Journal of Aging & Social Policy

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/wasp20

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To cite this article: Jenny Olofsson, Filip Fors Connolly, Gunnar Malmberg, Maria Josefsson & Mikael Stattin (2023): Sociodemographic Factors and Adjustment of Daily Activities During the COVID-19 Pandemic – Findings from the SHARE Corona Survey, Journal of Aging & Social Policy, DOI: 10.1080/08959420.2023.2206077

To link to this article: https://doi.org/10.1080/08959420.2023.2206077

Published online: 01 May 2023.

JOURNAL OF AGING & SOCIAL POLICY
https://doi.org/10.1080/08959420.2023.2206077

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Sociodemographic Factors and Adjustment of Daily Activities During the COVID-19 Pandemic – Findings from the SHARE Corona Survey

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ABSTRACT

In the wake of the COVID-19 pandemic in 2020, older people across Europe have adjusted their daily activities as personal risk avoidance and as an amendment to policy recommendations and restrictions. In this study, we use multilevel logistic regressions to examine to what extent sociodemographic factors are associated with activity reduction among the older population (50+) in Europe and whether these associations are moderated by governmental policy responses to COVID-19. By combining data for~35,000 respondents from the SHARE Corona Survey on reported changes in daily activities and stringency of restrictions at the national level, we find that older age, poorer health and being female versus male were (consistently) associated with greater activity reduction across all activities both in countries with weak and in those with strong restrictions. Associations between education, employment and living situation, on the one hand, and activity reduction, on the other, were weaker and less consistent. We conclude that differences between sociodemographic groups are rather similar for countries with weak and those with strong restrictions and hence argue that group-specific policy recommendation are relevant independent of stringency recommendations.

ARTICLE HISTORY
Received 19 May 2022
Accepted 16 November 2022

KEYWORDS
Activity adjustment; COVID-19; cross-national comparisons; daily activities; Europe; government response stringency; SHARE Corona Survey

Introduction

When the COVID-19 pandemic spread in Europe in early 2020, countries applied different strategies to reduce daily activities and encourage physical distancing, the aim being to curb the spread of the infection. While some countries introduced a strict lockdown, others relied more on recommendations and people's voluntary adjustments (Hale et al., 2020). Evidently, people's reduction in daily activities influenced not only the spread of the virus, but also social life, physical activities and access to services, with potentially

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short- and long-term consequences for people's well-being and health, and possibly with great variations across different sociodemographic groups. Thus, the aim of the present study is to generate knowledge about the consequences of the COVID-19 pandemic and how policy-induced restrictions may have affected different social groups in society. For this purpose, we examine how different sociodemographic groups in Europe (aged 50 and over) adjusted their daily activities during the COVID-19 pandemic and to what extent the association between sociodemographic factors and activity adjustment is moderated by the stringency of restrictions at the national level. Thus, our study makes a novel contribution to the research on the consequences of restrictions during the COVID-19 pandemic.

Previous studies have shown a substantial reduction in many activities across European countries, but also that this reduction varies across countries (Mendolia et al., 2020; Santamaria et al., 2020). For instance, Del-Fava et al. (2020) showed that the reduction in people's mobility was a response to governmental guidelines on physical distancing rather than a reduction in response to the lockdown, and Mendolia et al. (2020) found that government-imposed policies (restrictions) explained mobility reduction patterns across countries. Moreover, a recent study demonstrated that both restrictions and infections (overall spread of the pandemic) were positively related to self-reported activity reduction among older people in Europe (Fors Connolly et al., 2021). However, to what extent governmental restrictions and voluntary adjustments affected the spread of the pandemic in general and across socio-demographic groups is still an open question, and the effectiveness of different policy approaches has become an important question for policymakers.

Because the association between policy stringency and the spread of the COVID-19 is highly variable (Hale et al., 2020; Johns Hopkins University CSSE COVID-19 Data), other factors affecting activity adjustment have been recognized in previous studies. These factors include welfare regimes (Warburton & Jeppsson Grassman, 2011), economic wealth (Gómez et al., 2020), and cultural individualism/collectivism (Huynh, 2020). In a cross-national study conducted in Europe, Lakomý (2021) found associations between social participation among old people and both individual characteristics and macro-contexts, specifically welfare regimes.

Although previous research indicates that societal factors such as restrictions and governmental recommendations reduce mobility, it is likely that some individuals respond more strongly to restrictions and recommendations than others do. Carlucci et al. (2020) found that women, people who are more educated, middle-aged individuals and healthcare workers were more likely to comply with voluntary home quarantine. Moreover, studies have shown that the highly educated on average have better access to health-related information and are more conscious of health risks, and for this reason generally comply better with health recommendations (e.g. Mackenbach et al., 2008;

Marmot & Brunner, 2005). However, it is worth noting that a study following the lockdown in France found no association between level of education and compliance with restrictions (Brouard et al., 2020). Using data from the United Kingdom, Wright et al. (2021) demonstrated that (young) age, better physical health, lower empathy, lower conscientiousness and greater general willingness to take risks were associated with reduced compliance over time. Further, Schnell et al. (2021) found that age and personal concern (fear of infection, person at risk) predicted adherence positively.

For various reasons, including the fact that men are overrepresented among those who died from COVID-19, one key question is to what extent we find gender differences in adjustment of daily activities during the pandemic and whether these activities are related to gender differences in compliance with restrictions. Brouard et al. (2020) found greater compliance among women and older individuals. Mirroring these results, Perrotta et al. (2021) showed that women are more likely to adopt preventive behavior, and Gómez et al. (2020) revealed more COVID-19 worries among females. Results from these studies are in line with previous research showing stronger compliance with various kinds of health-protective behavior among women (Lonnquist et al., 1992). These findings are also consistent with studies showing that women score higher than men on prosocial personality traits and values (MacGiolla & Kajonius, 2019; Schwartz & Rubel-Lifschitz, 2009), which could be expected to be related to greater compliance. Thus, women may be more compliant with COVID 19-related policy restrictions than men for two reasons: first, to protect their own health and, second, to protect other people's health.

