Mental Health Costs of Lockdowns: Evidence from Age-specific Curfews in Turkey*

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Abstract

Using a strict, age-specific lockdown order for adults aged 65 and older in Turkey, we examine the mental health consequences of an extended period of tight mobility restrictions on senior adults. Adopting a regression discontinuity design, we find that the curfew reduced mobility by decreasing the number of days spent outside by 43 percent. The curfew-induced decline in mobility substantially worsened mental health outcomes, including somatic and nonsomatic depression (0.20, 0.22 standard deviations, respectively). Exploring potential channels, we document a large increase in social and physical isolation, with no evidence of changes in labor market outcomes or intrahousehold conflict.

JEL Classification: I18, I31, O15

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Mental health conditions account for 20 percent of all disabilities worldwide, with an estimated cost of more than US$ 1 trillion annually (World Health Organization 2019). Social isolation, loneliness, self-assessed physical and mental health, life satisfaction and similar measures of subjective wellbeing are shown to be important predictors of adult mortality and chronic diseases that lead to early mortality (Idler and Benyamini 1997; Ortega et al. 2010; Steptoe et al. 2013; Boehm et al. 2016).

Recent anecdotal evidence suggests a considerable increase in mental health disorders after the introduction of movement restrictions to slow the spread of Covid-19 (The New York Times May 12, 2020). In the United States, 45 percent of adults reported in early April that the worry and stress related to the Covid-19 crisis had negatively affected their mental health (Panchal et al. 2020).[1] The stay-at-home orders are associated with an increased number internet search queries related mental health, most strikingly suicide intentions (Jacobson et al. 2020).[2] The mental health effects are expected to worsen over time as self- or government-imposed quarantine and other social distancing measures create increased social isolation, physical immobility, and economic uncertainty. Moreover, the mental health burden is likely to be higher in countries with stricter lockdown measures and more fragile labor markets. Despite the mounting descriptive evidence coupled with increasing concern among the public health and medical community (Armitage and Nellums 2020; Brooks et al. 2020; Galea et al. 2020; Holmes et al. 2020; Panchal et al. 2020), no research has rigorously quantified the causal impact of restricted mobility on mental health outcomes.

Our aim is to fill this gap by quantifying the effects of stay-at-home orders binding for those aged 65 and above implemented in Turkey on individuals' mental health. The Turkish government imposed a strict stay-at-home order for the high-risk population group of those 65 and older starting on March 21, 2020. Severe financial penalties were imposed for noncompliance with these mandated movement restrictions. The draconian curfew orders remained in effect until June 2020, making it one of the longest confinement policies to reduce COVID-19 mortality.

Our study exploits the binding age cutoff to causally estimate the impact of the age-specific curfew on mental health outcomes. We rely on the fact that individuals who

[1]Similarly in Spain, using a cross-sectional survey, González-Sanguino et al. (2020) report psychological stress among 87 percent of survey participants and attribute the excessive prevalence to confinement.

[2]Similarly, individuals exposed to the stay-at-home orders in the United States also report increased health concerns, financial worry, and loneliness compared to those who are not exposed to them (Tull et al. 2020).

were born around the age cutoff at which the curfew becomes binding have no systematic differences in predetermined characteristics and are thus comparable. To this end, we conducted a phone survey in late May and early July, targeting the specific age group of 59- to 70-year-old adults to compare those who were just below the age cutoff of 65 and thus not affected by the stay-at-home order to those just above 65 who were affected. In addition to using survey instruments that are widely-used to measure mental health outcomes in nonclinical settings, we designed a survey to capture various channels through which the curfew can impact mental health outcomes.

Social isolation may generate adverse mental health consequences through several different channels that we examined in this study. First, stay-at-home orders reduce one's contact with other individuals and reduce social interactions, leading to increased feelings of loneliness and anxiety. Since older adults are already at risk for depression and mental illness, being prohibited from seeing their close relatives or friends is likely to act as an additional stressor, making them feel lonelier, anxious, and forgotten (Armitage and Nellums 2020; Santini et al. 2020; Newman and Zainal 2020). Second, stay-at-home orders may prevent older adults from participating in the workforce and reduce their potential income, leading to additional stress due to financial constraints.[3,4] Third, being confined at home with other family members for an extended time period can also increase the likelihood of intrahousehold conflict, and in extreme cases, it can give rise to physical or psychological abuse (Leslie and Wilson 2020; Ravindran and Shah 2020).[5]

We adopt a regression discontinuity design (RD) using a narrow age bandwidth and report three main results. First, our RD estimates show that the curfew reduced the number of days that individuals had gone outside in the previous week by around one day, corresponding to an approximately 43 percent decline relative to the control group. Similarly, it

[3]In the U.S. context, there have been negative effects on labor market outcomes, although the effects of stay-at-home orders have been rather limited (Forsythe et al. 2020). However, these studies also document a smaller and imprecisely estimated effect for the labor market outcomes of older adults (Gupta et al. 2020). Similarly, since we focus on a relatively older segment of the population a large proportion of which is already out of the labor force, one might expect to see smaller effects on the labor market outcomes.

[4]The retirement age in Turkey is 58 for women and 60 for men. For new entrants to the pension system after October 2008, the retirement age will gradually rise to 65 (OECD 2017). Hence, our respondents were not differentially affected by the retirement age cutoff. Using the HLFS 2019, Figure A1 illustrates graphically that the probability of retirement increases monotonically from age 63 to 68. Note that the HLFS 2019 does not contain month of birth information necessary to conduct an RD analysis. In addition, there are no specific government programs in Turkey similar to the Medicare in the US that individuals qualify once they turn 65.

[5]Although the incidence of domestic violence appears to be smaller among older adults, it is far from negligible ranging around 3 to 10 percent (Nelson 2002; Tufan 2011).

increased the probability of never leaving home by approximately 24–30 percentage points, corresponding to a 150 percent increase relative to the control group.

Second, we find that the curfew-induced reduction in mobility had a sizable positive impact on the probability of experiencing depression, measured both by somatic indicators that capture physical symptoms of depression and nonsomatic indicators representing more subjective assessments of depression. Our RD estimates imply that a one-day decline in days spent outside per week results in a 0.20 standard deviation increase in somatic depression and a 0.22 standard deviation increase in nonsomatic depression.[6]

Lastly, examining potential channels, we document that social and physical isolation play a particularly important role in explaining our results. Our results indicate that a one day reduction in days spent outside results in a 8.5 percentage point (43 percent) increase in the probability of having a substantial reduction in social interaction with friends and family, and a 16.4 percentage point (117 percent) increase in the probability of having a substantial reduction in physical activity. We find no evidence of a significant change in labor market outcomes or intrahousehold conflict measures.

We make several contributions to the existing literature. First, we show that the adverse impacts of social and physical isolation on mental health are substantial. Despite the well-known associations, most of the previous studies that document adverse mental health effects of quarantine and social isolation are based on small sample sizes and fail to account for reverse causality or potential omitted variable bias (Brooks et al. 2020; Newman and Zainal 2020). As unobservables such as earlier life events, childhood circumstances, and ability might affect both social isolation and mental health outcomes, establishing a causal relationship has been difficult. Our empirical setup allows us to estimate the effects of an exogenous decline in mobility on somatic and nonsomatic depression indicators. More broadly, our results add to the documented adverse mental health impacts following large-scale natural disasters and stressful events such as Zika and SARS outbreaks, major earthquakes, and terrorist attacks.[7]

Second, our findings contribute to a better understanding of the costs associated with policies of targeted movement restrictions, which go beyond the financial losses caused

[6]These effect sizes are similar to those reported in studies that document the substantial effects of cash transfers on psychological well-being and depression (Baird et al. 2013; Haushofer and Shapiro 2016).

[7]See, for example, Galea et al. (2002), Lee et al. (2007), Neria et al. (2008), Yokoyama et al. (2014), and Galea et al. (2020).

by the economic shutdown. The growing literature on the optimal policy response to an epidemic in economics and public health often uses a classic susceptible-infectious-recovered (SIR) framework under the assumption that different subpopulations might have different rates at which they become infected and might have differential chances of survival following hospitalization (Acemoglu et al. 2020; Alvarez et al. 2020; Brotherhood et al. 2020). Acemoglu et al. (2020), for instance, suggest that it is possible to achieve better social and economic outcomes through a simple "targeted policy that applies an aggressive lockdown" on individuals above 65. If the policy response to Covid-19 creates a mental health crisis by placing already susceptible populations at higher risk of depression and suicide, these consequences would call for additional policy interventions to address and mitigate such adverse effects. Such policy measures may include setting up mental health call centers, improving access to telehealth services, and establishing on-the-ground local support services for senior adults and other at-risk populations (Galea et al. 2020).

Third, our paper also contributes to the growing literature on the effects of pandemic-driven social isolation on at-risk populations, including adolescents, elderly people, homeless people, people with disabilities, and people with mental health concerns (Pfefferbaum and North 2020; Dotson and Koh 2020; Armitage and Nellums 2020). Given their heightened risk of physical and mental health problems, exposure to social isolation is a particularly important concern for the older adults that we study in this paper. However, since several other high-risk groups also face the risk of the adverse mental consequences of social isolation, our findings have broader implications in evaluating the risks for such groups.[8] Finally, there could be potential scarring effects on the long-term mental health of isolated individuals that are likely to pose problems long after the stay-at-home orders are over.[9]

This paper is organized as follows. Section 1 provides a brief description of the Covid-19 lockdown in Turkey. Section 2 presents the data used for the analysis, the identification strategy, and preliminary checks for the RD analysis. Section 3 presents the main results, and Section 4 discusses the evidence on potential causal channels. Section 5 concludes the

[8]These risks are particularly serious for children and adolescents with special needs or disadvantages, such as disabilities, trauma experiences, and existing mental health problems (Fegert et al. 2020).

[9]While previous studies have discussed scarring effects of the pandemic on long-term beliefs affecting economic outcomes (Kozlowski et al. 2020), scant attention has been paid to potential scarring effects on long-term mental health outcomes. When we consider the historical accounts of the Spanish flu, demographic evidence suggests that exposed populations reported depression, mental distraction, and sleep disturbances even six years after the pandemic (Eghigian 2020).

paper.

1 Background

The Turkish Ministry of Health reported the first case of the novel coronavirus on March 10, 2020, and the first COVID-19-related death on March 17.[10] From this early period, the older population and individuals with underlying medical conditions were defining features of the government's response to the COVID-19 pandemic. In stark contrast to the rest of the world, the Turkish government imposed strict and long-lasting mobility restrictions exclusively on senior citizens. The first curfew decree was issued on March 21 and imposed an absolute lockdown on individuals aged 65 and older and those with certain health conditions.[11] The central government formed local support teams to provide the basic needs for individuals who were subject to the decree and needed assistance, while no exceptions were allowed to breach the stay-at-home order. The age-specific curfew along with other government measures to contain the virus, such as mask wearing in public spaces, were routinely enforced by the local security forces and the offenders were fined.[12]

Only after May 10, individuals who were subject to the curfew were allowed a period of four hours to walk outside their home on Sundays conditional on wearing a mask and social distancing.[13] One week later, the government allowed a similar exception for six hours.[14] On May 21, senior citizens were allowed to travel to a specific location, conditional on staying there for at least one month and not leaving their new shelter.[15] On May 29, senior citizens who are actively employed were exempt from the lockdown. Finally, on June 10, the curfew was relaxed and all individuals who were subject to it were allowed to

[10] https://covid19.saglik.gov.tr/ - last accessed September 10, 2020.

