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COVID-19 precautionary behaviors and vaccine acceptance among older individuals: The role of close kin

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The family plays a central role in shaping health behaviors of its members through social control and support mechanisms. We investigate whether and to what extent close kin (i.e., partner and children) matter for older people in taking on precautionary behaviors (e.g., wearing a mask) and vaccination during the COVID-19 pandemic in Europe. Drawing on data from the Survey of Health, Ageing and Retirement in Europe (SHARE), we combine its Corona Surveys (June to September 2020 and June to August 2021) with pre-COVID information (October 2019 to March 2020). We find that having close kin (especially a partner) is associated with a higher probability of both adopting precautionary behaviors and accepting a COVID-19 vaccine. Results are robust to controlling for other potential drivers of precautionary behaviors and vaccine acceptance and to accounting for coresidence with kin. Our findings suggest that policymakers and practitioners may differently address kinless individuals when promoting public policy measures.

close kin | COVID-19 | family | precautionary behaviors | vaccine acceptance

Significance

Precautionary behaviors and vaccination are crucial to limit the spread of the coronavirus and its negative health consequences. Several socioeconomic and personal characteristics influence the adoption of precautionary behaviors and vaccine acceptance, but the role of having or not close kin has been overlooked in previous research. This study finds that having close kin (especially a partner) is positively associated with the adoption of precautionary behaviors and vaccine acceptance among older Europeans. Thus, kinless people, in particular unpartnered older individuals, might be considered a special target of information campaigns and measures to encourage anti-COVID behaviors and vaccination.

In the early phases of the COVID-19 pandemic, individual precautionary behaviors were the only weapon to protect people from infection and reduce the spread of the virus in the community. Due to herd immunity remaining a distant target (1) and given that COVID-19 vaccines neither permanently nor completely protect against infection (2–4), precautionary health behaviors have remained crucial also after the launch of COVID-19 vaccination campaigns. Thus, governments across the globe have imposed or recommended behaviors such as physical distancing, mask wearing, and frequent handwashing. Although these have been presented as general guidelines for everyone, individuals at greater risk of hospitalization and death when infected by the coronavirus, such as older individuals, have been particularly encouraged to adopt precautionary health behaviors during all phases of the pandemic (5–10). Monitoring and understanding compliance with COVID-19 preventive behaviors have thus become a prime target for research since the beginning of the pandemic (11–18).

The fight against the pandemic has entered a new stage with the approval by health authorities of effective COVID-19 vaccines. Although it is widely recognized that effective and equitable distribution of COVID-19 vaccines is a key policy priority (19–20), ensuring their acceptance by the population is just as important. Thus, several studies have aimed at understanding the determinants of vaccine acceptance. In this paper, as well as in several previous studies (21–30), vaccine acceptance includes both actual vaccine intake and intention to be vaccinated.

This paper contributes to the existing knowledge by investigating the role of close kin (children and partner) in the adoption of precautionary behaviors and vaccine acceptance among older Europeans. This paper focuses on close kin's role beyond acting as a control variable in various associations on topics relevant to the understanding of the COVID-19 pandemic. Family members are indeed known to influence health behaviors throughout the life course, (31–33) and in particular, in later life, they represent the most important social ties for older adults in terms of emotional closeness and intensity of support (34–36). Therefore, we believe that they will exert a clear effect also on precautionary behaviors and vaccination.

Despite the acknowledged importance of precautionary health behaviors and vaccines to limit the spread of the virus, compliance with guidelines and vaccine acceptance are anything but universal. Even among older adults, who are at the highest risk of COVID-19 complications, studies have shown that not all individuals follow the recommended precautionary behaviors (11–12) and/or are vaccinated or willing to be vaccinated (23–26). Individual sociodemographic characteristics such as gender and education and health conditions are associated with both the adoption of precautionary health behaviors (14–18) and vaccine acceptance (27–30). For example, highly educated individuals and those in poorer health conditions were more likely to follow the guidelines and get vaccinated, while a gender "paradox" emerged (37, 38): Women are more likely to adopt precautionary behaviors but less likely to accept COVID-19 vaccines. We extend the existing work by

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analyzing whether having close kin (a partner and/or children) is associated with the adoption of precautionary health behaviors and vaccine acceptance.

Numerous studies have investigated the role of having close kin (i.e., a partner and/or children) on health behaviors (39–41). The theoretical social–behavioral explanations of the importance of the family for health behaviors focus on the instrumental and emotional support that family members provide to each other complying with social norms of family obligations (42–43). Family members complement thus the role of the health care system by providing material support, information, and motivation to prevent diseases and help adhere to medical treatments or recommendations (44).

The power of close kin to improve health is also explained by the social control function of family members, which exerts pressures and control to inhibit unhealthy behaviors and to promote positive habits and lifestyles (33, 45, 46). Social control affects health behaviors directly (through sanctions for deviant behaviors, regulation, and physical interventions) and indirectly (through internalization of norms of healthful behavior and facilitation of positive health behaviors) (45). Partnership and parenthood, in particular, enhance a sense of obligation and greater self-regulation that discourage harmful behaviors and boost healthy ones (45, 47–48). In previous studies, partnership tends to be found to be more consistently beneficial for health and health behaviors as compared to parenthood (45, 49, 50). The influence of family members on health behaviors is especially strong when they live together (45) or geographically close and later in life (51). In this respect, on the one hand, the spatial pattern of proximity between older parents and their adult children exhibits a clear north–south divide, with coresidence with at least one child being a common living arrangement of older parents only in southern European countries. On the other hand, however, some similarities in proximity patterns exist across Europe where about 85% of parents aged 50 y or older have at least one child living within a 25-km radius (52). Close proximity often goes hand in hand with frequent contact across family generations and translates into more types of support (e.g., emotional and functional) and social control.

In the context of the COVID-19 pandemic, the social control function of partners and children might have been particularly relevant to vehiculate information about the importance of adopting precautionary behaviors (e.g., wearing masks) and of vaccination. Similarly, children might have provided instrumental support to their older parents with (online and in-person) shopping in order to limit their in-person contacts. Based on the arguments above grounded on the social control and support roles of close kin, we may expect individuals with a partner and children to be more likely to adopt precautionary behaviors and accept vaccination compared to their counterparts who lack these kin ties. Also, based on findings from the literature on family and health behaviors mentioned above, we expect the effect to be stronger for partnership than parenthood status. However, previous research also highlighted that under certain circumstances (e.g., family conflicts or multiple roles overload), kin may have a negative effect on health behaviors (44, 48). Unhealthy behaviors can also spread among family members, as it has been shown, for example, for smoking (53). Thus, it cannot be ruled out a priori that close kin might have a negative rather than a positive influence on the adoption of precautionary behaviors and vaccine acceptance. In addition, older adults with close kin may be less likely to comply with physical distancing recommendations to maintain their contact with nonresident family members.

We empirically test the role of close kin in precautionary health behaviors and COVID-19 vaccine acceptance using large-scale representative data from the Survey of Health, Ageing and Retirement in Europe (SHARE), a survey on individuals aged 50 y or more implemented in several European countries (54). We combine data from the two SHARE Corona Surveys administered in June to September 2020 and June to August 2021, with information from the latest pre-COVID wave (regular wave 8; October 2019 to March 2020).