The adjustment of older people to restrictions and infection is of vital interest, as they are more seriously affected by the pandemic. In previous studies, Radwan et al. (2021) and Sepúlveda-Loyola et al. (2020) also pointed to the possible negative long-term impact of stringent policy-mandated restrictions on older adults' health, as the reduction in social contact and fewer physical activities may have long-term negative consequences for both their physical and mental health. Hoffman et al. (2020) found that old age predicted a decline in physical activities during the COVID-19 pandemic, which in turn was associated with a decline in physical functioning.

Older people may also act differently in response to governmental restrictions and the overall spread of the virus, as they are arguably the most vulnerable group. Additionally, older people may also have other opportunities to adjust their activities. As many old people are retired, they are often less obliged to perform activities outside the home (e.g., working or commuting to work), thus Portegijs et al. (2021) observed a decline in older people's activities during the pandemic and found that participants mostly reported physical activities that took place close to home. For this reason, it is vital to examine the differences between those who still work and are retired as well was between those who have good, as compared to poor, health.

Previous research has addressed how activity adjustment was influenced by country-specific restrictions during the COVID-19 pandemic and how different sociodemographic groups adjusted in specific countries and/or in relation to specific activities. In the present study, we go one step further and explore how sociodemographic groups in Europe may have reduced different kinds of daily activities in response to the first wave of COVID-19. We focus on how age, health, employment status, household composition, education level and gender are related to activity reductions in four different daily activities: visiting family members, meeting more than five people, shopping and walking. Moreover, we analyze whether the relationships between sociodemographic factors and daily activity reduction differ between countries with weak versus strong restrictions. To investigate the above research questions, we use data from the Survey of Health Ageing and Retirement's (SHARE) Corona Survey collected via telephone interviews in 25 countries during summer 2020 with people aged 50 and older using a multi-level approach.

Methods

Data sources

The present study used data from the Survey of Health, Ageing and Retirement in Europe (SHARE), which is a longitudinal, cross-sectional study of adults aged 50 and older in 27 European countries and Israel (Börsch-Supan et al., 2013). Data were drawn from Wave 8 SHARE Corona Survey (Börsch-Supan, 2022a) and the eight wave of the regular face-to-face SHARE survey (Börsch-Supan, 2022b). The SHARE Corona Survey is a subsample of the regular SHARE panel, and computer assisted telephone interviews were conducted with 54,567 respondents during the period June-August 2020 (Scherpenzeel et al., 2020). Austria is not included in this sample because its fieldwork period was later than that of the other participating countries. The survey covers questions on older people's life circumstances, both health-related aspects and their socioeconomic situation, in the presence of the COVID-19 pandemic. Furthermore, we used data on governmental policy responses from the Oxford COVID-19 Government Response Tracker (OxCGRT) (Hale et al., 2020). The OxCGRT is a composite measure based on data on country-specific responses to the COVID-19 pandemic, for instance school and workplace closures as well as travel restrictions (ibid.).

Sample

Our sample includes 44,228 eligible respondents who were 50 years or older and had at any point left home since the pandemic began (see Figure 1). Malta was excluded from the dataset as there are no official country-level data on

governmental restrictions during the pandemic. The Netherlands was excluded due to missing data on education. After removing all respondents with a missing value on any of the variables included in the study, a final sample of 35,105 respondents from 25 European countries and Israel remained.

The characteristics of the final analytical sample are presented in Table 1. Descriptive statistics show that the sample consists of more women (57%) than men and that more than two-thirds of respondents were over the age of 70.

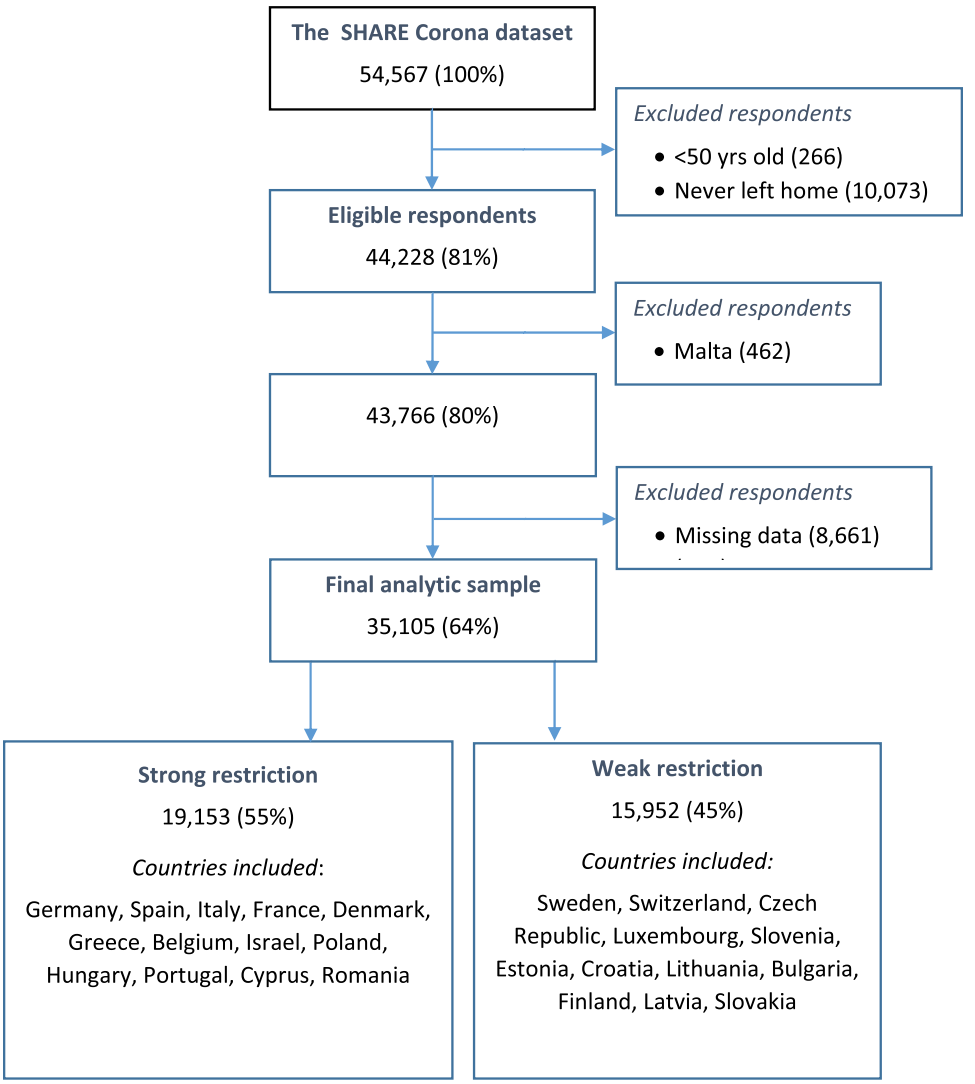

Figure 1. Flow chart of the study population and sample size.