[11] These conditions include autoimmune disorders, chronic pulmonary disease, asthma, cardiovascular disease, hypertension, renal, and liver-related diseases, https://www.icisleri.gov.tr/65-yas-ve-ustu-ile-kronik-rahatsizligi-olanlara-sokaga-cikma-yasagi-genelgesi – last accessed September 10, 2020.

[12] According to the law, the fine for curfew offenders was set between 789-3,180 Turkish Liras (https://blog.lexpera.com.tr/bulasici-hastaliklara-iliskin-tedbirlere-aykiri-davranma-sucu-tck-m-195/ – last accesed September 10, 2020). The anectodal evidence suggests that the upper limit was used to deter potential offenders (see for example https://www.hurriyet.com.tr/gundem/sokaga-cikma-yasagina-ragmen-kahvehanede-oyun-oynarken-yakalandilar-41492692 - last accessed September 10, 2020.) As a reference, the minimum monthly wage in Turkey during the same period was 2,943 Turkish Liras.

[13] https://www.goc.gov.tr/65-yas-ve-uzeri20-yas-altikronik-rahatsizligi-bulunan-kisilerin-sokaga-cikma-kisitlamasi-istisnasi-genelgesi-merkezicerik – last accessed September 10, 2020

[14] https://www.icisleri.gov.tr/65-yas-ve-uzeri-ile-kronik-rahatsizligi-olan-vatandaslarin-sokaga-cikma-gun-ve-saatleri –last accessed September 10, 2020

[15] https://www.icisleri.gov.tr/81-il-valiligine-65-yas-ve-uzeri-vatandaslarimiz-icin-seyahat-izin-belgesi-genelgesi – last accessed September 10, 2020

be outside between 10 a.m. and 8 p.m. The current regulation still restricts the mobility of senior citizens outside this time interval with no clear timeline to fully end the curfew.

The heterodox policy response to the pandemic has stirred controversy, as there was a lack of empirical evidence that the decision to impose age-specific curfews would slow down the death toll or spread of the virus.[16] The Turkish Medical Association (TMA), for example, argues that the excessive restrictions on senior citizens' mobility has adversely affected their mental health, severely disrupted their daily routines, and created a sense of unfairness among those who were locked down.[17] According to the TMA, the policy lacks epidemiological evidence to be effective in protecting the vulnerable populations at the expense of their mental well-being.[18] In summary, individuals aged 65 and over in Turkey have spent nearly three months under strict lockdown and to date remain partially restricted in their physical mobility.

In official announcements, the Turkish Ministry of Internal Affairs does not mention a specific birthday cutoff for the curfew and uses the term "age 65 and older" to indicate the senior population that is subject to lockdown, although anecdotal evidence suggests that the birth year is the sole determinant.[19] To confirm the threshold in our sample, we directly asked respondents whether they were subject to the age-specific curfew imposed by the government. We then ran a simulation in which we split our analysis sample into treatment and control groups using each birth year and month as the curfew threshold to estimate the average difference in exposure to the curfew between the treatment and control groups for each of the simulated thresholds.

As shown in Figure A2 and in line with the field observations, we obtain the largest difference in being subject to the curfew between individuals who were born just before and after January 1956. The estimated coefficient indicates that individuals who were born

[16]The Turkish government does not provide detailed and consistent epidemic data, thus to the best of our knowledge, there are no empirical studies that confirm or refute the success of the age-specific curfew policy. In addition, the reported aggregate figures on deaths substantially underestimate the total case and death toll; one study showed that excess mortality is at least twice as high as the official government death counts due to COVID-19 (Altindag 2020).

[17]`https://www.ttb.org.tr/415yi6z` – last accessed September 10, 2020

[18]According to the Ministry of Health, the total number of confirmed Covid-19 cases for 50–64 year-old individuals was 583 in 100,000 and 65–79 year-old ones was 553 in 100,000 between June 1 and June 18, 2020. The corresponding death rate for all confirmed cases was 3.19 percent for the former group while it was 13.0 percent for the latter one.

[19]Separate curfews were imposed on individuals aged 18 and 20, and government announcements indicate the year of birth as the determinant of being within that age group. See, for example, `https://www.icisleri.gov.tr/sokaga-cikma-yasagi-bulunan-18---20-yas-arasindaki-genclerle-ilgili-istisnalar` – last accessed September 10, 2020.

in December 1955 or before are 85 percentage points more likely to claim to be subject to the curfew than those who were born in January 1956 or later. In the empirical analysis, we rely on this threshold, which provides the strongest discontinuity in exposure to the treatment, as shown by various measures in Figure 2.

2 Data and Empirical Methodology

2.1 Data

We use a unique data set covering individuals who were born in Turkey between 1950 and 1961. The data were collected by the KONDA Research and Consultancy, a reputable research and consultancy firm in Istanbul, Turkey. Since the firm regularly conducts nationally representative surveys to provide information on public opinion on a wide range of political issues, they have built a surveyor base throughout the country. Their regular surveys—called the KONDA Barometer surveys and conducted 11 times per year—have successfully predicted the election outcomes in recent general elections. Given their record and well-respected position in both the Turkish[20] and international media[21] (The Economist 2008, Reuters 2011, The Economist 2019), we contacted the KONDA Research and Consultancy to implement our survey instrument.

Specifically, we approached KONDA to collect survey data with the following two criteria: (i) respondents should reside in the urban areas where the curfews are strictly imposed, and (ii) they should be aged between 59 and 70 to have 6 treatment and 6 control cohorts on each side of the curfew threshold. Consequently, the survey instrument was implemented in urban areas across 26 regions in late May and early June.[22]

Appendix Table A1 provides a comparison of basic demographic information from our analysis sample to the 2019 Household Labor Force Survey (HLFS) focusing on individuals born between 1950 and 1961. We observe that the average age is 64 for both samples, and the marital status indicators are quite similar. Our analysis sample has relatively fewer

[20] https://www.hurriyet.com.tr/gundem/hangi-anket-sirketi-secimlerin-sonucunu-dogru-bildi-29224184

[21] See, for example, https://www.economist.com/briefing/2008/07/17/flags-veils-and-sharia?story_id=E1_TTSQVVSD, https://www.reuters.com/article/us-turkey-referendum-poll/poll-shows-backing-for-turk-reforms-on-eve-of-vote-idUSTRE68A0EV20100911?feedType=RSS&feedName=everything&virtualBrandChannel=11563, https://www.economist.com/erasmus/2019/07/01/in-turkey-demography-is-a-brake-on-islamisation.

[22] On average, the respondents were subject to the curfew for 8 to 9 weeks when they were contacted.

women and is composed of more educated individuals than the HLFS due to the urban sampling frame.

Appendix Table A2 presents the summary statistics for our analysis sample composed of a maximum of 1909 individuals. We observe that 27 percent of the sample completed high school or above, and 13 percent are illiterate. On average, 43 percent of our sample is female, 81 percent are married, and 26 percent have a non-Turkish ethnic identity (e.g., Arabic or Kurdish), which is similar to the overall ethnic distribution in Turkey. The household size prior to the Covid-19 outbreak is 3.3, with approximately 11 percent of the respondents having ever received psychological support and 57 percent having a chronic disease.[23] We observe that 48 percent of the respondents in our sample reported being subject to the curfew, 36 percent reported never going outside the home, and the average number of days spent outside in the previous week was 1.9 days.[24]

Finally, we observe that 14 percent had a job that they could not attend in the previous week. While 61 percent reported having enough money for usual needs, approximately 60 percent reported being worried about spending money. Approximately 25 percent had a substantial reduction in social interaction, and 22 percent had a substantial reduction in physical activity.[25] Their current household size was 3.4, and approximately 37 percent reported having a conflict with a household member over the last month.

Our survey also includes a mental health module focusing on a subset of malaise inventory questions. These questions—initially developed by Rutter et al. (1970) to identify depression in nonclinical settings—capture the typical symptoms of depression, such as poor concentration or thoughts of suicide, and less-known somatic symptoms such as digestive problems or frequent aches.[26] Following Duflo et al. (2007) and Erten and Keskin (2020), we construct three summary indices: (i) an overall depression index, which is an average of the z-scores of 20 mental health indicators; (ii) a somatic depression index, which is an average of 4 indicators related to the body and are therefore more objective

[23] Less than 7 percent of the respondents reported that they were living alone at home.

[24] In our survey, we also asked the respondents how often they went out in a usual week over the last month and received a very similar response.

[25] Substantial reduction in social interaction is a dummy variable that takes the value of one if the respondent reported that his/her social interaction with friends and family has been substantially reduced. Similarly, substantial reduction in physical activity is a dummy variable that takes the value of one if the respondent reported that his/her physical activity (e.g. walking, running, doing sports, etc.) has been substantially reduced.

[26] American Psychiatric Association also suggests that symptoms of depression include not only classic psychological signs such as loss of interest or anxiety but also somatic symptoms such as general aches and pains or trembling (American Psychiatric Association 2013).

measures of depression; and (iii) a nonsomatic depression index, which is an average of the remaining 16 indicators that represent more subjective assessments of depression. We create these indices to have a mean of 0 and a standard deviation of 1, following Anderson (2008); the variables that compose each index are described in Appendix A. Higher index values reflect higher levels of depression.

2.2 Identification

As explained in Section 1, the COVID-19 lockdowns were strictly imposed on individuals who were born in December 1955 or before while those who were born in January 1956 or later were unconditionally exempt. The context thus offers an ideal setting to implement an RD design to estimate the impact of the curfew on a range of outcomes.

Our RD design leverages the quasi-random assignment of curfew around the age cutoff to estimate both the reduced-form (RF) and the local average treatment effects (LATE) of the curfew on our outcomes of interest. The causal interpretation of both estimates relies on the identifying assumption that around the vicinity of the curfew age cutoff, the assignment to curfew is as good as random. The LATE estimates additionally require the exclusion restriction assumption, which holds in our setting given that we do not expect any factor other than the curfew to impact the mental health of individuals who were born around the threshold. For our RF estimates, we use the following specification:

$$y_i = \alpha + \beta z_i + f(x_i) + \epsilon_i \tag{1}$$

$$\forall x_i \in (c - h, c + h)$$

where y_i captures the outcome of interest, which is regressed on a treatment indicator z_i that equals one for individuals who were born before January 1956 and zero otherwise. x_i is the forcing variable defined as the number of months that the respondent is older than the index month of the curfew threshold. The function $f(x_i)$ is a continuous local linear function fit separately on each side of the threshold point c. The standard errors are clustered at the month-year of birth to account for the correlation in outcomes across individuals who were born in the same year-month cell (Lee and Card 2008). We additionally control for month of birth fixed effects, province fixed effects, surveyor fixed effects, as well as indicator variables for education levels, ethnicity, and gender. For the regression sample restriction, we use

the Imbens and Kalyanaraman (2012) procedure to choose the optimal bandwidth h.[27] As discussed in Section 3, our results are robust to a range of bandwidths and a quadratic control function.

