]	[0.378]
Employed	-1.913***	-0.879	-1.312***	-1.360***
	[0.519]	[0.553]	[0.423]	[0.412]
Covid $\times$ Religiosity	-0.255**	-0.082	-0.184**	
	[0.104]	[0.171]	[0.079]	
Covid $\times$ Religiosity (Low Strictness)				-0.254**
				[0.097]
Covid $\times$ Religiosity (High Strictness)				-0.076
				[0.167]
Observations	2493	2487	4980	4980
Strictness	Only Low	Only High	All	All
Adjusted R^2	0.181	0.179	0.179	0.180

Standard errors in brackets

[1] All the regressions are OLS estimates with a full set of individual and county-level controls included

[2] Strictness used here is a binary variable based on the GPS movements at county-level

[3] The coefficients Covid $\times$ Religiosity (High Strictness) is a post-estimation test for the linear combination of the sum of coefficients (Religiosity $\times$ Covid) + (Religiosity $\times$ Covid $\times$ Strictness)

[4] Standard Errors are clustered at the state-level

the sub-samples based on low and high strictness. The results are quite stark — the beneficial effects of past religiosity on mental health are significant only when strictness was relatively low. In other words, higher lockdown strictness eroded any benefits that emanated from being religious. In Column 3 of the table, we present the results for full-sample and the benefits of religiosity are seen. Finally, to further re-iterate our result, in Column 4 we estimate the triple interaction of strictness, religiosity, and covid (with all the respective double interactions included). The beneficial effect of religiosity in ameliorating the mental health impact of covid is absent for respondents in high-strictness counties, while is highly significant and beneficial in low-strictness counties.

This leads us to consider the alternate modes of access to religious services that

respondents have reported. Mean engagement for all modes is shown in Figure 7, with over half of the respondents availing of some form of virtual engagement with religious services. Hence, availing online services is defined as availing of at least one of the services — virtual religious services, online discussion groups, online religious classes, or virtual choir singing.

Figure 7: Virtual Access to Religious Services
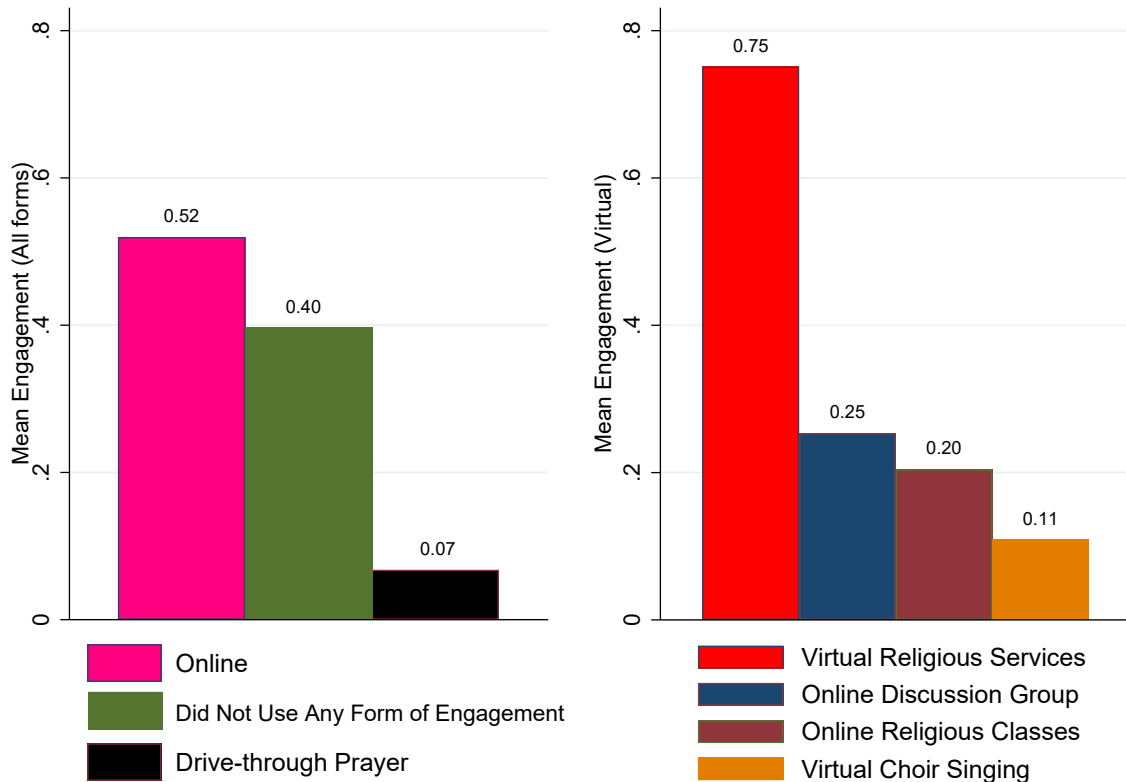
Notes: The first figure shows the distribution of alternate access to religious services. The second figure shows the breakdown of online (virtual) access to religious services. A respondent can use multiple combinations of these virtual services offered by their church.