Results

Having Close Kin and Precautionary Behaviors. We first present the results based on the SHARE Corona Survey 1 (SCS1) which collected information on nine precautionary behaviors in June to September 2020. To ease the interpretation of results, we present them graphically in Fig. 1 in terms of average marginal effects (AMEs) with 95% CIs obtained from fully adjusted logistic regression models (see *Materials and Methods* for the sociodemographic and health variables we controlled for). The full table of regression estimates (log-odds) is reported in *SI Appendix*, Table S1.

Fig. 1 shows that, overall, respondents who have close kin (partner or children) are more likely to adopt the suggested precautionary health behaviors against the spread of the virus compared to kinless older adults. As an example, compared to older people who do not have a partner, partnered older adults (independent of whether they have children or not) are about 6 percentage points more likely to use hand sanitizer or disinfection fluids more frequently than before the outbreak of the pandemic. The positive effect of kin is particularly evident for partnership: for most outcomes, having a *partner and no children* is more often associated with a higher probability of adopting precautionary behaviors than having *children and no partner*. In addition, the AMEs for those who have a *partner and children* are usually very similar and not statistically different from the AMEs for those who have a *partner and no children*. The only precautionary behavior where the combined effect of partnership and parenthood is both significantly and substantially higher than the effect of partnership alone is for reporting less shopping: Partnered respondents with children are about 5 percentage points more likely to report having left home for shopping less often or not at all since the outbreak of the pandemic than partnered respondents without children.

Having Close Kin and Vaccine Acceptance. Next, we present results about vaccine acceptance based on the SHARE Corona Survey 2 (SCS2; June to August 2021), the only SHARE survey where this information is available. (Note that, as we discuss in detail in the *Materials and Methods* section, SCS2 did not include the same items about precautionary behaviors.) Fig. 2 presents estimated AMEs (with 95% CIs) obtained from a fully adjusted multinomial logistic regression (full regression estimates are available in *SI Appendix*, Table S2). Fig. 2 shows that the probability of being already vaccinated or planning to do so is about 5 percentage points higher for respondents who have a partner (independently of whether they have children or not). Similarly, older adults in a partnership are less likely to both be undecided about vaccination and not to intend to get vaccinated. Parenthood, instead, does not seem to play a role in vaccine acceptance. In fact, the AMEs of having *children and no partner* are very close to zero and not statistically significant. In addition, the effect of partnership is neither substantially nor statistically modified by its combination with parenthood.

Additional Analyses. First, to rule out the specificity of results for certain demographic or country groups, we reestimated the models

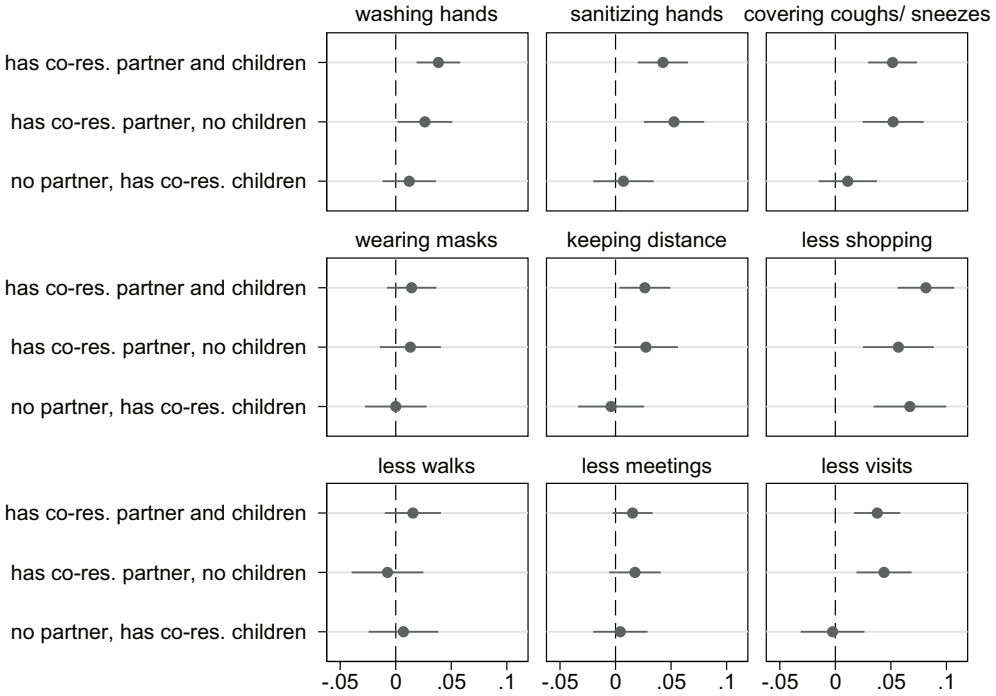

Fig. 1. Having close kin (partner and children) and COVID-19 precautionary behaviors. Notes: The graph shows the effect of the explanatory variable (having kin) in the form of average marginal effects (AMEs) with 95% CIs from nine separate logistic regression models (one for each of the considered precautionary behaviors). Each AME compares the predicted probability of adopting a precautionary behavior for one of the three groups of older adults who have kin available (e.g., those who have both a partner and children) with the predicted probability of the outcome for the reference group (kinless, i.e., older adults who lack both a partner and children). All control variables are included in the models. Full estimates are available in *SI Appendix*, Table S1. Data are from the SHARE Corona Survey 1 (June to September 2020).

analyzed above adding interactions with gender, age groups, and country groups (*SI Appendix*, Figs. S1–S6). Overall, the associations of close kin availability with the considered outcomes are very similar across age groups (*SI Appendix*, Figs. S1 and S2), gender (*SI Appendix*, Fig. S3 and S4), and country groups (*SI Appendix*, Fig. S5 and S6), with statistically significant differences only