Table 1. Descriptive statistics of the final analytical sample.

	Frequency (%)		
Variable	Female ($n = 19{,}968$)	Male ($n = 15{,}137$)	Total ($n = 35{,}105$)
Reduction visiting family	17,050 (85.3)	12,389 (81.9)	29,439 (83.9)
Reduction meeting people	17,883 (89.6)	13,022 (86.0)	30,905 (88.0)
Reduction going shopping	14,807 (74.2)	9,347 (61.8)	24,154 (68.8)
Reduction going walking	9,646 (48,3)	6,376 (42.1)	16,022 (45.6)
Age≥70 yrs	8,935 (44.8)	7,453 (49.2)	16,388 (46.7)
Highly educated	5,162 (25.9)	4,119 (27.2)	9,281 (26.4)
Employed*	4,777 (23.9)	3,916 (25.9)	8,693 (24.8)
Single household	5,672 (28.4)	2,271 (15.0)	7,943 (22.6)
Fair/Poor prepandemic health	5,664 (28.4)	4,189 (27.7)	9,853 (28.1)
Worsened health**	1,728 (8.7)	1,009 (6.7)	2,737 (7.8)

*Employment status when COVID-19 broke out.
**Health change after COVID-19 broke out.

Measures of variables

Four measures of activity adjustment were used as outcome variables: "Going shopping," "Going out for a walk," "Meeting with more than 5 people from outside your household," and "Visiting other family members." The respondents were asked to specify the extent to which they have adjusted their daily activities based on the question *"Since the outbreak of Corona, how often have you done the following activities, as compared to before the outbreak?."* The activities were dichotomized into two levels, where those respondents who reported "Not anymore" or "Less often" were coded 1 (i.e., reduction in activity) and those who reported "About the same" or "More often" were coded 0.

Explanatory variables used in the present study consist of sociodemographic variables including gender (male/female), age (categorized into 50–69 years/≥ 70 years), education level and employment status. Education is measured on the International Standard Classification of Education Scale (ISCED-97), ranging from 0 (none/early childhood education) to 6 (doctoral or equivalent level). We categorized education level into two levels, taking the value of 0 if "Low educated" (ISCED 0–4) and 1 "Highly educated" (ISCED 5, 6). Employment status is measured as "Employed/self-employed" or "Not employed" when COVID-19 broke out. To assess household composition, a binary variable was created indicating whether the respondent was living with two or more persons in a household (coded as 1) or living in a single household (coded as 0). Regarding health status, we created a binary variable for the respondents' subjective health status before the pandemic broke out (pre-pandemic health), with 0 indicating that the respondents reported "Fair/poor health" and 1 indicating "Good/very good/excellent health." In addition, the respondents were asked to compare their health with that before the pandemic broke out (health change), and we dichotomized the variable into

0 "Improved health status/no change" and 1 "Worsened health status". All explanatory variables except education were retrieved from the Wave 8 SHARE Corona Survey. Data on education were taken from the regular wave 8 SHARE.

The OxCGRT is a stringency index measured on a scale from 0 to 100, where 100 represents the strictest level. In the present study, we calculated mean values for all countries between 1 March-31 July 2020, equivalent to the time period when COVID-19 broke out and the time period of the SHARE Corona Survey fieldwork. The stringency index was dichotomized into strong restrictions (≥60) and weak restrictions (<60) (see Figure A1 in Appendix). We chose 60 as a cutoff because it is clearly over the mid-point on the stringency scale, and because we wanted to achieve similar numbers of countries and respondents in both groups.

Analytical approach

To examine the association between activity reduction and selected individual-level factors, multilevel logistic regressions including individuals as level 1-units and countries as level 2-units were conducted. In a first step, we estimated the intercept-only models in relation to the four activities – a) visiting other family members, b) meeting>5 people, c) shopping or d) walking – to assess whether the outcome variables vary across countries without controlling for any confounders (Table A1: Model 1a-1d, Appendix). The Interclass Correlation Coefficient (ICC) indicated that a sizable amount of the variation in the dependent variables could be explained by differences between countries (Heck et al., 2013). In the next step, models with the explanatory variables sex, age, education level, employment status, household composition, subjective health and health change, as fixed predictors at the individual level, and country-specific random intercepts were conducted (Table A2: Model 2a-2d, Appendix). In the final step, we investigated effect modification by restriction levels by including a dummy variable indicating high versus low restriction levels as well as interaction effects with the explanatory variables (Table A3: Model 3a-3d and Table A4: Model 4a-ad, Appendix). The ICC for the final models revealed that between 7% and 22% of the variance of the dependent variables could be explained by variations between the countries. The models estimate odds ratios (ORs) with 95% confidence intervals (CI). Statistical analyses were conducted using Stata software, version 16.

Results

Predicting activity reduction by sociodemographic factors

We begin our analysis by regressing our six explanatory variables on the four types of activity reduction measured in SHARE using a pooled sample of all

countries. In Figure 2 Model 2a-2d, we report the relationships for reduction in all four activities in relation to sex, age, education level, employment status, household composition and health (pre-pandemic).

Visiting other family members

Results show that females reduced this activity more than men did (OR = 1.39). We also find that older people (70+) reduced this kind of activity more than younger people (OR = 1.34). High education level is also associated with a reduction in meeting other family members; however, the effect is rather weak (OR = 1.04) and not statistically significant. On the other hand, people outside the labor market (not employed) reduced family meetings outside the household significantly more than the employed did (OR = 1.26). Further, people living in multi-person households (OR = 1.44) reduced this activity more than people living alone. Additionally, people with poor pre-pandemic health reduced family-related activities outside the household to a larger extent than did people with good pre-pandemic health (OR = 1.48). We also found that same pattern for worsened health (OR = 1.52).