We now want to see if people accessing online religious services were able to cope better with the negative mental health associated with Covid-19. As only religious people would access these services, we restrict the sample to only people with non-negative levels of religiosity. We would also assume that the level of religiosity of a person may matter for how beneficial online access is for them.

In Table 8 we investigate these relationships. We find that Covid-19 is consistently associated with higher CES-D scores but this association is weaker for those who access online religious services, as seen in the first column of the table. Columns 2 and 3 show that this effect is primarily driven by those who have a higher level of religiosity.

Table 8: Determinants of Mental Health

	(1) CES-D score	(2) CES-D score	(3) CES-D score
Covid	2.260***	2.456***	2.416***
{Not accessed online service}	[0.519]	[0.524]	[0.887]
Covid	1.350***	2.131***	1.254*
{Accessed online service}	[0.481]	[0.697]	[0.712]
Online	0.375	1.497***	-0.146
	[0.394]	[0.544]	[0.632]
Observations	4238	2094	2144
Religiosity (R)	R>0	0<R<Median (R)	R>=Median(R)
Adjusted R^2	0.167	0.223	0.132

Standard errors in brackets

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[1] All the regressions are OLS estimates with a full set of individual and county-level controls included

[2] County-level controls include GPS and Policy based Lockdown strictness measures, Past mental health, and county-level covid cases and death percapita

[3] Standard Errors are clustered at the state-level

[4] Covid {Accessed online service} is defined as a post-estimation test for the linear combination of the sum of coefficients Covid + (Covid $\times$ Online)

6 Conclusion

In this paper, we show how religiosity contributes to mental health more generally, but especially in the particular case of its effect during the Covid-19 pandemic. We find that being religious significantly reduces the negative mental health outcomes associated with Covid-19 incidence in one's social network. This beneficial effect of religiosity on mental health, in this context, is comparable to the effect of being employed. In addition, our OLS estimates show that other socioeconomic covariates do not mitigate the effects of Covid-19 on mental health as compared with religiosity.

We find that the frequency of past attendance at religious establishments drives the ameliorating effects of religiosity. In other words, if a respondent displayed high religious attendance in the past, this helped them to mitigate the effects of Covid-19 on their mental health. The role of attendance leads to our focus on access to religious establishments. The results are quite stark — being more religious has significant beneficial effects on mental health only when strictness is relatively low.

On the contrary, higher lockdown strictness eroded any benefits that emanated from being religious. We use both mobility-based strictness measures and test the robustness of our results with a policy-based measure to construct lockdown strictness. Finally, we also find significant uptake of online religious services that were introduced in lieu of in-person services. People who accessed these services demonstrated a lower association between Covid-19 and mental health.

Our findings are correlational, but they contribute to the literature which attempts to understand the mental health effects of the Covid pandemic and the role of religion in ameliorating these effects. We consider our findings to be important when designing effective public policies which concern individuals' mental health and well-being.

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Appendix

A Survey details

Figure A.1: The religiosity questionnaire

Before Covid-19 (think of December 2019), how important was religion to you?

○ Not important at all

○ Fairly unimportant

○ Fairly important

○ Very important

(a) Importance Of Religion: Q1

Before Covid-19 (think of December 2019), how often did you pray?

○ Never

○ Less than once a month

○ At least once a month

○ At least once a week

○ At least once a day

(b) Frequency of Prayer: Q2

Before Covid-19 (think of December 2019), how often did you attend religious services at your regular place of worship?

○ Never

○ Less than once a month

○ Less than once a week/at least once a month

○ Once a week or more

(c) Frequency of Attendance: Q3

Before Covid-19 (think of December 2019), how often did you attend such activities?