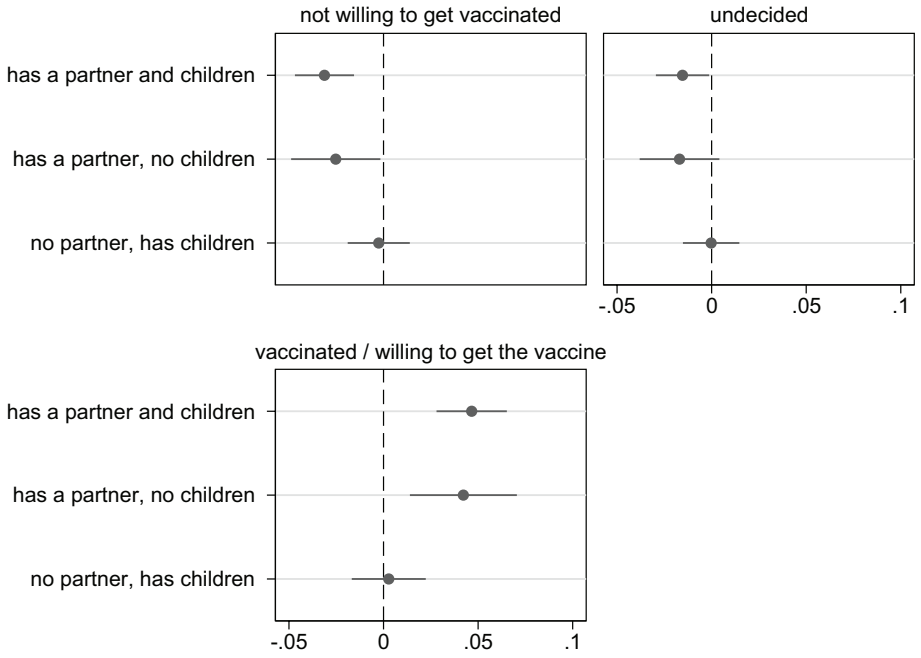

Fig. 2. Having close kin (partner and children) and COVID-19 vaccine acceptance. Notes: The graph shows results for the effect of the explanatory variable (having kin) in the form of average marginal effects (AMEs) with 95% CIs from a multinomial logistic regression model for the three-level categorical outcome vaccine acceptance. Each AME compares the predicted probability of a certain outcome category (e.g., being vaccinated or willing to get the vaccine) for one of the three groups of older adults who have kin available (e.g., those who have both a partner and children) with the predicted probability for the reference group (kinless, i.e., older adults who lack both a partner and children). All control variables are included in the models. Full estimates are available in *SI Appendix*, Table S2. Data are from the SHARE Corona Survey 2 (June to August 2021).

observed in a few of cases, therefore confirming the importance of kinship (partnership, in particular) for precautionary behaviors and COVID-19 vaccine acceptance.

Second, the stronger effect on precautionary behaviors and vaccine acceptance found for partnership as compared to parenthood might be driven by typical living arrangements with different kin at older ages. In our sample, the vast majority (95.9%) of partnered older adults live with their partner. Instead, only 16.1% of older parents coreside with at least one of their children. Thus, partners might be more likely to provide support and exert control as compared to children simply because of the higher amount of time (and resources) shared. However, even analyses that account for living arrangements show that coresiding partners more clearly influence precautionary behaviors and vaccine acceptance compared to coresiding children (see *SI Appendix*, Fig. S7 for precautionary behaviors and *SI Appendix*, Fig. S8 for vaccine acceptance).

Third, as explained in the *Materials and Methods* section, information on precautionary behaviors has been collected very differently in the second SHARE Corona Survey (SCS2) as compared to the first one hampering longitudinal analyses and comparisons. Nonetheless, analyses based on items in the SCS2 yielded qualitatively similar results to those based on items in the SCS1: Having close kin, and especially a partner, is associated with a higher probability of adopting certain precautionary behaviors (*SI Appendix*, Fig. S9).

Finally, we implemented an analysis that focused on the role of children and accounting for geographical distance and frequency of contact the respondent has with them. We find that having children is significantly associated with a higher probability of certain precautionary behaviors (*SI Appendix*, Fig. S10) and vaccine acceptance (*SI Appendix*, Fig. S11) only in case of frequent contact with them.

Discussion

Precautionary behaviors have demonstrated efficacy in containing the spread of the coronavirus (55–57). Similarly, COVID-19 vaccines have been found to reduce the risk of infection, hospitalization, and death (58–60). Thus, to slow the spread of the coronavirus and limit its negative health consequences, it is crucial to understand the factors associated with individuals' adoption of precautionary behaviors and acceptance of COVID-19 vaccines. Our study focuses on the role of kin ties among older people, which the general (pre-COVID) literature on health behaviors often found to be crucial for the adoption of healthy behaviors (39–41, 44–46, 48, 49).

Our results show that having close kin is overall positively associated with older individuals' likelihood of adopting precautionary behaviors and of accepting a COVID-19 vaccine. In particular, we find individuals in a partnership to be more likely to accept vaccine and to adopt precautionary behaviors considered in this analysis. Results are robust to controlling for several other drivers of precautionary behaviors and vaccine acceptance (such as health and education) and to accounting for coresidence with kin. In addition, results are not driven by specific age, gender, or country groups. Most statistically significant associations are also sizable. We find an adjusted difference in the probability of adoption of certain precautionary behaviors (washing hands, using hand sanitizer, covering coughs and sneezes, and reduced shopping) and of accepting COVID-19 vaccines of about 5 percentage points between partnered and unpartnered older adults. These effects can be understood as sizable and practically important because they are similar in magnitude to the effects found in previous research for important determinants of precautionary behaviors and vaccine acceptance such as gender, health perception, and chronic conditions (11, 15, 18, 30, 37).

Although our data do not include direct measures of social control, the positive effect of kin on older people's adoption of precautionary behaviors and vaccine acceptance in the context of the COVID-19 pandemic is in line with predictions from the pre-COVID literature which finds ample evidence of positive effects of family social control on health behaviors, such as avoidance of alcohol and cigarette consumption (33, 61–63). Thus, it can be speculated that during a pandemic, close kin (especially partners) have an important role in encouraging and controlling the respect of public health measures and recommendations to reduce the risk of contagion and its negative health effects. Evidence in our study is also consistent with social support mechanisms identified in pre-COVID studies, showing that motivational and practical help from close kin may positively influence health behaviors (33, 51, 64). In the context of a pandemic, partners and children may provide assistance and useful information to understand the importance of precautionary behaviors and vaccination. Practical help may also be a mechanism at work. Indeed, among the health behaviors analyzed, we find that having children is especially important for a specific outcome, i.e., limiting in-person shopping. Children, in this case, might take the burden to go shopping or order groceries online for their parents in order to reduce their risk of meeting strangers in a crowded indoor space and therefore their risk of infection (65–67).

The generally stronger role that we find for partners compared to children in influencing precautionary behaviors and vaccine acceptance also fits with the predominant evidence in the general literature on family and health behaviors that reports larger associations with health behaviors of being in a partnership than of having children (45, 49–50). This is in part explained by the stronger and more effective social control received by partners (33, 62) and by their usually greater provision of emotional and practical support (36, 49, 68). In addition, partners have been found to bilaterally influence each other's behaviors, thus reinforcing the social support and control function of being in a partnership (69). In addition, previous studies found that concerns about the possible consequences of COVID-19 for family members influence precautionary behavior and vaccine acceptance (30). This mechanism might also contribute to explaining the stronger effect we find for partnership than for parenthood: Older individuals might be more concerned about reducing the risk of infecting their partner than their children because partners are more likely to be themselves older individuals with health preconditions.