Meeting with more than five people from outside your household (social gatherings)

Results show that females reduced this activity more than men did (OR = 1.49). Further, older people also reduced this activity more than younger people (OR = 1.21). Both of these results mirror the results for meeting other family members, as the odds ratios are similar in size. However, in contrast to

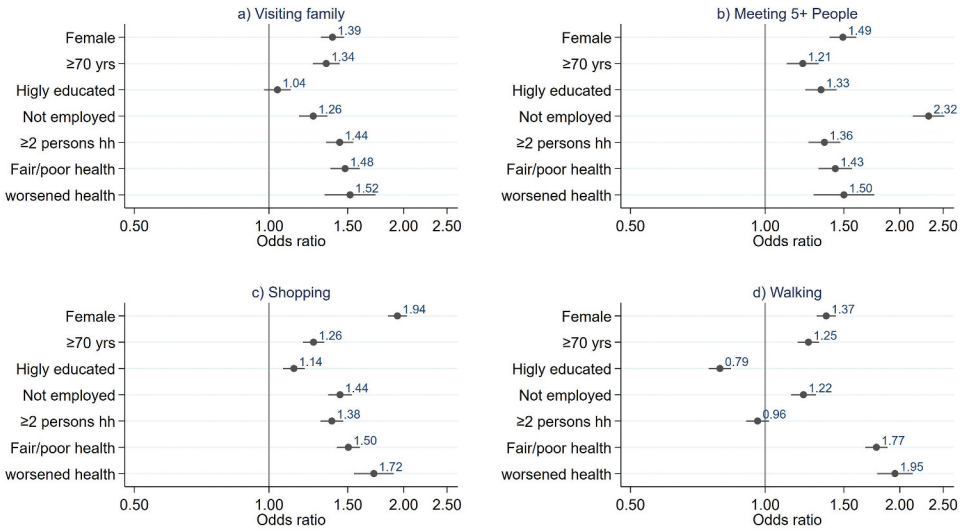

Figure 2. The relationship between sociodemographic factors and activity reduction. Results from Models 2a - 2d. Notes: Odds Ratios displayed on a logarithmic scale.

meeting family members, people with high education reduced their involvement in social gatherings clearly more than did people low in education (OR = 1.33). Further, individuals outside the labor market reduced this activity much more than employed individuals did (OR = 2.32). This effect was much stronger than the corresponding effect for meeting family members (2.32 vs. 1.26). Further, people living in multi-person households (OR = 1.36) reduced this activity more than people living alone. Moreover, people with poor pre-pandemic health reduced this activity to a greater extent than did people with good pre-pandemic health (OR = 1.43). We also found that same pattern for worsened health (OR = 1.50).

Going shopping

Results show that females reduced this activity much more than men did (OR = 1.94). This was a clearly stronger effect compared to the effect of being a female on meeting family members and more than five people. Regarding age, we find that individuals 70 years and older reduced their shopping more than younger individuals did (OR = 1.26), which mirrors results for the social activities presented above. People with high education reduced their shopping more than did people with low education (OR = 1.14), but the effect is rather weak. We also note that people who were not employed reduced their shopping less than did employed people (OR = 1.44). Further, individuals living in households consisting of at least two people reduced their activities more than did individuals living in single households (OR = 1.38). Finally, as in the previous models, individuals with poor pre-pandemic health display a sharper reduction in shopping compared to individuals with good pre-pandemic health, and we observe the same pattern for worsened health (OR = 1.72)

Going out for a walk

Results show that females reduced this activity more than men did (OR = 1.37). This effect of gender was similar to the effects found for the two social activities, but weaker compared to effects of being a female on shopping. In relation to age, we find that older individuals reduced walking more than younger individuals did (OR = 1.25) and that this effect was similar to effects obtained for the other activities. However, regarding education, people with high education reduced their walking less than did people with low education (OR = 0.79), an effect that goes in the opposite direction compared to the other activities. Regarding employment status, people outside the labor market reduced their walking more than the employed did (OR = 1.22), an effect that was similar to those obtained for meeting family members and shopping, but clearly weaker than the effect on meeting more than five people. In contrast to the other three activities, individuals living in households consisting of at least two people reduced their walking less than individuals living in

single households did (OR = 0.96). However, this effect was weak and not statistically significant. On the other hand, individuals with poor pre-pandemic health displayed a sharper reduction in walking compared to individuals with good pre-pandemic health (OR = 1.77). We observe the same pattern for worsened health status (OR = 1.95).

In sum, women, older people, people outside the labor market and people with poor pre-pandemic health and worsened health reduced their activities across all four types of activities. Living in a multi-person household displayed the same pattern of results, except for walking, where we find no relationship with household size. High education was associated with reduction in meeting more than five people and shopping, but displayed no effect on meeting family members outside the household and an inverse effect on walking.

Potential moderation of restrictions

To investigate whether restrictions at the macro-level moderate the relationship between individual-level factors and activity reduction, we ran regression models with cross-level interactions between restrictions and our sociodemographic factors. Results are displayed in Figure 3 Models 3a-3d and 4a-4d, while the interaction terms and p-values are displayed in Tables A3 and A4, Appendix.

Starting with restrictions and meeting other family members, the association between gender and a reduction in this activity displays a fairly uniform pattern, where women tend to reduce family visits more than men do, regardless of restrictions. The same pattern is observed for age and education, where older people (70+) and people high in education reduced this activity more than others, both in countries with strong and in those with weak restrictions. However, regarding people outside the labor market, the reduction by this group in meeting family members is stronger in countries with weak restrictions compared to countries with high restrictions ($p < .05$). On the other hand, the difference between contexts is less evident for the effects of living in a multi-person household and having poor pre-pandemic health (and worsened health), with similar effects regardless of restrictions.

When it comes to meeting more than five people, results mirror the results for meeting family members. Results once again show that the effects of gender, old age, high education, living in a multi-person household, having poor pre-pandemic health and worsened health are rather similar in countries with strong and those with weak restrictions. Further, the effect of being outside the labor market is once again stronger in countries with weak restrictions ($p < .001$). However, the difference is much larger between people living in countries with strong versus weak restrictions for this activity (1.86 vs. 2.82), as compared to visiting other family members.