○ Never

○ Less than once a month

○ Less than once a week/at least once a month

○ Once a week or more

(d) Frequency of attending other Religious Activities: Q4

Figure A.2: The CES-D questionnaire (Mental health)

Now we will ask you about how you felt during the last one month.

	Never/rarely	Sometimes	A lot of the time	Most/all of the time
You were bothered by things that usually don't bother you	○	○	○	○
You didn't feel like eating, your appetite was poor	○	○	○	○
You felt that you could not shake off the blues, even with help from your family and your friends	○	○	○	○
You felt that you were just as good as other people	○	○	○	○
You had trouble keeping your mind on what you were doing	○	○	○	○
You felt depressed	○	○	○	○
You felt that you were too tired to do things	○	○	○	○
You felt hopeful about the future	○	○	○	○
You thought your life had been a failure	○	○	○	○
You felt fearful	○	○	○	○

(a) Mental health: Q1

Now we will ask you about how you felt during the last one month.

	Never/rarely	Sometimes	A lot of the time	Most/all of the time
You were happy	○	○	○	○
You talked less than usual	○	○	○	○
You felt lonely	○	○	○	○
People were unfriendly to you	○	○	○	○
You enjoyed life	○	○	○	○
You felt sad	○	○	○	○
You felt like people disliked you	○	○	○	○
It was hard to get started doing things	○	○	○	○
You felt life was not worth living	○	○	○	○

(b) Mental health: Q2

B Determinants of Mental Health, by Covid Measures

The focus of Table B.1 is to investigate which aspects of the interaction between religiosity and covid contraction are driving the results in our results section. Column

1 shows the baseline effects of religiosity and Covid on CES-D scores. Column 2 shows the interaction effects of religiosity and Covid, which is the desired specification in our results section. Column 4 shows the disaggregated measures of Covid interaction with Religiosity. Clearly, the tangible and higher effects are seen in helping deal with covid contraction in family.

Table B.1: Determinants of Mental Health, by Covid Measures

	(1) CES-D score	(2) CES-D score	(3) CES-D score	(4) CES-D score
Religiosity	-0.269***	-0.177**	-0.236***	-0.168**
	[0.067]	[0.083]	[0.069]	[0.076]
Covid	1.996***	2.007***		
	[0.354]	[0.347]		
Covid× Religiosity		-0.184**		
		[0.079]		
Covid (Self)			2.960***	2.808***
			[0.471]	[0.439]
Covid (Family)			0.699	0.790
			[0.503]	[0.512]
Covid (Friends)			1.070***	1.096***
			[0.265]	[0.264]
Covid (Congregation)			-2.087***	-0.820
			[0.745]	[0.953]
Covid (Self) × Religiosity				0.235*
				[0.132]
Covid (Family) × Religiosity				-0.267**
				[0.109]
Covid (Friends) × Religiosity				-0.089
				[0.076]
Covid (Congregation) × Religiosity				-0.295
				[0.194]
Observations	4980	4980	4980	4980
Adjusted R^2	0.178	0.179	0.180	0.181

[1] All the columns include individual and county-level controls

[2] Standard Errors are clustered at the state-level.

C   Determinants of Mental Health, other socioeconomic covariates

The focus of Table C.1 is to show that other covariates that could plausibly help deal with the mental health effects of contraction of covid in the social network are absent. Only religiosity is a significant effect of note. Column 1 shows baseline OLS regression of covariates without any interaction effects with religiosity Column 2 onward we include other covariates interacted with Covid. Clearly, Religiosity is the only covariate that has a significant beneficial effect on mental health.

Table C.1: Determinants of Mental Health, other socioeconomic covariates

	(1)	(2)	(3)	(4)	(5)
	CES-D score	CES-D score	CES-D score	CES-D score	CES-D score
Religiosity	-0.269***	-0.177**	-0.267***	-0.269***	-0.269***
	[0.067]	[0.083]	[0.067]	[0.067]	[0.066]
Covid	1.996***	2.007***	1.410***	2.061***	1.971**
	[0.354]	[0.347]	[0.444]	[0.454]	[0.760]
Covid× Religiosity		-0.184**			
		[0.079]			
Covid× Single			1.116*		
			[0.567]		
Covid× Work from home				-0.212	
				[0.780]	
Covid× White					0.032
					[0.803]
Observations	4980	4980	4980	4980	4980
Adjusted R^2	0.178	0.179	0.178	0.178	0.178

[1] All the columns include individual and county-level controls

[2] Standard Errors are clustered at the state-level.