Our findings should be considered in light of some limitations. Our data could not account for the quality of relationships with partners and children for those individuals who have these ties. Previous research found that in the case of conflicting relationships, family ties may also lead to health-compromising behaviors as coping mechanisms to deal with stress (70). Also, the effectiveness of social control may vary with the type of behavior of the agent of the control (71). Although we did not have information on the quality of relationships with children, additional analyses showed that parenthood related to precautionary behaviors and vaccine acceptance only in the case of frequent contact with at least one child, which might be a proxy for good relationship quality. Future research could examine more in detail possible heterogeneity in the role of kin ties in the context of the COVID-19 pandemic related to these and other factors (e.g., availability of friends). Also, an interesting avenue for future research is to examine the role of kin's characteristics such as age, gender, education and health, and their own precautionary behaviors and vaccine acceptance. Furthermore, our results might be affected

by differential response rates by family status during the pandemic. Finally, although not the focus of our paper, we acknowledge that there was substantial heterogeneity in response policies and measures to COVID-19 and their implementation between countries (including but not limited to the level of enforcement of measures, regional or local differences, and the length of such policies). Similarly, national COVID-19 vaccination strategies and policies during rollout differed substantially in European countries, with countries prioritizing different age groups, vulnerabilities, or key workers. Although in our analyses we control for country, future studies might better understand whether and how specific policies (or changes in policies) impacted the relationships between having close kin and precautionary behaviors across different countries.

Despite these limitations, our findings originally contribute to shedding some light on the complex and ambiguous role of kin ties during the COVID-19 pandemic. Other studies also found a significant effect of partnership status on precautionary behaviors (72, 73). While these studies have considered partnership status as a control variable or as one of the many potential determinants of anti-COVID behaviors, this study provides both theoretical arguments and detailed analyses on the role of close kin in influencing precautionary behaviors and vaccine acceptance. Other studies have analyzed the role of kin in influencing COVID-19 infections and deaths. It has been argued that family relationships (measured, for example, in terms of coresidence and frequent face-to-face contacts) may increase the chances of getting in contact with an infected person, thus constituting a risk to contract the virus. While it has been shown that conditional on having a (coresident) family member infected the risk of getting the coronavirus substantially increases (74–75), the evidence on the (unconditional) risk of coronavirus infection due to family ties per se is still scarce and, with few exceptions, is based on macrolevel data. Also, such macrolevel analyses show mixed results (76–82). A recent study (83) based on the same individual-level data we used found that a higher frequency of face-to-face contact with adult children was associated with a lower risk of coronavirus infection for older women. Although it was not the focus of their study, the authors also found a similar effect for living with a partner for both men and women. These results are consistent with our findings of a positive association of close kin ties with precautionary behaviors and vaccine acceptance.

As Ross et al. (49) wrote well before the onset of the COVID-19 pandemic, "a family is more than just a collection of people who might expose each other to infections and pollutants." Thus, on the one hand, family contact can constitute a risk factor for coronavirus infection (as all types of in-person contact). On the other hand, partners and, to a lesser extent, children can also positively influence precautionary behaviors and vaccination. The overall effect of kin on the risk of contagion and death is not easy to predict, and it may vary with several factors, including extra-family (horizontal) relationships (84), working status, (85) and age (86) of family members. Our findings point to a potential positive role of kin in helping public health institutions to fight the pandemic and suggest that when analyzing the role of social relationships on COVID-19 outcomes rather than social network size per se, one should account for (precautionary) behaviors and all types of contact (not limited to a specific type of ties, e.g., family) a person has. Understanding under which conditions social relationships may play a positive role in the context of a pandemic is of paramount importance, and our study offers a perspective and empirical evidence on this matter. Our findings that kin can have a positive influence on precautionary behaviors and vaccine acceptance urge policymakers and practitioners to pay special attention to kinless (especially unpartnered) older individuals when designing interventions and recommendations to encourage the uptake and adherence to public health measures for COVID-19 prevention or in future pandemics.

Materials and Methods

Data. The present study used data from the Survey of Health, Ageing and Retirement in Europe (SHARE) (54). SHARE is a longitudinal survey on noninstitutionalized individuals aged 50+ y and their partners in 27 European countries and Israel. It is conducted biannually since 2004, and 9 waves of data have been collected to date. We use data from wave 8, which started in October 2019 but was suspended in all countries in March 2020 due to the COVID-19 outbreak. Regular data collection is based on computer-assisted personal interviewing, which provides pre-COVID information (87). A special dataset, SHARE Corona Survey 1 (88), was added to wave 8. This survey was administered with computer-assisted telephone interviewing between June and September 2020 to collect information on individuals' behaviors and conditions during the pandemic (SHARE Corona Survey 1; SCS1). We also used data from wave 9, i.e., SHARE Corona Survey 2 (SCS2) (89), collected between June and August 2021. We excluded observations from Portugal (because in this country, the fieldwork of the regular wave 8 started only a few weeks before the beginning of the first lockdown), thus restricting the analyses to individuals from 27 countries with data collected in both regular and SCS1/SCS2 surveys. Our outcome variables (precautionary behaviors and vaccine acceptance) come from the two SHARE Corona Surveys; independent variables, instead, are measured from the pre-COVID wave 8 of SHARE because these variables are not available in the Corona Surveys (see below for details). In SHARE, response rates and attrition vary across countries and waves (90); SHARE provides information on longitudinal retention rates separately for different subsamples. For the sample of those who first entered the panel in wave 1, the retention rate between wave 8 and SCS1 was rather high and ranged between 66.4% (Denmark) and 94.2% (Greece) (91). Information on nonresponse rates for refreshment samples and retention rates for the SCS2 is not yet available at the time of writing this paper. To adjust for nonresponse and attrition, we use calibrated individual weights in all analyses (92). Missing values have been imputed using Multivariate Imputation by Chained Equations (MICE) (93), including in the imputation all variables considered in the analyses. Specifically, 20 imputed datasets were created. *SI Appendix*, Table S3 reports the number of missing values for each variable. The sample sizes of each imputed dataset amount to 35,786 and 29,349 individuals for the SCS1 and SCS2, respectively.

Measures. Using data from the SCS1, we derived nine outcome variables corresponding to nine different precautionary health behaviors. The questionnaire of the SCS1 is available at http://www.share-project.org/data-documentation/questionnaires/corona-questionnaire-1.html. All outcome variables are binary and coded so that 1 represents a precautionary behavior, i.e., activities done or not 'since the outbreak of the pandemic'. More specifically, respondents were classified as reporting precautionary behaviors if they (note that italicized words refer to variable labels used in models and reported in Figures and Tables) washed hands more than usual (*washing hands*), used special hand sanitizer or disinfection fluids more frequently than usual (*sanitizing hands*), paid special attention to covering cough and sneeze (*covering coughs and sneezes*), always wore a face mask when in a public space (*wearing masks*), always kept distance from others in public (*keeping distance*), left their home for shopping less often (*less shopping*), left their home for going out for a walk less often (*less walks*), left their home for meeting with more than five people from outside their household less often (*lessmeetings*), and left their home for visiting other family members less often (*less visits*). All questions above but the first three have been asked only to individuals who left their home at least once since the outbreak of the pandemic. We have classified those who declared not to have left home since the beginning of the pandemic as people who adopted precautionary behaviors (i.e., we assigned them a value of 1).