To address potential noncompliance with the curfew, we use the age threshold as an instrument to predict the number of days that the respondent was outside in the week of the survey ($days_i$) using Equation (1) as the first stage and estimate the following two-stage least squares (2SLS) model in a fuzzy RD setup:

$$y_i = \gamma + \tau_i \widehat{days}_i + f(x_i) + u_i \tag{2}$$

$$\forall x_i \in (c - h, c + h)$$

where the coefficient τ reflects the impact of an additional day per week of mandatory shelter in place on the outcome of interest for those who complied with the curfew order around the cutoff c. The optimal bandwidth according to the method of Imbens and Kalyanaraman (2012) is 44.7 for the first-stage variable capturing days spent outside in the previous week.[28] For ease of interpretation, we use this constant bandwidth in our main tables for second-stage outcomes. The results are highly similar with different bandwidths and control functions.

2.3 Preliminary Checks

We conduct two standard checks to validate our RD design (Imbens and Lemiuex 2008). The first is to test whether the forcing variable is subject to manipulation around the predetermined threshold (McCrary 2008). In our specific setup, rejecting a one-sided null hypothesis would indicate that individuals falsify their birthday to be exempt from the curfew. This is, however, highly unlikely because we asked individuals to read their birthday from their national IDs, and this is also the standard tool that the local security forces use to enforce the curfew. Figure A3 provides visual evidence that the local linear fits on the left- and right-hand side of the age threshold for the curfew do not exhibit any jumps in observation density. A formal test provided in McCrary (2008) also fails to reject

[27] We use a uniform kernel in our estimations. The results are highly similar when we use a triangular kernel.

[28] The optimal bandwidth according to the method of Calonico et al. (2014) is 17. Appendix Table A11 provides the RD estimates using this bandwidth.

the null hypothesis.[29]

Second, we examine whether the predetermined covariates are balanced around the discontinuity. In Figure 1, each graph plots local averages of the outcome in one-month bins against the forcing variable. We find no evidence of a significant break at the discontinuity for indicator variables of whether the respondent completed high school, whether he/she is illiterate, whether he/she is female, whether he/she is married, whether he/she is widowed or separated, whether he/she is of non-Turkish ethnic origin, whether he/she has ever received psychological support, whether he/she has a chronic disease, and the household size of the respondent prior to Covid-19.[30] Overall, we conclude that the predetermined covariates appear to be balanced around the threshold.

3 Effects of the Curfew on Mobility and Mental Health Outcomes

3.1 Mobility Outcomes

We begin by testing the effect of the curfew on mobility outcomes. Panel A of Figure 2 plots local averages of three mobility outcomes in monthly bins against the respondent's month and year of birth, with a cutoff of December 1955. As described in 1, the curfew required those born before this date to stay at home, whereas the younger cohorts were free to leave their homes at any time. Local linear smoothed fits on each side of the cutoff are overlaid on each figure. Figure 2(a) shows a clear downward shift at the discontinuity with an approximately 1-day decline in the number of days that respondents went out during the week prior to the interview. Similarly, Figure 2(b) also reveals a clear jump around the discontinuity in the self-reported probability of being subject to the curfew. Similarly, in Figure 2(c), the probability of never going outside—the likelihood of never leaving home—increases abruptly around the age threshold. Compared to the control groups averages, all of these indicators show a substantial decline in the mobility of respondents older than 65 years of age at the time the curfew was imposed.

In Table 1, we present the corresponding first-stage estimates using the main estimating

[29]To conduct the test, we use our first-stage optimal bandwidth of 44.7 months. The test yields a t-statistic of 0.03 with a p-value of 0.82.

[30]In regression-based tests reported in Appendix Table A3, we note that none of the predetermined covariates display any evidence of a statistically significant jump at the discontinuity across different bandwidths. SUR tests of the coefficients' joint significance result in p-values ranging from 0.25 to 0.75 depending on the bandwidth.

equation at various bandwidths. Crossing the treatment threshold reduces the number of days that the respondents went outside in the previous week by 1–1.1 days. The estimates are robust to different bandwidths and roughly correspond to a 43 percent decline in mobility relative to the control group mean.

Related indicators exhibit similarly large declines in mobility: being born before 1955 increases reporting of being subject to the curfew by 58–70 percentage points and raises the probability of never going out by 24–30 percentage points. Relative to the control group means, these estimates correspond to an approximately 7-fold increase in the probability of reporting being subject to under curfew and a 150 percent increase in the probability of never leaving home. The Appendix Table A4 shows that these results are robust to using a quadratic control function.

3.2 Mental Health Outcomes

We next examine the impact of the curfew on mental health outcomes. Panel B of Figure 2 plots local averages of three depression indices in monthly bins against the respondent's month and year of birth, with a cutoff of December 1955. These graphs suggest a sharp increase in all depression indicators around the discontinuity. Table 2 quantifies the magnitude of these effects: column 1 reports the OLS estimates using days outside during the week prior to the interview as the independent variable, column 2 reports the reduced-form RD treatment effects of being born before December 1955 with a linear control function in the month-year of birth on each side of the discontinuity, and column 3 reports the 2SLS (i.e., fuzzy) RD treatment effects by using being born before December 1955 as an instrument for days outside during the week prior to the interview.

The OLS estimates indicate a negative correlation between depression indices and the number of days that the respondent went outside. Remarkably, the reduced-form RD estimates show a substantial positive impact of the curfew on all measures of depression, with the first row estimates implying a 0.28 standard deviation increase in the overall depression index. The IV estimates confirm this effect, suggesting that a 1-day decline in days spent outside results in a 0.26 standard deviation increase in overall depression. We estimate similar effects for the more objective measure of depression—the somatic index (0.20 standard deviations)–which includes only physical symptoms of depression. The corresponding effect size of the nonsomatic depression index is an increase of 0.22 standard

deviations. These estimates are robust to different bandwidths and control functions, as shown in Appendix Tables A5 and A6.

4 Effects of the Curfew on Potential Causal Channels

We proceed by examining potential causal channels through which the curfew had a negative impact on mental health outcomes. We divide our analysis into three subsections by focusing on the effects of the curfew on the following outcomes: (i) employment and income, (ii) social and physical isolation, and (iii) household conflict.

4.1 Employment and Income Outcomes

If exposure to the curfew prevents one from going to work, it can result in a negative impact on one's ability to work outside and earn a living. Such negative labor market impacts can lead to additional anxiety and a deterioration of in mental health outcomes. We explore this mechanism by testing whether the curfew had a negative impact on employment and income outcomes.

In Panel A of Table 3, we find no evidence that the curfew had a significant impact on whether the respondent has a job that he/she cannot attend. Similarly, we find no evidence of a significant impact of the curfew on having enough money to meet usual needs, or being worried about spending money. Hence, we conclude that the labor market channel does not seem to explain our results.

4.2 Social and Physical Isolation Outcomes

Confinement may severely limit an individual's social interaction and physical mobility. Social isolation, loneliness, and disconnectedness from the community may lead to mental health problems among the senior population. Moreover, continuous confinement within the same physical space and a lack of physical mobility and exercise could further magnify the risk of a mental breakdown.

In Panel B of Table 3, the RD estimates show that the curfew had a positive impact on the probability of having a substantial reduction in social interaction and physical activity. In particular, a one day decline in days spent outside results in a 8.5 percentage point increase in the probability of having a substantial reduction in social interaction with friends and

family, corresponding to a 43 percent increase relative to the control group. Similarly, a one day decline in days spent outside leads to a 16.4 percentage point increase in the probability of having a substantial reduction in physical activity such as walking, running, or doing sports, corresponding to a 117 percent increase compared to the control group. Overall, we conclude that the social and physical isolation channel can potentially explain our results.

4.3 Household Conflict Outcomes

While being confined to the home reduces the time spent with people outside of the home, it tends to result in an increase in the time spent with household members. This additional time could mechanically increase the probability of having a conflict with a household member. Moreover, the additional stress of social isolation could also increase the probability of experiencing a conflict at home.

In Panel C of Table 3, the RD estimates indicate no evidence of a change in the current household size, implying no significant impact of the curfew on household composition. We also find no evidence of a significant change in the probability of having a conflict with a household member driven by home confinement. Hence, the household conflict channel does not appear to explain our results.

Individual beliefs and practices Finally, we explore some potential consequences of the curfew for individual beliefs and practices. For example, age-specific curfews might create a sense of social unfairness among individuals who are subject to them. As shown in Appendix Table A10, individuals who were subject to curfew are substantially less likely to support the curfew policy. Lastly, we examine the change in religious practices and religiosity as a coping mechanism under social isolation. The estimates provided in Appendix Table A9 show no evidence of a significant impact of the curfew on religious beliefs and practices.

Note that these estimates are robust to the use of different bandwidths and control functions used as shown in Appendix Tables A7 and A8. They are also robust to using the optimal bandwidth chosen by the Calonico et al. (2014) procedure as shown in Appendix Table A11.

5 Conclusion

As policymakers continue to weigh policy options in response to the Covid-19 pandemic, it is imperative to understand the potential costs of stay-at-home orders targeting certain subpopulations. While macroeconomic models incorporating the SIR framework often recommend age-specific lockdowns targeting adults age 65 and older, they often neglect the mental health consequences of these movement restrictions.

Using a rather unique setup in Turkey—which imposed a strict curfew for the high-risk population group of those aged 65 and above on March 21, 2020—we implement an RD design comparing those just under the binding age cutoff to those above it using data from a detailed phone survey covering 59- to 70-year-old adults.

Our findings reveal that the curfew had striking mental health consequences. We find that the curfew reduced the number of days spent outside the week prior to the interview by approximately one day. The fuzzy RD estimates indicate that a-one day decline in days spent outside results in a 0.20 standard deviation increase in somatic depression and 0.22 standard deviation increase in nonsomatic depression. These sizable effects are all the more concerning since older adults are already more susceptible to a higher risk of depression and suicide.

These mental health consequences of strict lockdown policies call for a rethinking of how additional policy measures – ranging from mental health call centers and telehealth services to on-the-ground local support for senior adults – can be used to alleviate the mental health burden on susceptible populations.

References

Acemoglu, Daron, Victor Chernozhukov, Iván Werning, and Michael D Whinston, "A multi-risk SIR model with optimally targeted lockdown," Technical Report, National Bureau of Economic Research 2020.

Altindag, Onur, "What do official COVID19 death statistics tell us?," 2020. Accessed at `https://www.onuraltindag.info/pt-tr/posts/excess_mortality_eng/` on August 8, 2020.

Alvarez, Fernando E, David Argente, and Francesco Lippi, "A simple planning problem for covid-19 lockdown," Technical Report, National Bureau of Economic Research 2020.

American Psychiatric Association, *Diagnostic and statistical manual of mental disorders (DSM-5®)*, American Psychiatric Pub, 2013.

Anderson, Michael L, "Multiple inference and gender differences in the effects of early intervention: A reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects," *Journal of the American statistical Association*, 2008, *103* (484), 1481–1495.