Regarding shopping, effects of the sociodemographic variables are very similar both in countries with strong and in those with weak restrictions,

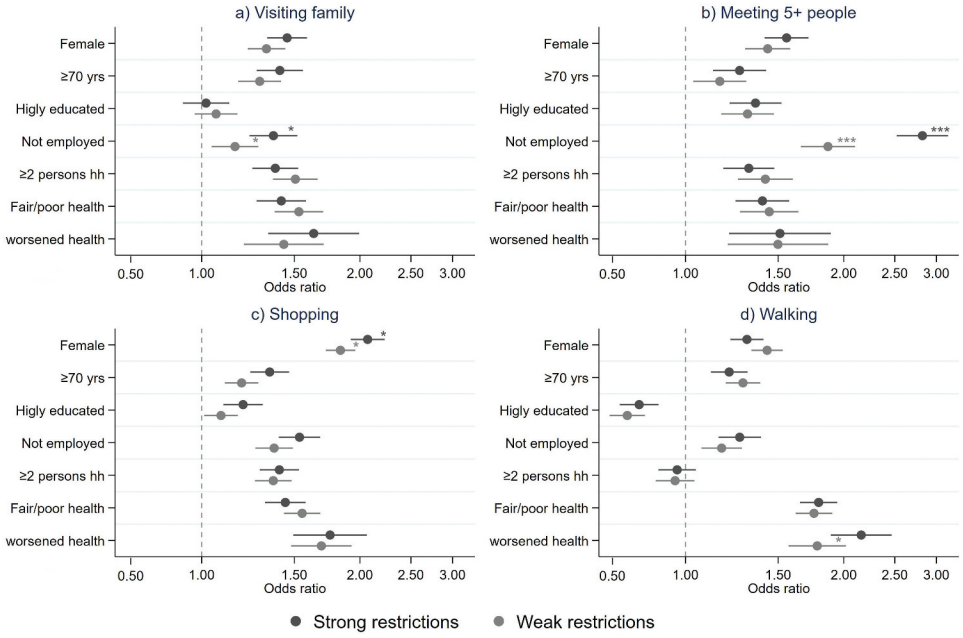

Figure 3. The relationship between sociodemographic factors and activity reduction, including cross-level interaction effects. Results from Models 3a - 3d and Models 4a - 4d. Notes: Odds Ratios displayed on a logarithmic scale; significance level of interaction effects: * p<.05; ** p<.01; *** p<.001

although the effect of being a female is somewhat stronger in countries with low restrictions (1.84 vs. 2.07; $p < .05$).

Walking follows the pattern of the other three activities, in that the effects of the sociodemographic variables once again are highly similar in countries with strong and in those with weak restrictions, with only one exception: the effect of worsened health on reduced walking is stronger in countries with weak restrictions ($p < .05$).

In sum, the results for potential moderation of restrictions show that the effects of different sociodemographic factors on activity reduction are highly similar across the two groups. Thus, the results indicate that restrictions do not play an important role as a moderator of the effects of sociodemographic characteristics on activity reduction. However, we found a couple of exceptions to this pattern, such that being outside the labor market, as compared to being employed, was more strongly related to a reduction in meeting other family members and meeting more than five people in countries with weak restrictions (compared to strong restrictions). Further, women and older people (70+) reduced their shopping more in countries with weak restrictions. In addition, people with worsened health reduced their walking to a larger extent in countries with weak restrictions.

Discussion

The aim of the present study was to increase our knowledge about how sociodemographic factors were related to daily activities among older people after the coronavirus outbreak in early 2020. We found that older age, poorer health and being female versus male were (consistently) associated with greater activity reduction across all activities both in countries with weak and in those with strong restrictions. Associations between education, employment and living situation, on the one hand, and activity reduction, on the other, were weaker and less consistent.While previous studies have found that older people in Europe reduced their daily activities during the COVID-19 crisis, no studies have systematically analyzed how activity reduction among older people in Europe was related to sociodemographic factors. Further, no previous studies have investigated whether the effects of sociodemographic factors on activity reduction differ depending on country-level restrictions.

Our main results showed that gender was consistently associated with activity reduction across all activities. More specifically, women tend to reduce their activities more than men do when it comes to shopping and walking as well as social activities (meeting family members or meeting more than five people). We observed this gendered pattern both in countries with strong and in those with weak governmental restrictions, although relationships were slightly stronger in countries with low restrictions for shopping. These results are in line with our expectations, as studies have shown that females display more prosocial values than men do (Schwartz & Rubel-Lifschitz, 2009), score higher on the personality trait agreeableness (Mac Giolla and Kajonius 2019) and engage in health-protecting behavior to a greater extent than men (Lonnquist et al., 1992). However, the gender difference observed for a reduction in shopping could be explained by the fact that women may have higher baseline levels of shopping and, for this reason, are able to reduce this activity more than men. In addition, men's outdoor activities may have been strongly restricted during the pandemic, and shopping could have remained one of few activities still possible to perform.

Our results also show that older people (70+) reduced their activities more than younger people did (50–69). This finding was also expected, given that the older age groups have a much higher risk of becoming severely ill if they are infected by COVID-19 and, for this reason, have strong motivation to behave in a health-protective manner (Caramelo et al., 2020). As with gender, we observed this age effect not only when analyzing all countries in a pooled sample, but also when applying separate analysis for countries with strong vs. those with weak restrictions. However, older age had a slightly stronger effect on shopping in countries with low restrictions.

Mirroring the results for old age, poor health also increased activity reduction in all contexts, presumably for the same reason age had an effect: people

with poor health have a greater risk of becoming severely ill if they are infected by the virus and, thus, act more cautiously. The results above are in line with findings from a study of older people in the US by Hoffman et al. (2022), which showed a decline in physical activity among females, the oldest old (65–80 vs. 50–64) and among people with fair/poor physical health. Thus, we replicated the same results in Europe for physical activity (walking) and add to previous studies by showing that gender, age and health predict not only a decline in physical activity, but also declines in social activities and shopping.