The SCS2 used a different questionnaire (available at http://www.share-project.org/data-documentation/questionnaires/corona-questionnaire-2.html), with questions which are not directly comparable with those in the SCS1. Some of the questions about precautionary behaviors investigated in the SCS1 were not kept in the SCS2 (*washing hands*, *sanitizing hands*, *wearing masks, less walks, and less visits*); others changed the time reference (no longer 'since the outbreak of the

pandemic' but either 'in the 3 mo preceding the survey' or 'compared to the first wave of the pandemic'), and there were some additional behaviors not included in the SCS1 (such as going out to a restaurant). Therefore, questions about precautionary behaviors asked in the SCS2 were only analyzed as robustness checks (and presented in *SI Appendix*). In particular, we repeated our analyses classifying as reporting precautionary behaviors (and once again giving them a code of 1) if they went out for shopping less often than once a week during the 3 mo preceding the survey (*infrequent shopping*), left their home for meeting with more than five people from outside their household less often than once a week during the 3 mo preceding the survey (*infrequent meetings*), paid special attention to covering cough and sneeze more frequently (*more covering of cough/sneeze*), always pay special attention to keep distance from others in public during the 3 mo preceding the survey (*keeping distance*), and went out to a restaurant less often than once a week during the 3 mo preceding the survey (*infrequent restaurants*).

The SCS2 additionally collected information in two consecutive steps on vaccination status and intent to get vaccinated. First, respondents were asked whether they had been vaccinated against COVID-19 at least once. Second, those who had not yet been vaccinated were asked about their intention to do so, distinguishing whether they already had scheduled an appointment for vaccination, wanted to get vaccinated, did not want to get vaccinated, or were still undecided. We combined the information from these two questions and built a three-level categorical outcome variable: *vaccinated or willing to get the vaccine* (including vaccinated individuals and those who either had a scheduled appointment for the vaccination or wanted), *undecided*, and *not willing to get the vaccine*. We decided to merge respondents willing to get vaccinated with those who received at least one dose of the COVID-19 vaccine because not all vaccination policies were similar in all countries under study (94). Therefore, an individual's ability to get their first dose of COVID-19 vaccine (even if they wanted to) was affected by their country's prioritization list and eligible groups at the time of the SCS2 interview. Moreover, as shown in Table 1, only about 3% of the sample was in this category.

The main explanatory variable combined information on partnership and parenthood status, with the following categories: *has a partner and children* (respondents who are in a partnership and have at least one child); *has a partner, no children* (childless respondents with a partner); *no partner, has children* (unpartnered respondents, including widowed or divorced respondents, with at least one child); and *no partner, no children* (respondents with no close kin–reference category in the models). In the main analyses, we do not distinguish our main independent variable of interest according to living arrangements, i.e., we only account for having kin regardless of where they live. In a robustness check, we further restricted kin availability to coresidence and dropped respondents who did not live with their partner or at least one child. The resulting variable had the following categories: *has coresiding partner and children* (respondents who live with both their partner and at least one child); *has coresiding partner, no children* (childless respondents with a coresident partner); *no partner, has coresiding children* (unpartnered respondents with at least one coresident child); and *no partner, no children* (respondents with no close kin–reference category).

Control variables included the following: *age* (in 5-y categories: 50 to 54–reference category, 55 to 59, 60 to 64, 65 to 69, 70 to 74, 75 to 79, 80 to 84, and 85+ y); *women* (gender of respondent; *men*–reference category); *education* (*low*–reference category, *medium*, and *high* with the three groups defined according to the International Standard Classification of Education (http://www.uis.unesco.org/), where low education refers to no qualifications or primary education and a high educational level is defined as having a university education); *working status* (*retired*–reference category, *working*, and *other*); (equivalized) *household income* (continuous); *cognition* (the first principal component from a principal component analysis that combined four cognitive tests); *diagnosed illness* (= 1 for respondents who self-reports of at least one doctor-diagnosed conditions including hypertension, diabetes, cancer, lung disease, heart disease, stroke, and arthritis; = 0 otherwise); *gali* (global activity limitations; = 1 for respondents whose activities are limited or severely limited because of health problems; = 0 otherwise); *country* of residence (reference category: *Austria*); and *week of interview.* The latter variables were controlled for to account for the fact that governments' responses to the COVID-19 outbreak (including enforcements and lengths of containment and closure policies as well as prioritization and eligibility for vaccination) varied significantly across Europe (94). With the exception of week of interview, all control variables used information from the regular SHARE wave 8 either because they measure time-invariant characteristics or because the information was not collected at the SHARE Corona Surveys.

Table 1. Descriptive statistics on all variables used in the analyses

Variables	%	Variables	%
Precautionary behaviors		Working status	
washing hands	88.2	retired	68.9
sanitizing hands	82.3	working	18.0
covering coughs and sneezes	83.5	other	13.1
wearing masks	62.8	Household income†	19,305.5
keeping distance	80.2	Depression symptoms†	2.4
less shopping	73.9	Cognition†	0.0
less walks	53.9	Diagnosed illness	55.6
less meetings	89.9	Gali	48.9
less visits	85.9		
Vaccine acceptance		Austria	3.7
vaccinated*	78.4	Germany	6.7
willing to get the vaccine*	3.3	Sweden	3.1
undecided	9.6	The Netherlands	1.3
not willing to get the vaccine	8.7	Spain	2.8
Close kin availability		Italy	5.1
no partner, no children	5.3	France	4.8
has a partner and children	62.9	Denmark	4.1
has a partner, no children	3.2	Greece	7.7
no partner, has children	28.6	Switzerland	4.5
Age, years		Belgium	4.3
50–54	2.0	Israel	2.1
55–59	10.0	Czech Republic	5.9
60–64	16.5	Poland	4.8
65–69	19.7	Luxembourg	1.9
70–74	18.9	Hungary	1.4
75–79	14.5	Slovenia	6.1
80–84	10.7	Estonia	7.7
85+	7.7	Croatia	3.3
Women	58.2	Lithuania	3.2
Education		Bulgaria	1.9
low	16.9	Cyprus	1.1
medium	18.1	Finland	2.8
high	65.0	Latvia	2.0
		Malta	1.9
		Romania	3.3
		Slovakia	2.5

Notes: Weighted descriptive statistics. Multiple imputation has been used (20 datasets) to address missing values.
*The two categories "vaccinated" and "willing to get the vaccine" have been grouped in the multivariable regressions.
†For these continuous variables, the mean instead of the percentage is reported.

Analyses. Each of the precautionary health behavior described above represented a different binary outcome that we modeled using logistic regression. Thus, based on data from the SCS1, we estimated nine logistic regression models, one for each outcome. For vaccine acceptance, we use a multinomial logistic regression model. Although an ordering of the three categories of the outcome can be established (in terms of vaccine acceptance), a multinomial model allowed a higher degree of flexibility compared to an ordered logistic regression (i.e., it was possible to estimate separate effects of the independent variables for each category of the outcome).

As mentioned above, 20 imputed datasets have been generated. The results of analyses for each individual dataset were then combined using Rubin's rules (95).