Armitage, Richard and Laura B Nellums, "COVID-19 and the consequences of isolating the elderly," *The Lancet Public Health*, 2020, *5* (5), e256.

Baird, Sarah, Jacobus De Hoop, and Berk Özler, "Income shocks and adolescent mental health," *Journal of Human Resources*, 2013, *48* (2), 370–403.

Boehm, Julia K, Ying Chen, David R Williams, Carol D Ryff, and Laura D Kubzansky, "Subjective well-being and cardiometabolic health: An 8–11 year study of midlife adults," *Journal of psychosomatic research*, 2016, *85*, 1–8.

Brooks, Samantha K, Rebecca K Webster, Louise E Smith, Lisa Woodland, Simon Wessely, Neil Greenberg, and Gideon James Rubin, "The psychological impact of quarantine and how to reduce it: rapid review of the evidence," *The Lancet*, 2020.

Brotherhood, Luiz, Philipp Kircher, Cezar Santos, and Michèle Tertilt, "An economic model of the Covid-19 epidemic: The importance of testing and age-specific policies," 2020.

Calonico, Sebastian, Matias Cattaneo, and Rocio Titiunik, "Robust Nonparametric Confidence Intervals for Regression Discontinuity Designs," *Econometrica*, 2014, *82*, 2295–2326.

Duflo, Esther, Rachel Glennerster, and Michael Kremer, "Using Randomization in Development Economics Research: A Toolkit," *Handbook of Development Economics*, 2007, *4*, 3895–3962.

Eghigian, Greg, "The Spanish Flu Pandemic and Mental Health: A Historical Perspective," Technical Report, Psychiatric Times 2020.

Erten, Bilge and Pinar Keskin, "Breaking the cycle? education and the intergenerational transmission of violence," *Review of Economics and Statistics*, 2020, *102* (2), 252–268.

Fegert, Jörg M, Benedetto Vitiello, Paul L Plener, and Vera Clemens, "Challenges and burden of the Coronavirus 2019 (COVID-19) pandemic for child and adolescent mental health: a narrative review to highlight clinical and research needs in the acute phase and the long return to normality," *Child and adolescent psychiatry and mental health*, 2020, *14*, 1–11.

Forsythe, Eliza, Lisa B Kahn, Fabian Lange, and David Wiczer, "Labor Demand in the time of COVID-19: Evidence from vacancy postings and UI claims," *Journal of Public Economics*, 2020, pp. 104–238.

Galea, Sandro, Jennifer Ahern, Heidi Resnick, Dean Kilpatrick, Michael Bucuvalas, Joel Gold, and David Vlahov, "Psychological sequelae of the September 11 terrorist attacks in New York City," *New England journal of medicine*, 2002, *346* (13), 982–987.

_ , Raina M Merchant, and Nicole Lurie, "The mental health consequences of COVID-19 and physical distancing: The need for prevention and early intervention," *JAMA internal medicine*, 2020, *180* (6), 817–818.

González-Sanguino, Clara, Berta Ausín, Miguel ÁngelCastellanos, Jesús Saiz, Aída López-Gómez, Carolina Ugidos, and Manuel Muñoz, "Mental health consequences during the initial stage of the 2020 Coronavirus pandemic (COVID-19) in Spain," *Brain, Behavior, and Immunity*, 2020.

Gupta, Sumedha, Laura Montenovo, Thuy D Nguyen, Felipe Lozano Rojas, Ian M Schmutte, Kosali I Simon, Bruce A Weinberg, and Coady Wing, "Effects of social distancing policy on labor market outcomes," Technical Report, National Bureau of Economic Research 2020.

Haushofer, Johannes and Jeremy Shapiro, "The short-term impact of unconditional cash transfers to the poor: experimental evidence from Kenya," *The Quarterly Journal of Economics*, 2016, *131* (4), 1973–2042.

Holmes, Emily A, Rory C O'Connor, V Hugh Perry, Irene Tracey, Simon Wessely, Louise Arseneault, Clive Ballard, Helen Christensen, Roxane Cohen Silver, Ian Everall et al., "Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science," *The Lancet Psychiatry*, 2020.

Idler, Ellen L and Yael Benyamini, "Self-rated health and mortality: a review of twenty-seven community studies," *Journal of health and social behavior*, 1997, pp. 21–37.

Imbens, Guido and Karthik Kalyanaraman, "Optimal bandwidth choice for the regression discontinuity estimator," *The Review of economic studies*, 2012, *79* (3), 933–959.

_ and Thomas Lemiuex, "Regression Discontinuity Designs: A Guide to Practice," *Journal of Econometrics*, 2008, *142* (2), 615–635.

Jacobson, Nicholas C, Damien Lekkas, George Price, Michael V Heinz, Minkeun Song, A James O'Malley, and Paul J Barr, "Flattening the Mental Health Curve: COVID-19 Stay-at-Home Orders Are Associated With Alterations in Mental Health Search Behavior in the United States," *JMIR mental health*, 2020, *7* (6), e19347.

Kozlowski, Julian, Laura Veldkamp, and Venky Venkateswaran, "Scarring body and mind: the long-term belief-scarring effects of Covid-19," *NBER Working Paper*, 2020, (27439).

Lee, Antoinette M, Josephine GWS Wong, Grainne M McAlonan, Vinci Cheung, Charlton Cheung, Pak C Sham, Chung-Ming Chu, Poon-Chuen Wong, Kenneth WT Tsang, and Siew E Chua, "Stress and psychological distress among SARS survivors 1 year after the outbreak," *The Canadian Journal of Psychiatry*, 2007, *52* (4), 233–240.

Lee, David S. and David Card, "Regression discontinuity inference with specification error," *Journal of Econometrics*, 2008, *142* (2), 655–674.

Leslie, Emily and Riley Wilson, "Sheltering in place and domestic violence: Evidence from calls for service during COVID-19," *forthcoming in Journal of Public Economics*, 2020.

McCrary, Justin, "Manipulation of the running variable in the regression discontinuity design: A density test," *Journal of econometrics*, 2008, *142* (2), 698–714.

Nelson, Daniel, "Violence against elderly people: a neglected problem," *The Lancet*, 2002, *360* (9339), 1094.

Neria, Yuval, Arijit Nandi, and Sandro Galea, "Post-traumatic stress disorder following disasters: a systematic review," *Psychological medicine*, 2008, *38* (4), 467.

Newman, Michelle G and Nur Hani Zainal, "The value of maintaining social connections for mental health in older people," *The Lancet Public Health*, 2020, *5* (1), e12–e13.

OECD, "Pensions at a Glance 2017: Country Profiles – Turkey," Technical Report, OECD 2017.

Ortega, Francisco B, Duck chul Lee, Xuemei Sui, Laura D Kubzansky, Jonatan R Ruiz, Meghan Baruth, Manuel J Castillo, and Steven N Blair, "Psychological well-being, cardiorespiratory fitness, and long-term survival," *American journal of preventive medicine*, 2010, *39* (5), 440–448.

Panchal, Nirmita, Rabah Kamal, Kendal Orgera, Cynthia Cox, Rachel Garfield, Liz Hamel, and P Chidambaram, "The implications of COVID-19 for mental health and substance use," *KFF Issue Brief*, 2020, *5*, 2020.

Pfefferbaum, Betty and Carol S North, "Mental health and the Covid-19 pandemic," *New England Journal of Medicine*, 2020.

Ravindran, Saravana and Manisha Shah, "Unintended Consequences of Lockdowns: COVID-19 and the Shadow Pandemic," Technical Report, National Bureau of Economic Research 2020.

Rutter, Michael, Jack Tizard, and Kingsley Whitmore, *Education, health and behaviour*, Longman Publishing Group, 1970.

Samuel, Samantha Ciarocco Dotson and Katherine A Koh, "Disaster psychiatry and homelessness: creating a mental health COVID-19 response," *The Lancet Psychiatry*, 2020.

Santini, Ziggi Ivan, Paul E Jose, Erin York Cornwell, Ai Koyanagi, Line Nielsen, Carsten Hinrichsen, Charlotte Meilstrup, Katrine R Madsen, and Vibeke Koushede, "Social disconnectedness, perceived isolation, and symptoms of depression and anxiety among older Americans (NSHAP): a longitudinal mediation analysis," *The Lancet Public Health*, 2020, *5* (1), e62–e70.

Steptoe, Andrew, Aparna Shankar, Panayotes Demakakos, and Jane Wardle, "Social isolation, loneliness, and all-cause mortality in older men and women," *Proceedings of the National Academy of Sciences*, 2013, *110* (15), 5797–5801.

The New York Times, "The Coronavirus Mental Health Crisis Hits Home," *The New York Times*, May 12, 2020.

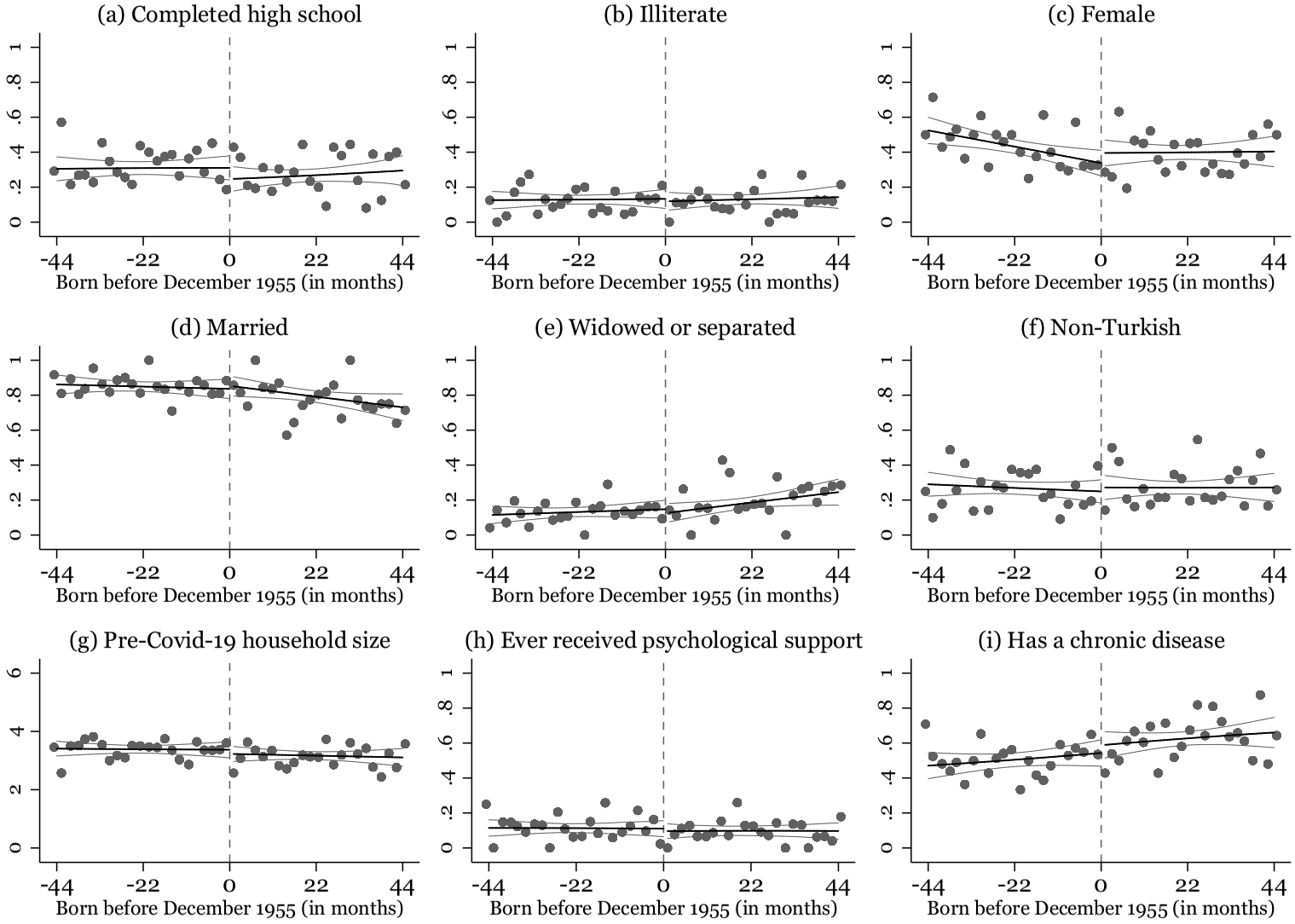
Tufan, I, "Violence against the elderly in Turkey, 1st Turkey atlas of Gerontology-Geroatlas," 2011.