Further, in Table C.2 we investigate triple interactions of covid, religiosity, and other covariates. We present the results for the coefficients of the linear combination of the respective triple interaction with Covid × Religiosity. For instance, from Column 2 we infer that religiosity offers additional benefits for the aged (defined as over 50 years old). Similar inference can be made from other columns.

Table C.2: Determinants of Mental Health, using alternate strictness measure

	(1) CES-D	(2) CES-D	(3) CES-D	(4) CES-D	(5) CES-D
Religiosity	-0.177**	-0.238**	-0.263**	-0.052	-0.257**
	[0.083]	[0.102]	[0.129]	[0.085]	[0.096]
Covid	2.007***	2.022***	2.167***	1.426***	2.363***
	[0.347]	[0.481]	[0.718]	[0.442]	[0.516]
Covid× Religiosity	-0.184** [0.079]				
Covid× Religiosity (Aged)		-0.282** [0.132]			
Covid× Religiosity (White)			-0.179** [0.088]		
Covid× Religiosity (Single)				-0.104 [0.117]	
Covid× Religiosity (Employed)					-0.143 [0.100]
Observations	4980	4980	4980	4980	4980
Adjusted R^2	0.179	0.179	0.179	0.180	0.180

[1] All the columns include individual and county-level controls
[2] Standard Errors are clustered at the state-level.

D   Robustness of Strictness Measure

Table D.1: Determinants of Mental Health, other socioeconomic covariates

	(1)	(2)	(3)	(4)
	CES-D score	CES-D score	CES-D score	CES-D score
Religiosity	-0.265**	-0.131	-0.177**	-0.296***
	[0.107]	[0.120]	[0.083]	[0.099]
Covid	1.220***	2.733***	2.007***	2.037***
	[0.430]	[0.515]	[0.347]	[0.351]
Covid × Religiosity	-0.284***	-0.042	-0.184**	-0.171**
	[0.088]	[0.124]	[0.079]	[0.076]
Strictness × Religiosity				0.209*
				[0.117]
Observations	2318	2662	4980	4980
Strictness	Only Low	Only High	All	All
Adjusted R^2	0.188	0.175	0.179	0.180

[1] All the columns include individual and county-level controls

[2] Standard Errors are clustered at the state-level.

Figure D.1: Robustness of Strictness Measure
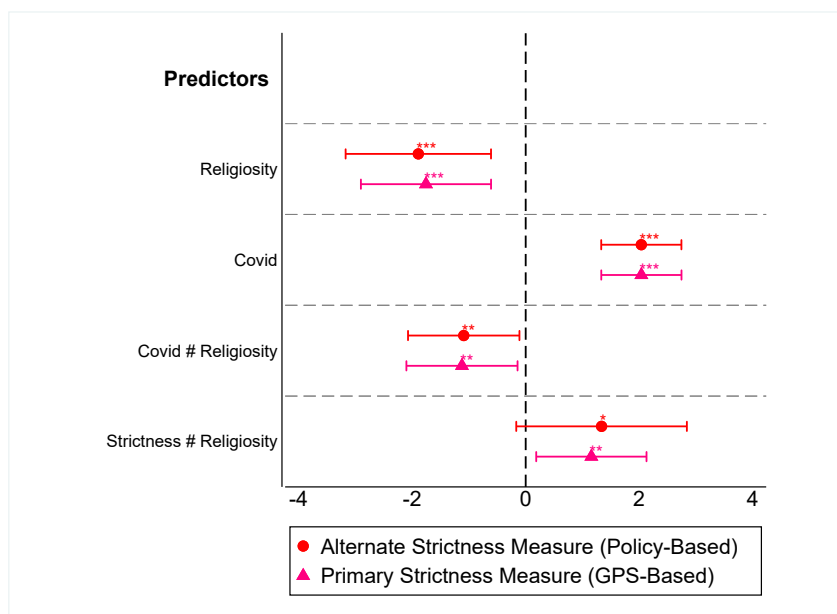
Notes: The figure is a plot of regression coefficients of Columns 4 of Table D.1 and Table 7, with their confidence intervals. The Religiosity coefficient is scaled by its mean to compare the effects with other coefficients.