To ease interpretation of results, the main findings are reported in the main text graphically as average marginal effects (AMEs) for the explanatory variable with 95% CIs. Due to the categorical nature of our outcomes and explanatory variables, the AMEs are to be interpreted as the discrete effect of the independent variable (compared to the reference category–*no partner, no children*), i.e., as the difference between the predicted probabilities (in percentage points) across the groups being compared (e.g., *has a partner and children* vs. *no partner, no children*) (96). Full tables of regression estimates (estimated coefficients; log-odds) are reported in *SI Appendix*. All control variables listed above have been included in all regression models.

Among the additional analyses implemented, we considered heterogeneity analyses to rule out that the main findings only applied to certain demographic (gender and age) or country groups. More specifically, we have reestimated the models that generated the main results by adding interactions between the explanatory variable and, in turn, gender, age (two groups: 50 to 64 and 65+ y), and country groups. Interacting the explanatory variables with each country separately is challenging due to the number of countries. We experimented with different grouping of countries reaching similar conclusions. We present results where countries have been grouped geographically: Northern/Central Europe (Denmark, Finland, France, Germany, Luxembourg, the Netherlands, Sweden, and Switzerland) and Southern/Eastern Europe (Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Israel, Italy, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, and Spain). Although simple, this classification allows to capture considerable variation in family norms, and similar grouping has been used in a previous study about the role of families on health and mortality (97). Similarly to what we did for the main analyses, results are presented graphically, showing the estimated AMEs for the three categories of the explanatory variable corresponding to having close kin. However, this time, we estimated separate AMEs for the two groups defined, in turn, by gender, age groups, or country groups (96). In the few cases of a statistically significant difference (at the 5% level) between the AMEs, this is indicated by an "*x*" used as a marker (the "*x*" is used for the highest AME among the two compared).

Data, Materials, and Software Availability. We used secondary data from the Survey of Health, Ageing and Retirement in Europe (SHARE) (54, 87). The SHARE data are available to academic researchers upon registration at http://www.share-project.org/data-access.html.

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1. C. Aschwanden, Five reasons why COVID herd immunity is probably impossible. *Nature* **591**, 520–522 (2021).
2. V. J. Hall *et al.*, COVID-19 vaccine coverage in health-care workers in England and effectiveness of BNT162b2 mRNA vaccine against infection (SIREN): A prospective, multicentre, cohort study. *The Lancet* **397**, 1725–1735 (2021).
3. P. Naaber *et al.*, Dynamics of antibody response to BNT162b2 vaccine after six months: A longitudinal prospective study. *Lancet Reg. Health-Eur.* **10**, 100208 (2021).
4. D. A. Swan *et al.*, COVID-19 vaccines that reduce symptoms but do not block infection need higher coverage and faster rollout to achieve population impact. *Sci. Rep.* **11**, 1–9 (2021).
5. D. Carr, COVID-19 Trends, disparities, and consequences for older adults. *J. Gerontol Ser B.* **76**, e65–e67 (2020).
6. N. G. Davies *et al.*, Age-dependent effects in the transmission and control of COVID-19 epidemics. *Nat. Med.* **26**, 1205–1211 (2020).
7. O. Hradsky, A. Komarek, Demographic and public health characteristics explain large part of variability in COVID-19 mortality across countries. *Eur. J. Public Health* **31**, 12–16 (2021).
8. S. Mallapaty, The Coronavirus is most deadly if you are old and male. *Nature* **585**, 16–17 (2020).
9. S. Richardson *et al.*, Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. *JAMA J. Am. Med. Assoc.* **323**, 2052–2059 (2020).
10. F. Zhou *et al.*, Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: A retrospective cohort study. *The Lancet* **395**, 1054–1062 (2020).
11. A. Bíró, R. Branyiczki, P. Elek, Time patterns of precautionary health behaviours during an easing phase of the COVID-19 pandemic in Europe. *Eur. J. Ageing* **19**, 837–848 (2021).
12. H. J. Hutchins *et al.*, COVID-19 mitigation behaviors by age group–United States, April–June 2020. *MMWR Morb. Mortal. Wkly Rep.* **69**, 1584–1590 (2020).
13. N. Plohl, B. Musil, Modeling compliance with COVID-19 prevention guidelines: The critical role of trust in science. *Psychol. Health Med.* **26**, 1–12 (2020).
14. A. Delerue Matos, A. Fonseca de Paiva, C. Cunha, G. Voss, Precautionary behaviours of individuals with multimorbidity during the COVID-19 pandemic. *Eur. J. Ageing* **19**, 827–835 (2022).
15. V. Galasso *et al.*, Gender differences in COVID-19 attitudes and behavior: Panel evidence from eight countries. *Proc. Natl Acad. Sci. U.S.A.* **117**, 27285–27291 (2020).
16. M. H. Haischer *et al.*, Who is wearing a mask? Gender-, age-, and location-related differences during the COVID-19 pandemic. *PloS One* **15**, e0240785 (2020).
17. R. Pasion, T. O. Paiva, C. Fernandes, F. Barbosa, The AGE effect on protective behaviors during the COVID-19 outbreak: Sociodemographic, perceptions and psychological accounts. *Front Psychol.* **11**, 1–14 (2020).
18. S. Spitzer, M. Shaikh, D. Weber, Older Europeans' health perception and their adaptive behavior during the COVID-19 pandemic. *Eur. J. Public Health* **32**, 322–327 (2022).
19. K. Moodley, Vaccine inequity is unethical. *Nat. Hum. Behav.* **6**, 168–169 (2022).
20. H. T. Rydland *et al.*, The radically unequal distribution of Covid-19 vaccinations: A predictable yet avoidable symptom of the fundamental causes of inequality. *Hum. Soc. Sci. Commun.* **9**, 61 (2022).
21. A. A. Dror *et al.*, Vaccine hesitancy: The next challenge in the fight against COVID-19. *Eur. J. Epidemiol.* **35**, 775–779 (2020).
22. J. S. Solís Arce *et al.*, COVID-19 vaccine acceptance and hesitancy in low-and middle-income countries. *Nat. Med.* **27**, 1385–1394 (2021).
23. D. Bhagianadh, K. Arora, COVID-19 vaccine hesitancy among community-dwelling older adults: The role of information sources. *J. Appl. Gerontol.* **41**, 4–11 (2022).
24. M. Detoc *et al.*, Intention to participate in a COVID-19 vaccine clinical trial and to get vaccinated against COVID-19 in France during the pandemic. *Vaccine* **38**, 7002–7006 (2020).
25. J. Wang *et al.*, Acceptance of COVID-19 vaccination during the COVID-19 pandemic in China. *Vaccines* **8**, 482 (2020).
26. M. Sallam, COVID-19 vaccine hesitancy worldwide: A concise systematic review of vaccine acceptance rates. *Vaccines* **9**, 160 (2021).
27. M. Bergmann, A. Bethmann, T. V. Hannemann, A. T. Schumacher, Who are the unvaccinated? Determinants of SARS-CoV-2 vaccinations among older adults across Europe. 1–11 (*2022*), 10.15464/easy.2022.01, easy_social_sciences, (Mixed 1).
28. P. Galanis *et al.*, Predictors of COVID-19 vaccination uptake and reasons for decline of vaccination: A systematic review. MedRxiv [Preprint] (2021). 10.1101/2021.07.28.21261261 (Accessed 17 January 2023).
29. J. V. Lazarus *et al.*, A global survey of potential acceptance of a COVID-19 vaccine. *Nat. Med.* **27**, 225–228 (2021).
30. M. F. Lindholt, F. Jørgensen, A. Bor, M. B. Petersen, Public acceptance of COVID-19 vaccines: Cross-national evidence on levels and individual-level predictors using observational data. *BMJ Open* **11**, e048172 (2021).
31. L. F. Berkman, T. Glass, I. Brissette, T. E. Seeman, From social integration to health: Durkheim in the new millennium. *Soc. Sci. Med.* **51**, 843–857 (2000).
32. M. D. Resnick *et al.*, Protecting adolescents from harm: Findings from the National Longitudinal Study of Adolescent Health. *JAMA* **278**, 823–832 (1997).
33. D. Umberson, R. Crosnoe, C. Reczek, Social relationships and health behavior across the life course. *Annu. Rev. Soc.* **36**, 139–157 (2010).
34. K. S. Rook, T. L. Schuster, "Compensatory processes in the social networks of older adults" in *Handbook of Social Support and the Family*, (Springer, Boston, MA, 1996), pp. 219–248.
35. I. A. Connidis, A. E. Barnett, *Family Ties and Aging* (Sage publications, 2018).
36. P. Dykstra, "Aging and social support" in *The Blackwell Encyclopedia of Sociology*, G. Ritzer, Ed. (Blackwell, Oxford, 2007), pp. 88–93.
37. V. Galasso, P. Profeta, M. Foucault, V. Pons, COVID-19 vaccine's gender Paradox. medRxiv [Preprint] (2021). 10.1101/2021.03.26.2125438 (Accessed 17 January 2023).
38. S. Zintel *et al.*, Gender differences in the intention to get vaccinated against COVID-19: A systematic review and meta-analysis. *Z Gesundh Wiss* **7**, 1–25 (2022), 10.1007/s10389-021-01677-w.
39. D. Carr, R. L. Utz, Families in later life: A decade in review. *J. Marriage and Family* **82**, 346–363 (2020).