Tull, Matthew T, Keith A Edmonds, Kayla Scamaldo, Julia R Richmond, Jason P Rose, and Kim L Gratz, "Psychological Outcomes Associated with Stay-at-Home Orders and the Perceived Impact of COVID-19 on Daily Life," *Psychiatry research*, 2020, p. 113098.

World Health Organization, "The WHO special initiative for mental health (2019-2023): universal health coverage for mental health," Technical Report, World Health Organization 2019.

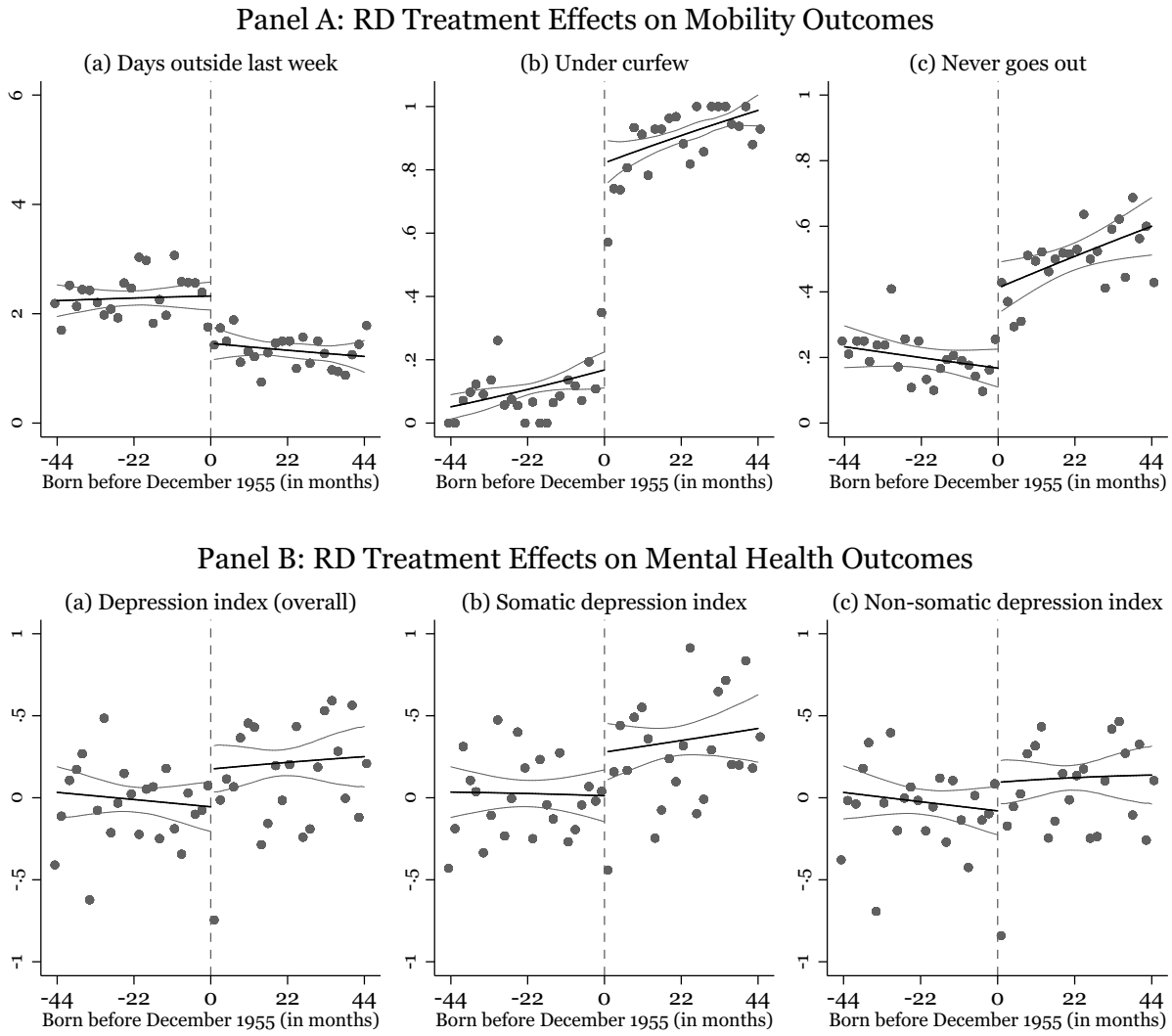
Yokoyama, Yukari, Kotaro Otsuka, Norito Kawakami, Seiichiro Kobayashi, Akira Ogawa, Kozo Tannno, Toshiyuki Onoda, Yumi Yaegashi, and Kiyomi Sakata, "Mental health and related factors after the Great East Japan earthquake and tsunami," *PloS one*, 2014, *9* (7), e102497.

FIGURE 1: BALANCED COVARIATES



Note: The sample includes all individuals born before and after 44 months around the cutoff point, December 1955. The figures plot predetermined covariates in monthly bins against the month-year of birth of being born in December 1955. The vertical line in each graph represents the cutoff point. Gray lines show 95 percent confidence intervals around the mean level. Variable definitions are listed in Appendix A.

FIGURE 2: RD TREATMENT EFFECTS ON MOBILITY AND MENTAL HEALTH OUTCOMES



Note: The sample includes all individuals born before and after 44 months around the cutoff point, December 1955. The vertical line in each graph represents the cut-off point, December 1955. Gray lines show 95 percent confidence intervals around the mean level. Variable definitions are listed in Appendix A.

Table 1: Effects of Curfew on Mobility Outcomes

	±24	±36	±48	±60	±72
Days outside last week					
Born before 1955	-1.015***	-1.116***	-1.037***	-1.023***	-0.994***
	(0.236)	(0.213)	(0.170)	(0.166)	(0.153)
Observations	672	976	1274	1601	1856
Control group mean	2.40	2.33	2.33	2.40	2.41
Under curfew					
Born before 1955	0.578***	0.630***	0.666***	0.682***	0.700***
	(0.057)	(0.050)	(0.045)	(0.041)	(0.037)
Observations	659	955	1263	1575	1852
Control group mean	0.10	0.10	0.09	0.08	0.08
Never goes out					
Born before 1955	0.238***	0.296***	0.299***	0.271***	0.273***
	(0.064)	(0.042)	(0.035)	(0.032)	(0.030)
Observations	648	940	1244	1556	1830
Control group mean	0.17	0.19	0.20	0.18	0.18

Notes: This table presents first-stage estimates of the effect of being born before December 1955 on the mobility outcomes of individuals. The variable descriptions are provided in Appendix A. The first column presents results for individuals born within 24 months of the age threshold, December 1955. The second through fifth columns expand the sample to include individuals within 36, 48, 60, and 72 months of the age threshold. The specification includes month fixed effects, province fixed effects, surveyor fixed effects, as well as indicator variables for education levels, ethnicity, and gender. Standard errors are clustered at the month-year cohort level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Table 2: Effects of Curfew on Mental Health Outcomes

	OLS (1)	RF (2)	IV (3)
Overall depression index			
Days outside last week	-0.082***	0.275***	-0.260***
	(0.016)	(0.088)	(0.078)
Somatic depression index			
Days outside last week	-0.063***	0.217**	-0.204***
	(0.016)	(0.084)	(0.075)
Nonsomatic depression index			
Days outside last week	-0.079***	0.231***	-0.218***
	(0.016)	(0.087)	(0.073)
Observations	1179	1179	1179

Notes: This table presents regression discontinuity estimates of the effect of the curfew on mental health outcomes. See the Appendix A for details of index construction. Column 1 reports the OLS estimates using days outside last week as the independent variable, column 2 reports the reduced-form RD treatment effects of being born before December 1955 with a linear control function in the month-year of birth on each side of the discontinuity, and column 3 reports the two-stage least-squares RD treatment effects by using being born before December 1955 as an instrument for days outside last week. The sample consists of individuals born within 44 months of the age threshold, December 1955. Standard errors are clustered at the month-year cohort level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Table 3: Effects of Curfew on Potential Channels

	OLS (1)	RF (2)	IV (3)
Panel A: Employment and Income Outcomes			
Has a job but could not attend last week			
Days outside last week	0.059***	-0.027	0.025
	(0.008)	(0.035)	(0.030)
Control group mean	0.16	0.16	0.16
Observations	1163	1163	1163
Has enough money for usual needs			
Days outside last week	0.010	0.059	-0.054
	(0.011)	(0.059)	(0.051)
Control group mean	0.57	0.57	0.57
Observations	1174	1174	1174
Worried about spending money			
Days outside last week	0.006	-0.002	0.002
	(0.009)	(0.047)	(0.042)
Control group mean	0.61	0.61	0.61
Observations	1170	1170	1170
Panel B: Social and Physical Isolation Outcomes			
Substantial reduction in social interaction			
Days outside last week	-0.039***	0.089*	-0.085**
	(0.008)	(0.046)	(0.038)
Observations	1176	1176	1176
Control group mean	0.20	0.20	0.20
Substantial reduction in physical activity			
Days outside last week	-0.052***	0.177***	-0.164***
	(0.007)	(0.044)	(0.039)
Observations	1157	1157	1157
Control group mean	0.14	0.14	0.14
Panel C: Household Conflict Outcomes			
Household size			
Days outside last week	0.028	-0.010	0.009
	(0.028)	(0.155)	(0.134)
Control group mean	3.50	3.50	3.50
Conflict with a household member			
Days outside last week	-0.002	0.065	-0.062
	(0.008)	(0.041)	(0.040)
Control group mean	0.38	0.38	0.38
Observations	1156	1156	1156