Regarding the effects of socioeconomic factors (education, employment status and household composition) on activity reduction, the observed associations were generally weaker than those for gender, age and health, and the direction of the effects differed somewhat between activities. Regarding education, highly educated people reduced their shopping and their participation in social gatherings (meeting more than five people) slightly more than did people with lower education across all contexts. However, the opposite pattern was found for walking. A possible explanation for these results is that individuals high in education may deliberate more than individuals low in education, and for this reason prioritize a reduction in activities that have the greatest potential to spread the virus or result in infection. Concerning employment status, we found that employed people reduced their activities less than people outside the labor market did. This effect of employment was strongest for meeting more than five people, which is expected given that many employed people must leave their home to get to their workplace, which in turn may involve various kinds of social interactions. The fact that employed people also reduced walking, shopping and family visits less than other groups may simply be a by-product of leaving home for work. For instance, some people may walk to their workplace and shop on their way back home. Lastly, we found that household size (not living alone) predicted an increased reduction in shopping, meeting family members outside the household, and meeting more than five people. These results were expected, as since people living in multi-person households can take turns shopping. For obvious reasons, people belonging to this group may also have their social needs met at home to a greater extent than individuals living alone, i.e., the urge to leave home for social meetings may be much stronger for the latter group.

Regarding the potential moderation by restrictions on the association between sociodemographic factors and activity reduction, we found only partial support for such interactions. Although the effects of most sociodemographic factors varied somewhat depending on country-level restrictions, differences were generally small as judged by the mostly non-significant interaction effects and small differences in regression coefficients between countries with weak and those with strong restrictions. Thus, results indicate that restrictions primarily affect activity reduction for all people in society rather than amplifying or decreasing the effects for certain groups. However, we found one clear exception to this pattern,

being outside the labor market was much more strongly related to a reduction in meeting more than five people in countries with weak restrictions compared to in countries with strong restrictions. We believe this finding can be explained by the fact that social gatherings may mostly have happened within workplace settings during the pandemic. Although remote work may have been recommended in countries with weak restrictions (e.g., Sweden), not all workers may have adhered to such recommendations and many jobs cannot be done from home. Thus, in countries with weak restrictions, many workers may still have been involved in social gatherings at work. On the other hand, workplace closures were common in countries with strong restrictions, which may explain the sharp decline in social gatherings for both the employed and non-employed in these countries.

In relation to country variation in restrictions, we expected that weak restrictions would allow more scope for voluntary activity reduction, which would in turn amplify the effects for sociodemographic groups that have strong incentives to avoid getting infected by COVID-19. Although our analysis gives limited support for this hypothesis, we still observed several trends in the expected direction. We noted that gender displayed slightly stronger associations with activity reduction for social activities and shopping in countries with weak restrictions. This result is in line with the assumption that women are more risk-averse and pro-social than men are, and for this reason engage more in voluntary adjustment when governmental restrictions are low. The same trend was not observed for walking. However, this is not surprising, as walking is a relatively safe activity as regards infection. We also noted the same trend for age, where the oldest old reduced their social activities and shopping (but not walking) more than did the younger-old in countries with low restrictions. This result can be explained by the fact that the oldest old have a much stronger incentive to voluntarily reduce their activities compared to the younger-old, because old age increases the risk of becoming severely ill if infected by the virus. Thus, restrictions may be more effective in reducing mobility among relatively younger people who have less incentive to voluntarily restrict their behavior. This amplified age effect in countries with weak restrictions may in turn be driven by governmental recommendations and public information campaigns during the pandemic. For instance, in Sweden, the country with the lowest restrictions during the period, people 70+ were recommended to isolate themselves at home as much as possible (Gustavsson & Beckman, 2020).

Future research should study *why* certain sociodemographic factors are associated with greater activity reduction among older people during the COVID-19 pandemic. In the present paper, we suggested arguments for why certain sociodemographic factors play a role for activity reduction, but were not able to study these factors empirically. For instance, we suggested that the

sharper reduction in daily activities for women compared to men during the pandemic could be explained by higher risk-aversion and pro-social values/traits among women. Thus, in the case of gender, future studies should investigate to what extent risk-aversion and pro-social tendencies mediate gender differences in activity reduction during the COVID-19 pandemic. Future studies should also investigate whether factors other than sociodemographic factors can explain the variation in activity reduction among the old. For instance, several of the big five personality traits have been linked to compliance during the COVID-19 pandemic (Han, 2021). These personality traits may also explain activity reduction over and above sociodemographic factors.

Limitations

Our study has some limitations. First, our analysis was limited to people 50+ in 25 European countries as well as Israel. For this reason, the associations we found between sociodemographic factors and activity reduction may differ for older people in other countries and cultural contexts. Second, we used self-reported measures of activity reduction, which may not be perfectly reliable (Schwarz et al., 2007). Given that it is hardly possible to remember exactly how one's activities have changed from the onset of the pandemic until the interview, respondents had to make an educated guess. If their guesses are noisy but relatively unbiased, aggregated differences in activity adjustment between sociodemographic groups should still reflect valid differences. If, on the other hand, social desirability affects how different sociodemographic groups report their activity reduction, our results may be biased. In the case of the COVID-19 pandemic, the reliability of self-reports may also be influenced by country-specific policies, if for instance people in countries with strong restrictions are less prone to report activities that were forbidden. This could influence the variations observed at the national level, and we cannot rule out that our results, focusing on differences between sociodemographic groups, may be biased to some extent for the same reason. Further, more reliable data on activity reduction, such as mobility data gathered by smartphones, are not available on the individual level, but are needed for the research questions addressed in the present study. Third, we used a cross-sectional research design, which is not suitable for making causal inference. For this reason, observed associations between some sociodemographic factors (e.g., education) and activity reduction could be explained by confounding factors. However, reverse causality should not be a problem, as our outcome was activity reduction during a relatively short time span. Fourth, because our moderation analysis was based on comparisons between crude country groups (strong vs. weak restrictions), conclusions regarding potential moderation of restrictions must be viewed with a great deal of caution. Although odds ratios between the two country groups' restrictions were in most cases highly similar, a more fine-grained country grouping

based on a larger set of countries with more variation in restrictions could have revealed stronger moderating effects of restrictions.

Conclusions

Our research on how restrictions during the COVID-19 pandemic in 2020 influenced the reduction in daily activities reveals substantial differences across sociodemographic groups both in countries with weak and in those with strong restrictions. Thus, when designing policies to limit the spread of infections, it is essential for policymakers to consider the potential consequences of restrictions for different sociodemographic groups in relation to people's exposure to infection as well as to their social isolation and inactivity.