40. K. Hank, A. Steinbach, "Families and health: A review" in *A Demographic Perspective on Gender, Family and Health in Europe*, G. Doblhammer, J. Gumà, Eds. (Springer, Cham, 2018), pp. 23–39.
41. D. Umberson, M. B. Thomeer, Family matters: Research on family ties and health, 2010 to 2020. *J. Marriage and Family* **82**, 404–419 (2020).
42. T. C. Antonucci, J. S. Jackson, S. Biggs, Intergenerational relations: Theory, research, and policy. *J. Soc. Issues* **63**, 679–693 (2007).
43. D. Carr, K. W. Springer, Advances in families and health research in the 21st century. *J. Marriage and Family* **72**, 743–761 (2010).
44. M. R. DiMatteo, Social support and patient adherence to medical treatment: A meta-analysis. *Health Psychol.* **23**, 207–218 (2004).
45. D. Umberson, Family status and health behaviors: Social control as a dimension of social integration. *J. Health Soc. Behav.* **28**, 306–319 (1987).
46. D. Umberson, Gender, marital status and the social control of health behavior. *Soc. Sci. Med.* **34**, 907–917 (1992).
47. T. D. Fuller, Relationship status, health, and health behavior: An examination of cohabiters and commuters. *Soc. Perspectives* **53**, 221–246 (2010).
48. K. M. Nomaguchi, S. M. Bianchi, Exercise time: Gender differences in the effects of marriage, parenthood, and employment. *J. Marriage and Family* **66**, 413–430 (2004).
49. C. E. Ross, J. Mirowsky, K. Goldsteen, The impact of the family on health: The decade in review. *J. Marriage and Family* **52**, 1059–1078 (1990).
50. D. Umberson, J. K. Montez, Social relationships and health: A flashpoint for health policy. *J. Health and Soc. Behav.* **51**, S54–S66 (2010).
51. P. A. Thomas, A. C. Lodge, C. Reczek, Do support and strain with adult children affect mothers' and fathers' physical activity? *Res. Aging* **41**, 164–185 (2019).
52. K. Hank, Proximity and contacts between older parents and their children: A European comparison. *J. Marriage and Family* **69**, 157–173 (2007).
53. R. Margolis, L. Wright, Better off alone than with a smoker: The influence of partner's smoking behavior in later life. *J. Gerontol. Ser. B Psychol. Sci. Soc. Sci.* **71**, 687–697 (2016).
54. A. Börsch-Supan *et al.*, Data resource profile: The Survey of health, ageing and retirement in Europe (SHARE). *Int. J. Epidemiol.* **42**, 100–992 (2013).
55. S. Kwon *et al.*, Association of social distancing and face mask use with risk of COVID-19. *Nat. Commun.* **12**, 1–10 (2021).
56. N. Islam *et al.*, Physical distancing interventions and incidence of coronavirus disease 2019: natural experiment in 149 countries. *bmj* **370**, m2743 (2020).
57. T. Mitze, R. Kosfeld, J. Rode, K. Wälde, Face masks considerably reduce COVID-19 cases in Germany. *Proc. Natl. Acad. Sci. U.S.A.* **117**, 32293–32301 (2020).
58. H. Chung *et al.*, Effectiveness of BNT162b2 and mRNA-1273 covid-19 vaccines against symptomatic SARS-CoV-2 infection and severe covid-19 outcomes in Ontario, Canada: Test negative design study. *bmj* **374**, n1943 (2021).
59. P. Nordström, M. Ballin, A. Nordström, Risk of infection, hospitalisation, and death up to 9 months after a second dose of COVID-19 vaccine: a retrospective, total population cohort study in Sweden. *The Lancet* **399**, 814–823 (2022).
60. E. Vasileiou *et al.*, Interim findings from first-dose mass COVID-19 vaccination roll-out and COVID-19 hospital admissions in Scotland: A national prospective cohort study. *The Lancet* **397**, 1646–1657 (2021).
61. M. A. Lewis, R. M. Butterfield, Social control in marital relationships: Effect of one's partner on health behaviors 1. *J. Appl. Soc. Psychol.* **37**, 298–319 (2007).
62. J. S. Tucker, Health-related social control within older adults' relationships. *J. Gerontol. Ser. B Psychol. Sci. Soc. Sci.* **57**, P387–P395 (2002).
63. D. Umberson, R. Donnelly, A. M. Pollitt, Marriage, social control, and health behavior: A dyadic analysis of same-sex and different-sex couples. *J. Health Coc. Behav.* **59**, 429–446 (2018).
64. S. H. Han, K. Kim, J. A. Burr, Social support and preventive healthcare behaviors among couples in later life. *The Gerontologist* **59**, 1162–1170 (2019).
65. E. Pantano, G. Pizzi, E. Bilotta, P. Pantano, Shopping with (out) distancing: Modelling the personal space to limit the spread of contagious disease among consumers in retail stores. *J. Mark. Manage.* **37**, 1764–1782 (2021).
66. R. A. Shumsky, L. Debo, R. M. Lebeaux, Q. P. Nguyen, A. G. Hoen, Retail store customer flow and COVID-19 transmission. *Proc. Natl. Acad. Sci. U.S.A.* **118** (2021).
67. F. Ying, N. O'Clery, Modelling COVID-19 transmission in supermarkets using an agent-based model. *Plos One* **16**, e0249821 (2021).
68. H. R. Walen, M. E. Lachman, Social support and strain from partner, family, and friends: Costs and benefits for men and women in adulthood. *J. Soc. Pers. Relat.* **17**, 5–30 (2000).
69. M. A. Lewis, R. M. Butterfield, L. A. Darbes, C. Johnston-Brooks, The conceptualization and assessment of health-related social control. *J. Soc. Personal Relationships* **21**, 669–687 (2004).