Notes: This table presents regression discontinuity estimates of the effect of the curfew on potential channels. The variable descriptions are provided in Appendix A. Column 1 reports the OLS estimates using days outside last week as the independent variable, column 2 reports the reduced-form RD treatment effects of being born before December 1955 with a linear control function in the month-year of birth on each side of the discontinuity, and column 3 reports the two-stage least-squares RD treatment effects by using being born before December 1955 as an instrument for days outside last week. The sample consists of individuals born within 44 months of the age threshold, December 1955. Standard errors are clustered at the month-year cohort level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Appendix A List of Variables

Outcome Variables:

- Days outside last week: The number of years the respondent went outside last week.
- Under curfew: A dummy variable equal to one if the respondent reported being subject to the curfew within the last month.
- Never goes out: A dummy variable equal to one if the respondent reported his/her current frequency of going outside as “never going outside".
- Depression indices: Following Anderson (2008), each index is generated by demeaning its component outcomes and converting them to effect sizes through dividing by control group standard deviation. The demeaned values are subsequently combined by weighting according to the inverse of the covariance matrix.
  - Somatic depression index: a z-score calculated by averaging the z-scores from each of the 4 somatic depression indicators, including dummy variables equal to one if the respondent reports that she experienced the following within the last four weeks: (i) frequent headaches, (ii) trembling hands, (iii) digestion problems, and (iv) heartburn or other stomach problems.
  - Nonsomatic depression index: a z-score calculated by averaging the z-scores from each of the 16 nonsomatic depression indicators, including dummy variables equal to one if the respondent reports that she experienced the following within the last four weeks: (i) appetite loss, (ii) trouble sleeping, (iii) felt easily frightened from several things, (iv) felt anxious or nervous, (v) had trouble in thinking clearly, (vi) felt unhappy, (vii) cried more often, (viii) did not enjoy daily activities, (ix) had difficulty making decisions, (x) delayed daily activities, (xi) felt useless, (xii) lost interest in activities that she previously enjoyed, (xiii) felt worthless, (xiv) thought about suicide, (xv) felt tired all the time, and (xvi) got tired easily.
  - Overall depression index: A z-score calculated by averaging the z-scores from 20 depression indicators, including 4 somatic and 16 nonsomatic depression indicators, as listed above.
- Has a job but could not attend last week: A dummy variable equal to one if the respondent reported having a job but could not attend this job last week.
- Has enough money for usual needs: A dummy variable equal to one if the respondent reported having enough money for satisfying his/her usual needs last month.
- Worried about spending money: A dummy variable equal to one if the respondent reported being worried about spending money last month.

- Substantial reduction in social interaction: A dummy variable equal to one if the respondent reported that his/her social interaction with friends and family has been substantially reduced.
- Substantial reduction in physical activity: A dummy variable equal to one if the respondent reported that his/her physical activity (e.g. walking, running, doing sports, etc.) has been substantially reduced.
- Household size: The number of people currently residing with the respondent in the same household.
- Conflict with a household member: A dummy variable equal to one if the respondent reported that he/she had a conflict with a household member last month.

Covariates:

- Completed high school: A dummy variable equal to one if the respondent completed high school or above.
- Illiterate: A dummy variable equal to one if the respondent is illiterate.
- Female: A dummy variable equal to one if the respondent is female.
- Married: A dummy variable equal to one if the respondent is married.
- Widowed or separated: A dummy variable equal to one if the respondent is widowed or separated.
- Non-Turkish: A dummy variable equal to one if the respondent has a non-Turkish ethnic identity, e.g. Arabic, Kurdish, or other.
- Pre-Covid-19 household size: The number of people residing with the respondent in the same household prior to the Covid-19 outbreak.
- Ever received psychological support: A dummy variable equal to one if the respondent has ever received psychological support.
- Has a chronic disease: A dummy variable equal to one if the respondent has a chronic disease.

Outcome Variables in Appendix B:

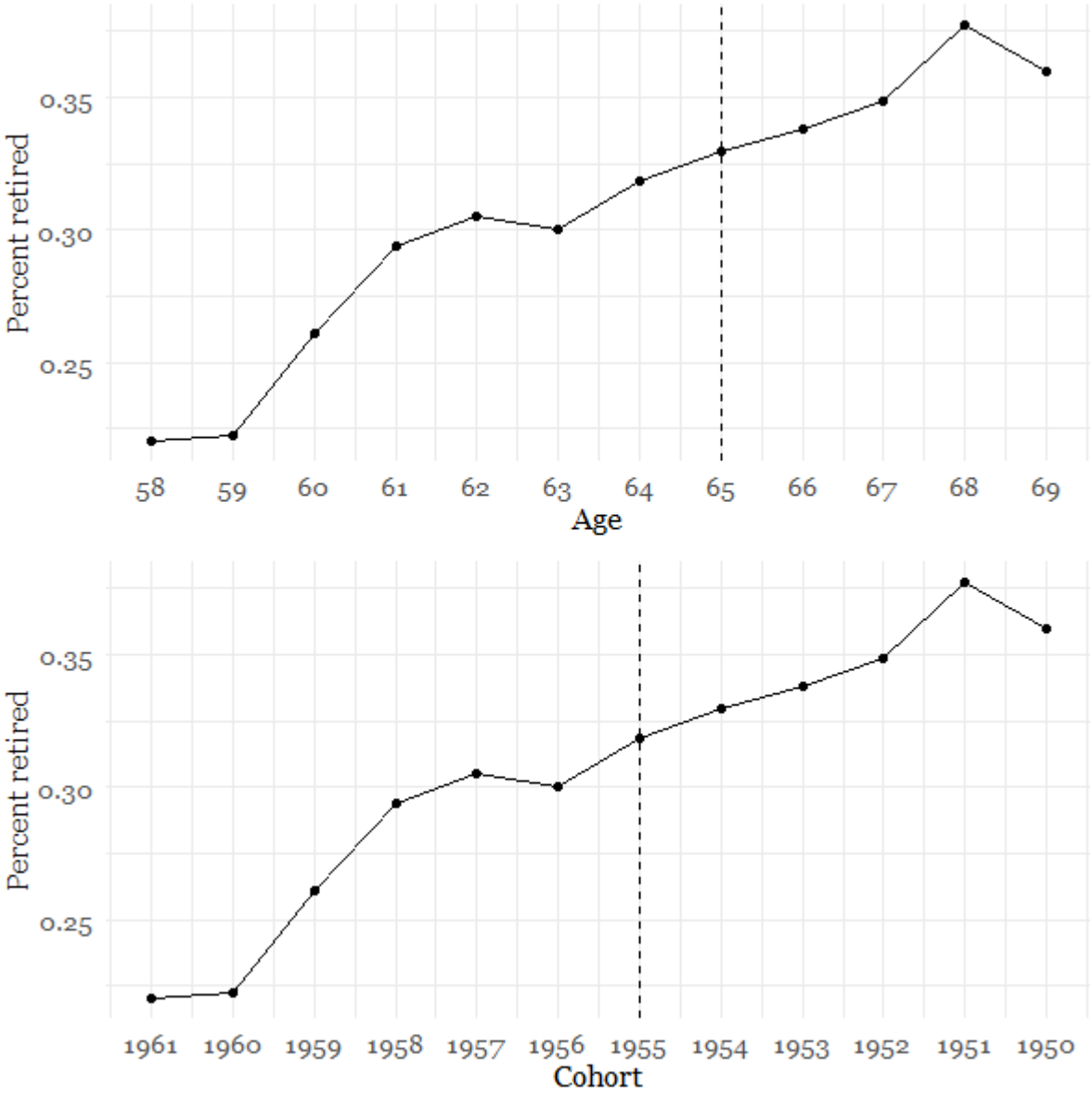
- Each one of the below outcomes is a dummy variable that equals one if the respondent agreed with the statement:
  - *Considers himself/herself religious*: "Religion has an important place in my life."

  - *Prays daily*: "I prayed most of the day during the last month."
  - *Agrees that one should live by the holy book*: "One should live word-by-word the holy book."
  - *Agrees that virus is a God-sent warning*: "Epidemics is a God sent warning to humanity."

- Religiosity index: A standard normalized z-score calculated by averaging the individual 4 religiosity indicators defined above. Following Anderson (2008), the index is generated by demeaning its component outcomes and converting them to effect sizes through dividing by control group standard deviation. The demeaned values are subsequently combined by weighting according to the inverse of the covariance matrix.

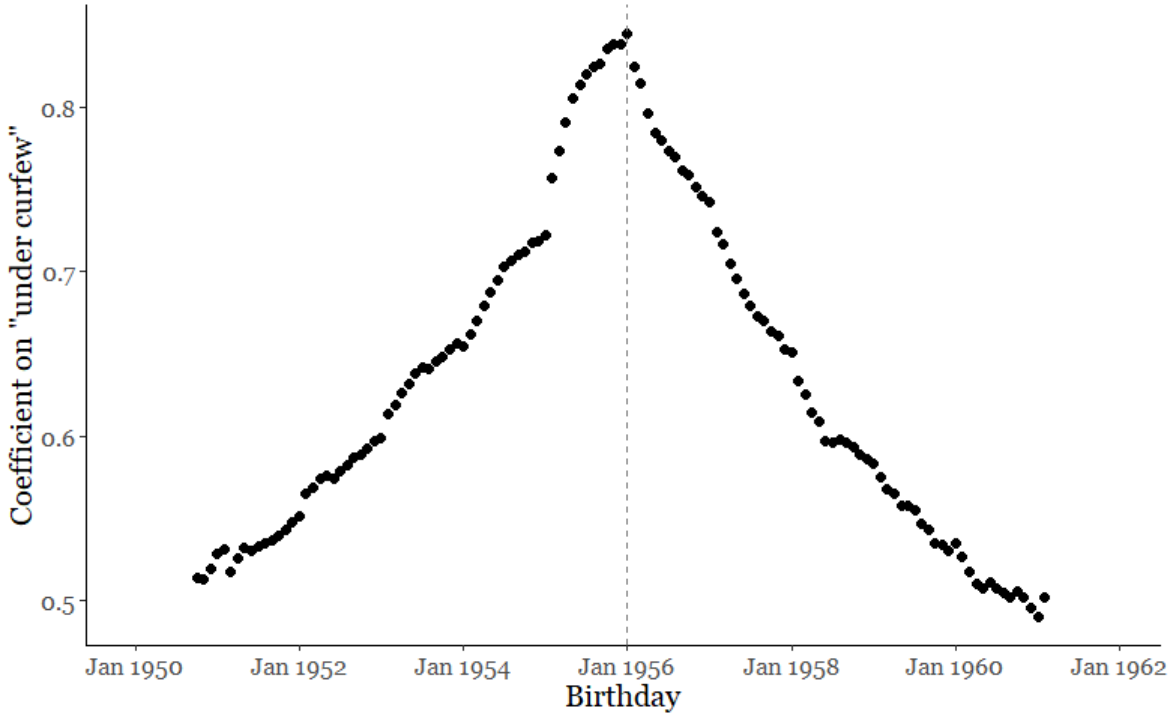
Appendix B Additional Figures and Tables