It is especially urgent to reflect on the situation of the most vulnerable groups – the oldest-old and people with poor health – who, for good reasons, reduced their daily activities more during the pandemic, but also experienced more social isolation and inactivity. Moreover, people who are single living have fewer possibilities to reduce their daily activities and, thus, have been more exposed to the risk of becoming infected.

Because the differences between sociodemographic groups observed on a European level are rather similar for countries with weak and those with strong restrictions, the group-specific policy recommendations are relevant independent of the stringency of restrictions. Still, it is clear that the impact on activity reduction is much stronger in countries with stringent restrictions. Hence, policymakers should have in mind the potential consequences of social isolation and inactivity when implementing stringent restrictions.

Key points

- Older people, female, and unhealthy individuals reduced activities more than younger, male, and healthy ones during COVID-19 pandemic
- Cohabitants reduced shopping and social activities compared to single households, but maintained walking habits
- Highly educated people, compared to those with lower education, reduced shopping and social gatherings, but increased walking
- Employed people reduced their activities less than people outside the labor market
- Policymakers should consider how inactivity may affect health when implementing stringent restrictions

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

The SHARE data collection has been funded by the European Commission, DG RTD through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-PREP: GA N°211909, SHARE-LEAP: GA N°227822, SHARE M4: GA N°261982, DASISH: GA N°283646) and Horizon 2020 (SHARE-DEV3: GA N°676536, SHARE-COHESION: GA N°870628, SERISS: GA N°654221, SSHOC: GA N°823782, SHARE-COVID19: GA N°101015924) and by DG Employment, Social Affairs & Inclusion through VS 2015/0195, VS 2016/0135, VS 2018/0285, VS 2019/0332, and VS 2020/0313. Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C, RAG052527A) and from various national funding sources is gratefully acknowledged (see www.share-project.org).Research in this article is a part of the H2020 SHARE-COVID project (Grant agreement No. 101015924).

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Data availability statement

This paper uses data from the Survey of Health, Ageing and Retirement in Europe (SHARE): Wave 8, release version 8.0.0, DOI: 10.6103/SHARE.w8.800 and Wave 8 COVID-19 Survey 1, release version 8.0.0 DOI: 10.6103/SHARE.w8ca.800, https://share-eric.eu/data/.

Ethics approval

The ethical Review board in Sweden has approved SHARE in general (Dnr 2012/373–31) and the specific COVID-19 Project (Dnr 2021–03581), which this study is part of.

Informed consent

Data used in our article involved human subjects who consented to participate in SHARE, see www.share-project.org

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Appendix

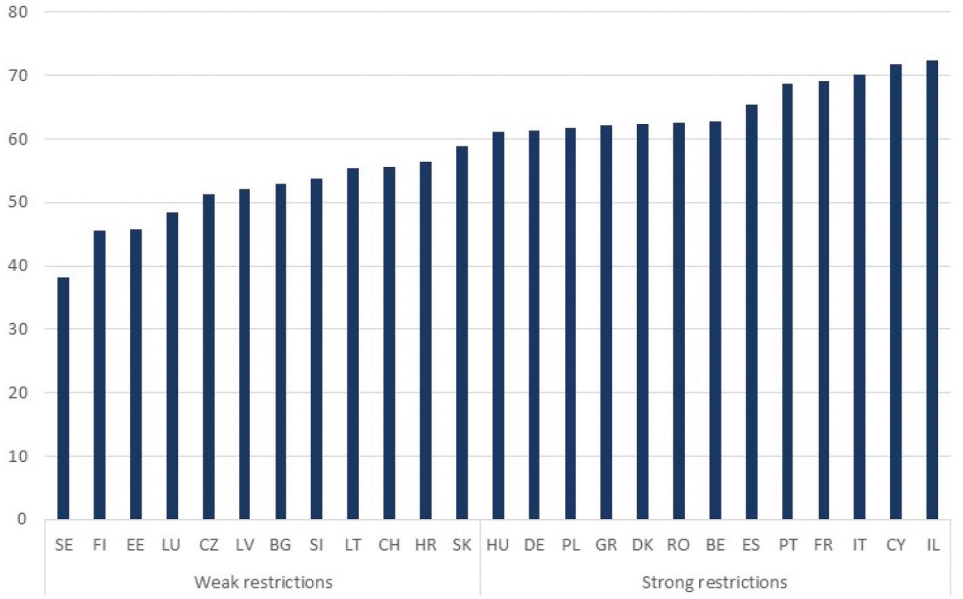

Figure A1. Sample composition by weak and strong COVID-19 restrictions (based on mean levels between 1 March and 31 July 2020 from the OxCGRT).
Data: Hale et al. (2020). Oxford COVID-19 Government Response Tracker, Blavatnik School of Government.

Table A1. Intercept-only model 1a-1d.

	(a) Family	(b) People	(c) Shopping	(d) Walking
	OR (95%-CI)	OR (95%-CI)	OR (95%-CI)	OR (95%-CI)
Fixed parts:				
Intercept	5.71*** (4.58–7.13)	8,37*** (6.23–11.24)	2.34*** (1.88–2.91)	0.97 (0.62–1.49)
Random parts:				
Between-country variance	0.56 (0.42–0.74)	0.75 (0.56–0.99)	0.55 (0.42–0.74)	1.11 (0.83–1.46)
ICC	0.09	0.14	0.09	0.27
aic	29928.47	24327.69	41752.93	41045.58
bic	29945.40	24344.62	41769.86	50153.86
N	35105	35105	35105	35105

Unweighted data. OR: Odds ratios. ICC: Inter Class Correlation Coefficient.
Significance level: *$p < .05$; **$p < .01$; ***$p < .001$.

Table A2. Fixed predictors at individual level with random intercept, model 2a-2d.