70. D. M. Ng, R. W. Jeffery, Relationships between perceived stress and health behaviors in a sample of working adults. *Health Psychol.* **22**, 638–642 (2003).
71. M. A. Lewis, R. M. Butterfield, Antecedents and reactions to health-related social control. *Personality Soc. Psychol. Bull.* **31**, 416–427 (2005).
72. H. Litwin, M. Levinsky, Network-exposure severity and self-protective behaviors: The case of COVID-19. *Innov. Aging* **5**, igab015 (2021).
73. G. Sand, J. Bristle, Motivating protective behavior against COVID-19: Fear versus hope. *J. Aging Health.*, 10.1177/08982643221089427 (2022).
74. W. Li *et al.*, Characteristics of household transmission of COVID-19. *Clin. Infect. Dis.* **71**, 1943–1946 (2020).
75. X. Yan *et al.*, Tied infections: How social connectedness to other COVID-19 patients influences illness severity. *Am. Behav. Sci.* **65**, 1901–1928 (2021).
76. C. Bayer, M. Kuhn, Intergenerational ties and case fatality rates: A cross-country analysis (SSRN scholarly paper ID 3573284). *Social Science Research Network*. https://papers.ssrn.com/abstract=3573284 (2020).
77. A. A. Fenoll, S. Grossbard, Intergenerational residence patterns and COVID-19 fatalities in the EU and the US. *Economics Hum. Biol.* **39**, 100934 (2020).
78. B. Arpino, V. Bordone, M. Pasqualini, No clear association emerges between intergenerational relationships and COVID-19 fatality rates from macro-level analyses. *Proc. Natl. Acad. Sci. U.S.A.* **117**, 19116–19121 (2020).
79. B. Arpino, V. Bordone, M. Pasqualini, Reply to Dowd et al.: Dangerous to overemphasize the importance of specific COVID-19 risk factors based on (unadjusted) macro-level analyses. *Proc. Natl. Acad. Sci. U.S.A.* **117**, 25977–25978 (2020).
80. U. Basellini, C. G. Camarda, Explaining regional differences in mortality during the first wave of Covid-19 in Italy. *Popul. Stud.* **76**, 99–118 (2022).
81. M. Belloc, P. Buonanno, F. Drago, R. Galbiati, P. Pinotti, Cross-country correlation analysis for research on COVID-19. https://voxeu.org/article/cross-country-correlation-analysis-research-covid-19 (28 March 2020).
82. G. Liotta, M. Marazzi, S. Orlando, L. Palombi, Is social connectedness a risk factor for the spreading of COVID-19 among older adults? The Italian paradox. *PLoS One* **15**, e0233329 (2020).
83. D. Uccheddu, E. Rizzi, Intergenerational ties and COVID-19 contagion: A study on European adults 50 years and older using SHARE data. *J. Gerontol. Ser. B.*, 10.1093/geronb/gbac196 (2022), (Forthcoming).
84. L. Sage, M. Albertini, S. Scherer, The spreading of SARS-CoV-2: Interage contacts and networks degree distribution. *PLOS One* **16**, e0256036 (2021).
85. M. Brandén *et al.*, Residential context and COVID-19 mortality among adults aged 70 years and older in Stockholm: A population-based, observational study using individual-level data. *The Lancet Healthy Longevity* **1**, e80–e88 (2020).
86. F. C. D. Andrade, N. T. Quashie, L. F. Schwartzman, Coresidence increases the risk of testing positive for COVID-19 among older Brazilians. *BMC Geriatrics* **22**, 105 (2022).
87. A. Börsch-Supan, Survey of health, ageing and retirement in Europe (SHARE) Wave 8. Release version: 8.0.0. SHARE-ERIC. Data Set, 10.6103/SHARE.w8.800 (2022a).
88. A. Börsch-Supan, Survey of health, ageing and retirement in Europe (SHARE) Wave 8. COVID-19 Survey 1. Release version: 8.0.0. SHARE-ERIC. Data Set, 10.6103/SHARE.w8ca.800 (2022b).
89. A. Börsch-Supan, Survey of health, ageing and retirement in Europe (SHARE) Wave 9. COVID-19 Survey 2. Release version: 8.0.0. SHARE-ERIC. Data Set, 10.6103/SHARE.w9ca.800 (2022c).
90. M. Bergmann, A. Borsch-Supan, *SHARE Wave 8 Methodology: Collecting Cross-National Survey Data in Times of COVID-19* (MEA, Max Planck Institute for Social Law and Social Policy, Munich, 2021).
91. M. Bergmann, T. Kneip, G. De Luca, A. Scherpenzeel, "Survey participation in the Eighth Wave of the Survey of Health" in *Ageing and Retirement in Europe (SHARE)*. Based on Release 8.0.0. SHARE Working Paper Series 81–2022 (SHARE-ERIC, Munich, 2022).
92. G. De Luca, P. Li Donni, M. Rashidi, "Weights and imputations in SHARE Wave 8" in *SHARE Wave 8 Methodology: Collecting Cross-National Survey Data in Times of COVID-19*, M. Bergmann, A. Börsch-Supan, Eds. (MEA, Max Planck Institute for Social Law and Social Policy, Munich, 2021), pp. 133–145.
93. I. R. White, P. Royston, A. M. Wood, Multiple imputation using chained equations: Issues and guidance for practice. *Statistics Med.* **30**, 377–399 (2011).
94. T. Hale *et al.*, A global panel database of pandemic policies (Oxford COVID-19 Government response tracker). *Nat. Hum. Behave.* **5**, 529–538 (2021).
95. R. J. A. Little, D. B. Rubin, *Statistical Analysis with Missing Data* (Wiley, New York, NY, 2002).
96. J. R. Busenbark, S. D. Graffin, R. J. Campbell, E. Y. Lee, A marginal effects approach to interpreting main effects and moderation. *Organizational Res. Methods* **25**, 147–169 (2022).
97. P. Zueras, R. Rutigliano, S. Trias-Llimós, Marital status, living arrangements, and mortality in middle and older age in Europe. *International J. Public Health* **65**, 627–636 (2020).