FIGURE A1: RETIREMENT BY AGE AND COHORT: HOUSEHOLD LABOR FORCE SURVEY 2019



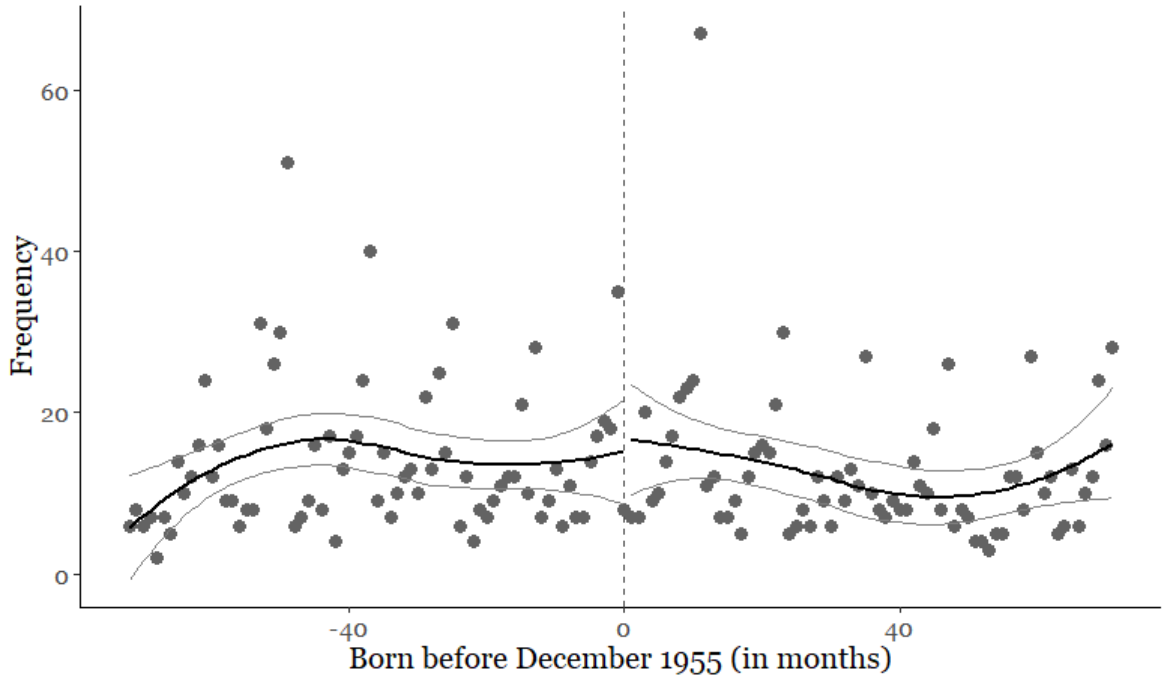
Note: The sample includes all individuals born between January 1950 and December 1961. The vertical line in each graph represents the cut-off point by age in 2019 and cohort.

FIGURE A2: GRID SEARCH FOR RD TREATMENT THRESHOLDS



Note: The sample includes all individuals born between January 1950 and December 1961. The vertical line represents the birth year and birth month for which the estimated coefficient of difference in exposure to curfew between the treatment and the control group is maximum. Variable definitions are listed in Appendix A.

FIGURE A3: DISTRIBUTION OF RUNNING VARIABLE AROUND THE THRESHOLD



Note: The sample includes all individuals born between January 1950 and December 1961. The vertical line in each graph represents the cut-off point, December 1955. Gray lines show 95 percent confidence intervals around the mean level. Variable definitions are listed in Appendix A.

Table A1: Comparison of Basic Demographic Information with Household Labor Force Survey

	Household Labor Force Survey (2019)			Analysis Sample		
Variable	Mean	S.D.	Obs	Mean	S.D.	Obs
Age	64.07	3.43	53,584	63.97	3.35	1,909
Female (%)	0.52	0.50	53,584	0.43	0.50	1,909
Marital Status (%)						
Never Married	0.02	0.12	53,584	0.02	0.13	1,907
Married	0.83	0.37	53,584	0.81	0.40	1,907
Divorced	0.03	0.17	53,584	0.03	0.16	1,907
Widowed	0.12	0.33	53,584	0.15	0.36	1,907
Education (%)						
Illiterate	0.19	0.39	53,584	0.13	0.34	1,896
Literate but no formal schooling	0.08	0.28	53,584	0.08	0.27	1,896
Primary school	0.49	0.50	53,584	0.37	0.48	1,896
Secondary school	0.06	0.24	53,584	0.15	0.35	1,896
High school	0.09	0.29	53,584	0.16	0.37	1,896
College and above	0.08	0.27	53,584	0.11	0.31	1,896

Notes: The sample includes all individuals born between January 1950 and December 1961. Age is calculated as in 2020.

TABLE A2: SUMMARY STATISTICS FOR 59-70 YEAR-OLD INDIVIDUALS

	Mean	S.D.	Min	Max	Obs.
Panel A: Pre-determined Characteristics					
Completed high school	0.27	0.44	0	1	1896
Illiterate	0.13	0.34	0	1	1896
Female	0.43	0.50	0	1	1909
Married	0.81	0.40	0	1	1907
Widowed or separated	0.18	0.38	0	1	1907
Non-Turkish	0.26	0.44	0	1	1881
Pre-Covid-19 household size	3.29	1.73	1	10	1909
Ever received psychological support	0.11	0.31	0	1	1887
Has a chronic disease	0.57	0.50	0	1	1898
Panel B: Mobility Outcomes					
Days outside last week	1.87	1.79	0	7	1896
Under curfew	0.48	0.50	0	1	1907
Never goes out	0.36	0.48	0	1	1885
Panel C: Potential Channels					
Has a job but could not attend last week	0.14	0.35	0	1	1876
Has money for usual needs	0.61	0.49	0	1	1894
Worried about spending money	0.60	0.49	0	1	1890
Substantial reduction in social interaction	0.25	0.44	0	1	1905
Substantial reduction in physical activity	0.22	0.42	0	1	1878
Current household size	3.42	1.83	1	10	1909
Conflict with a household member	0.37	0.48	0	1	1868

Notes: The table presents the means, standard deviations, minimum values, maximum values, and number of observations. The sample includes 59–70 year-old individuals born within 72 months before and after December 1955. The variables are described in Appendix A.

Table A3: RD Treatment Effects on Predetermined Covariates

	±24	±36	±48	±60	±72
Completed high school					
Born before 1955	0.025	-0.037	-0.039	-0.024	-0.013
	(0.073)	(0.071)	(0.060)	(0.054)	(0.049)
Observations	692	1000	1307	1638	1896
Control group mean	0.33	0.31	0.31	0.31	0.31
Illiterate					
Born before 1955	-0.023	-0.011	-0.015	-0.030	-0.032
	(0.047)	(0.040)	(0.032)	(0.029)	(0.027)
Observations	692	1000	1307	1638	1896
Control group mean	0.13	0.12	0.13	0.12	0.11
Female					
Born before 1955	0.040	0.076	0.029	0.032	0.027
	(0.062)	(0.060)	(0.055)	(0.050)	(0.046)
Observations	696	1007	1316	1650	1909
Control group mean	0.39	0.42	0.44	0.45	0.46
Married					
Born before 1955	0.019	0.015	0.012	-0.014	-0.019
	(0.054)	(0.045)	(0.041)	(0.036)	(0.034)
Observations	696	1006	1315	1648	1907
Control group mean	0.84	0.85	0.85	0.84	0.84
Widowed or separated					
Born before 1955	0.004	-0.015	-0.020	0.004	0.009
	(0.048)	(0.043)	(0.040)	(0.035)	(0.033)
Observations	696	1006	1315	1648	1907
Control group mean	0.15	0.13	0.13	0.14	0.14
Non-Turkish					
Born before 1955	0.127	0.059	0.062	0.013	0.012
	(0.087)	(0.065)	(0.055)	(0.048)	(0.042)
Observations	682	991	1294	1624	1881
Control group mean	0.26	0.26	0.26	0.25	0.25
Pre-Covid-19 household size					
Born before 1955	-0.211	-0.226	-0.147	-0.155	-0.193
	(0.192)	(0.165)	(0.151)	(0.134)	(0.126)
Observations	696	1007	1316	1650	1909
Control group mean	3.39	3.37	3.40	3.41	3.40
Ever received psychological support					
Born before 1955	-0.069	-0.032	-0.018	-0.010	-0.028
	(0.046)	(0.037)	(0.033)	(0.032)	(0.028)
Observations	688	998	1304	1634	1887
Control group mean	0.11	0.12	0.12	0.12	0.12
Has a chronic disease					
Born before 1955	-0.026	0.026	0.055	0.052	0.042
	(0.053)	(0.044)	(0.042)	(0.036)	(0.033)
Observations	691	1001	1309	1640	1898
Control group mean	0.51	0.51	0.51	0.50	0.49
Joint p-value	0.25	0.59	0.51	0.75	0.58

Notes: This table presents RD estimates of being born before December 1955 on the predetermined characteristics of individuals. The variable descriptions are provided in Appendix A. The first column presents results for individuals born within 24 months of the age threshold, December 1955. The second through fifth columns expand the sample to include individuals within 36, 48, 60, and 72 months of the age threshold. Standard errors are clustered at the month-year cohort level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Table A4: Effects of Curfew on Mobility Outcomes using a Quadratic Control Function

	±24	±36	±48	±60	±72
Days outside last week					
Born before 1955	-1.242***	-1.126***	-1.131***	-1.010***	-1.073***
	(0.375)	(0.261)	(0.256)	(0.234)	(0.239)
Observations	672	976	1274	1601	1856
Control group mean	2.40	2.33	2.33	2.40	2.41
Under curfew					
Born before 1955	0.573***	0.585***	0.609***	0.641***	0.673***
	(0.095)	(0.068)	(0.060)	(0.057)	(0.053)
Observations	678	982	1283	1610	1866
Control group mean	0.10	0.10	0.09	0.08	0.08
Never goes out					
Born before 1955	0.254***	0.283***	0.301***	0.260***	0.240***
	(0.090)	(0.057)	(0.055)	(0.047)	(0.043)
Observations	667	966	1264	1591	1844
Control group mean	0.16	0.19	0.19	0.18	0.18

Notes: This table presents first-stage estimates of the effect of being born before December 1955 on the mobility outcomes of individuals using a quadratic control function. The variable descriptions are provided in Appendix A. The first column presents results for individuals born within 24 months of the age threshold, December 1955. The second through fifth columns expand the sample to include individuals within 36, 48, 60, and 72 months of the age threshold. The specification includes month fixed effects, province fixed effects, surveyor fixed effects, as well as indicator variables for education levels, ethnicity, and gender. Standard errors are clustered at the month-year cohort level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Table A5: Effects of Curfew on Mental Health Outcomes using Different Bandwidths

	±24	±36	±48	±60	±72
Overall depression index					
Born before 1955	0.333**	0.238**	0.259***	0.248***	0.171**
	(0.132)	(0.108)	(0.080)	(0.073)	(0.076)
Somatic depression index					
Born before 1955	0.302**	0.214**	0.196**	0.209***	0.165**
	(0.148)	(0.102)	(0.079)	(0.079)	(0.071)
Nonsomatic depression index					
Born before 1955	0.247**	0.175*	0.217***	0.204***	0.127*
	(0.116)	(0.104)	(0.077)	(0.068)	(0.070)
Observations	677	983	1284	1610	1866

Notes: This table presents the reduced-form effects of being born before December 1955 on the mental health outcomes across different bandwidths. The variable descriptions are provided in Appendix A. The first column presents results for individuals born within 24 months of the age threshold, December 1955. The second through fifth columns expand the sample to include individuals within 36, 48, 60, and 72 months of the age threshold. The specification includes month fixed effects, province fixed effects, surveyor fixed effects, as well as indicator variables for education levels, ethnicity, and gender. Standard errors are clustered at the month-year cohort level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Table A6: Effects of Curfew on Mental Health Outcomes using a Quadratic Control Function

	OLS (1)	RF (2)	IV (3)
Overall depression index			
Days outside last week	-0.082***	0.291**	-0.284**
	(0.016)	(0.139)	(0.129)
Somatic depression index			
Days outside last week	-0.063***	0.295**	-0.288**
	(0.016)	(0.138)	(0.137)
Nonsomatic depression index			
Days outside last week	-0.079***	0.163	-0.159
	(0.016)	(0.131)	(0.112)
Observations	1179	1179	1179

Notes: This table presents regression discontinuity estimates of the effect of the curfew on mental health outcomes using a quadratic control function. See the Appendix A for details of index construction. Column 1 reports the OLS estimates using days outside last week as the independent variable, column 2 reports the reduced-form RD treatment effects of being born before December 1955 with a linear control function in the month-year of birth on each side of the discontinuity, and column 3 reports the two-stage least-squares RD treatment effects by using being born before December 1955 as an instrument for days outside last week. The sample consists of individuals born within 44 months of the age threshold, December 1955. Standard errors are clustered at the month-year cohort level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

TABLE A7: EFFECTS OF CURFEW ON POTENTIAL CHANNELS USING DIFFERENT BANDWIDTHS

	±24	±36	±48	±60	±72
Panel A: Employment and Income Outcomes					
Has a job but could not attend last week					
Born before 1955	0.005	-0.005	-0.042	-0.042	-0.045
	(0.058)	(0.042)	(0.036)	(0.032)	(0.031)
Observations	666	968	1268	1586	1836
Control group mean	0.16	0.16	0.17	0.18	0.18
Has enough money for usual needs					
Born before 1955	-0.027	0.088	0.069	0.074	0.074*
	(0.067)	(0.060)	(0.056)	(0.048)	(0.043)
Observations	673	978	1279	1601	1856
Control group mean	0.56	0.57	0.58	0.57	0.58
Worried about spending money					
Born before 1955	-0.126**	-0.032	-0.021	-0.030	-0.048
	(0.062)	(0.045)	(0.044)	(0.042)	(0.040)
Observations	672	974	1274	1597	1852
Control group mean	0.61	0.59	0.61	0.62	0.62
Panel B: Social and Physical Isolation Outcomes					
Substantial reduction in social interaction					
Born before 1955	0.103*	0.082	0.108**	0.071*	0.081**
	(0.060)	(0.050)	(0.045)	(0.040)	(0.039)
Observations	670	973	1270	1597	1852
Control group mean	0.20	0.19	0.21	0.19	0.20
Substantial reduction in physical activity					
Born before 1955	0.243***	0.174***	0.190***	0.138***	0.123***
	(0.063)	(0.047)	(0.043)	(0.037)	(0.034)
Observations	658	957	1251	1574	1825
Control group mean	0.12	0.13	0.15	0.14	0.15
Panel C: Household Conflict Outcomes					
Household size					
Born before 1955	0.019	0.002	-0.018	0.013	-0.000
	(0.210)	(0.183)	(0.160)	(0.146)	(0.132)
Observations	678	984	1285	1612	1868
Control group mean	3.55	3.50	3.52	3.54	3.52
Conflict with a household member					
Born before 1955	0.041	0.103**	0.060	0.023	0.010
	(0.063)	(0.049)	(0.039)	(0.037)	(0.035)
Observations	662	962	1257	1579	1829
Control group mean	0.35	0.38	0.38	0.38	0.37

Notes: This table presents the reduced-form effects of being born before December 1955 on the potential channels across different bandwidths. The variable descriptions are provided in Appendix A. The first column presents results for individuals born within 24 months of the age threshold, December 1955. The second through fifth columns expand the sample to include individuals within 36, 48, 60, and 72 months of the age threshold. The specification includes month fixed effects, province fixed effects, surveyor fixed effects, as well as indicator variables for education levels, ethnicity, and gender. Standard errors are clustered at the month-year cohort level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Table A8: Effects of Curfew on Potential Channels using a Quadratic Control Function

	OLS (1)	RF (2)	IV (3)
Panel A: Employment and Income Outcomes			
Has a job but could not attend last week			
Days outside last week	0.059***	0.002	-0.002
	(0.008)	(0.049)	(0.043)
Observations	1163	1163	1163
Control group mean	0.16	0.16	0.16
Has enough money for usual needs			
Days outside last week	0.010	-0.012	0.012
	(0.011)	(0.089)	(0.076)
Observations	1174	1174	1174
Control group mean	0.57	0.57	0.57
Worried about spending money			
Days outside last week	0.006	-0.052	0.051
	(0.009)	(0.062)	(0.057)
Observations	1170	1170	1170
Control group mean	0.61	0.61	0.61
Panel B: Social and Physical Isolation Outcomes			
Substantial reduction in social interaction			
Days outside last week	-0.039***	0.031	-0.031
	(0.008)	(0.069)	(0.061)
Observations	1176	1176	1176
Control group mean	0.20	0.20	0.20
Substantial reduction in physical activity			
Days outside last week	-0.052***	0.136**	-0.135**
	(0.007)	(0.068)	(0.059)
Observations	1157	1157	1157
Control group mean	0.14	0.14	0.14
Panel C: Household Conflict Outcomes			
Household size			
Days outside last week	0.028	0.099	-0.096
	(0.028)	(0.221)	(0.194)
Observations	1180	1180	1180
Control group mean	3.50	3.50	3.50
Conflict with a household member			
Days outside last week	-0.002	0.123*	-0.116
	(0.008)	(0.069)	(0.071)
Observations	1156	1156	1156
Control group mean	0.38	0.38	0.38

Notes: This table presents regression discontinuity estimates of the effect of the curfew on potential channels using a quadratic control function. The variable descriptions are provided in Appendix A. Column 1 reports the OLS estimates using days outside last week as the independent variable, column 2 reports the reduced-form RD treatment effects of being born before December 1955 with a linear control function in the month-year of birth on each side of the discontinuity, and column 3 reports the two-stage least-squares RD treatment effects by using being born before December 1955 as an instrument for days outside last week. The sample consists of individuals born within 44 months of the age threshold, December 1955. Standard errors are clustered at the month-year cohort level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Table A9: Effects of Curfew on Religiosity Outcomes

	OLS (1)	RF (2)	IV (3)
Considers himself/herself religious			
Days outside last week	-0.010	-0.021	0.020
	(0.007)	(0.042)	(0.036)
Observations	1148	1148	1148
Control group mean	0.79	0.79	0.79
Prays daily			
Days outside last week	-0.017	0.052	-0.048
	(0.010)	(0.042)	(0.036)
Observations	1154	1154	1154
Control group mean	0.67	0.67	0.67
Agrees that one should live by the holy book			
Days outside last week	-0.020**	0.026	-0.025
	(0.009)	(0.042)	(0.036)
Observations	1114	1114	1114
Control group mean	0.69	0.69	0.69
Agrees that virus is a God-sent warning			
Days outside last week	-0.010	0.001	-0.001
	(0.009)	(0.048)	(0.039)
Observations	1118	1118	1118
Control group mean	0.56	0.56	0.56
Religiosity index			
Days outside last week	-0.040**	0.039	-0.036
	(0.019)	(0.095)	(0.082)
Observations	1167	1167	1167
Control group mean	-0.03	-0.03	-0.03

Notes: This table presents regression discontinuity estimates of the effect of the curfew on religiosity outcomes using a linear control function. The variable descriptions are provided in Appendix A. Column 1 reports the OLS estimates using days outside last week as the independent variable, column 2 reports the reduced-form RD treatment effects of being born before December 1955 with a linear control function in the month-year of birth on each side of the discontinuity, and column 3 reports the two-stage least-squares RD treatment effects by using being born before December 1955 as an instrument for days outside last week. The sample consists of individuals born within 44 months of the age threshold, December 1955. Standard errors are clustered at the month-year cohort level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Table A10: Effects of Curfew on Political Support for Curfew and Covid-19-specific Policies

	OLS (1)	RF (2)	IV (3)
Supports the 65+ age-specific curfew			
Days outside last week	-0.018**	-0.127***	0.120***
	(0.009)	(0.041)	(0.046)
Observations	1163	1163	1163
Control group mean	0.79	0.79	0.79
Satisfied with the government's Covid-19 policy response			
Days outside last week	-0.031***	-0.051	0.047
	(0.008)	(0.045)	(0.042)
Observations	1153	1153	1153
Control group mean	0.68	0.68	0.68

Notes: This table presents regression discontinuity estimates of the effect of the curfew on supporting the 65+ age-specific curfew and being satisfied with the government's Covid-19 policy response using a linear control function. The variable descriptions are provided in Appendix A. Column 1 reports the OLS estimates using days outside last week as the independent variable, column 2 reports the reduced-form RD treatment effects of being born before December 1955 with a linear control function in the month-year of birth on each side of the discontinuity, and column 3 reports the two-stage least-squares RD treatment effects by using being born before December 1955 as an instrument for days outside last week. The sample consists of individuals born within 44 months of the age threshold, December 1955. Standard errors are clustered at the month-year cohort level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Table A11: Effects of Curfew on Main Outcomes using CCT Bandwidth

	Days outside last week (1)	Under curfew (2)	Never goes out (3)	Overall depression index (4)	Somatic depression index (5)	Nonsomatic depression index (6)	
Born before 1955	-1.011***	0.609***	0.213**	0.354*	0.341*	0.256	
	(-3.29)	(8.59)	(2.69)	(1.96)	(1.75)	(1.49)	
Observations	506	511	500	510	510	510	
Control group mean	2.30	0.12	0.17	-0.04	-0.02	-0.05	
	Has a job but could not attend last week (1)	Has enough money for usual needs (2)	Worried about spending money (3)	Substantial reduction in physical activity (4)	Substantial reduction in social interaction (5)	Household size (6)	Conflict with a household member (7)
Born before 1955	-0.016	0.028	-0.120*	0.157**	0.094	-0.098	0.035
	(0.090)	(0.096)	(0.066)	(0.075)	(0.080)	(0.244)	(0.093)
Observations	500	507	506	499	509	511	498
Control group mean	0.14	0.58	0.62	0.12	0.21	3.53	0.34

Notes: This table presents the reduced-form regression discontinuity estimates of the effect of the curfew main outcome variables using the first-stage optimal bandwidth chosen by the Calonico et al. (2014) algorithm (17 months) and a linear control function. The variable descriptions are provided in Appendix A. All columns report the reduced-form RD treatment effects of being born before December 1955 with a linear control function in the month-year of birth on each side of the discontinuity. Standard errors are clustered at the month-year cohort level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.