	(a) Family	(b) People	(c) Shopping	(d) Walking
	OR (95%-CI)	OR (95%-CI)	OR (95%-CI)	OR (95%-CI)
Fixed parts:				
Intercept	2.35***	2.29***	0.73**	0.55**
	(1.86–2.96)	(1.69–3.10)	(0.58–0.92)	(0.36–0.86)
Sex				
Female	1.39***	1.49***	1.94***	1.37***
	(1.31–1.47)	(1.39–1.60)	(1.84–2.03)	(1.30–1.44)
Age				
70 yrs>	1.34***	1.21***	1.26***	1.25***
	(1.25–1.44)	(1.12–1.32)	(1.19–1.33)	(1.18–1.32)
Education level				
High	1.04	1.33***	1.14***	0.79***
	(0.98–1.12)	(1.23–1.45)	(1.07–1.20)	(0.75–0.84)
Employment status				
Not employed	1.26***	2.32***	1.44***	1.22***
	(1.17–1.35)	(2.14–2.52)	(0.36–1.53)	(1.14–1.30)
Household size				
≥2 persons hh	1.44***	1.36***	1.38***	0.96
	(1.34–1.54)	(1.25–1.47)	(1.30–1.47)	(0.91–1.02)
Pre-pandemic health				
Fair/Poor	1.48***	1.43***	1.50***	1.77***
	(1.37–1.60)	(1.32–1.56)	(1.42–1.60)	(1.67–1.88)
Health change				
Worsened	1.52***	1.50***	1.72***	1.95***
	(1.33–1.73)	(1.28–1.75)	(1.55–1.90)	(1.78–2.14)
Random parts:				
Between-country variance	0.28	0.52	0.31	1.24
	(0.16–0.51)	(0.29–0.92)	(0.17–0.54)	(0.71–2.17)
ICC	0.08	0.14	0.08	0.27
aic	29370.51	23297.78	40221.72	39726.61
bic	29446.70	23373.97	40297.92	39802.80
N	35105	35105	35105	35105

Unweighted data. OR: Odds ratios. ICC: Inter Class Correlation Coefficient.
Significance level: *$p < .05$; **$p < .01$; ***$p < .001$.

Table A3. Fixed predictors at individual and macro level with random intercept and cross-level interactions – strong restrictions, model 3a-3d.

	Family	People	Shopping	Walking
Variables	OR (95%-CI)	OR (95%-CI)	OR (95%-CI)	OR (95%-CI)
Fixed parts:				
Intercept	1.90***	1.68*	0.63**	0.31***
	(1.38–2.62)	(1.11–2.55)	(0.45–0.88)	(0.17–0.54)
Sex				
Female	1.45***	1.56***	2.07***	1.31***
	(1.33–1.59)	(1.41–1.71)	(1.92–2.23)	(1.22–1.41)
Age				
≥70 yrs	1.41***	1.27***	1.35***	1.21***
	(1.27–1.56)	(1.13–1.42)	(1.24–1.47)	(1.12–1.31)
Education level				
High	1.02	1.36***	1.20***	0.82***
	(0.92–1.13)	(1.21–1.52)	(1.10–1.31)	(0.75.0.89)
Employment status				
Not employed	1.37***	2.82***	1.53***	1.27***
	(1.23–1.52)	(2.52–3.16)	(1.40–.1.68)	(1.16–1.39)
Household type				
≥2 persons hh	1.38***	1.32***	1.41***	0.96
	(1.25–1.53)	(1.18–1.47)	(1.29–1.53)	(0.89–1.05)
Pre-pandemic health				
Poor	1.42***	1.40***	1.44***	1.79***
	(1.27–1.58)	(1.25–1.58)	(1.32–1.58)	(1.65–1.94)
Health change				
Worsened	1.63***	1.51***	1.75***	2.16***
	(1.34–1.99)	(1.21–1.89)	(1.49–2.06)	(1.89–2.47)
Restrictions				
Strong	1.50	1.86*	1.32	3.11**
	(0.96–2.34)	(1.04–1.33)	(0.83–2.08)	(1.43–6.76)
Interactions				
*Female*strong restr*	0.91	0.92	0.89*	1.09
	(0.81–1.03)	(0.80–1.06)	(0.80–0.98)	(0.99–1.21)
*70 yrs>*strong restr*	0.92	0.92	0.88*	1.06
	(0.80–1.05)	(0.78–1.08)	(0.79–0.99)	(0.95–1.19)
*High edu*strong restr*	1.04	0.97	0.91	0.95
	(0.91–1.20)	(0.82–1.14)	(0.81–1.02)	(0.85–1.06)
*Not employed*strong restr*	0.85*	0.66***	0.89	0.92
	(0.73–0.98)	(0.56–0.78)	(0.79–1.01)	(0.81–1.05)
≥2 persons hh strong restr*	1.09	1.08	0.97	0.99
	(0.95–1.26)	(0.91–1.27)	(0.87–1.10)	(0.88–1.12)
Poor prepand health strong restr*	1.08	1.03	1.08	0.98
	(0.93–1.27)	(0.87–1.23)	(0.96–1.21)	(0.87–1.10)
*Worsened health*strong restr*	0.88	0.99	0.96	0.82*
	(0.67–1.14)	(0.72–1.36)	(0.78–1.19)	(0.69–0.99)
Random parts:				
Between-country variance	0.26	0.48	0.30	0.93
	(0.15–0.47)	(0.27–0.85)	(0.17–0.53)	(0.53–1.63)
ICC	0.07	0.13	0.08	0.22
Aic	29365.38	23267.83	40216.79	39725.47
Bic	29509.31	23411.75	40360.71	39869.39
N	35,105	35,105	35,105	35,105

Unweighted data. OR: Odds ratios. ICC: Inter Class Correlation Coefficient.
Significance level: *$p < .05$; **$p < .01$; ***$p < .001$.

Table A4. Fixed predictors at individual and macro level with random intercept and cross-level interactions – weak restrictions, model 4a-4d.

	Family	People	Shopping	Walking
	OR (95%-CI)	OR (95%-CI)	OR (95%-CI)	OR (95%-CI)
Fixed parts:				
Intercept	2.85*** (2.09–3.89)	3.12*** (2.07–4.69)	0.83 (0.60–1.14)	0.96 (0.56–1.64)
Sex				
Female	1.33*** (1.22–1.44)	1.43*** (1.30–1.58)	1.84*** (1.72–1.96)	1.43*** (1.34–1.53)
Age				
≥70 yrs	1.29*** (1.17–1.42)	1.16* (1.03-1-30)	1.19*** (1.11–1.28)	1.29*** (1.19–1.39)
Education level				
High	1.07 (0.97–1.17)	1.31*** (1.17–1.47)	1.09* (1.01–1.17)	0.77*** (0.72.0.84)
Employment status				
Not employed	1.16** (1.04–1.28)	1.87*** (1.66–2.10)	1.37*** (1.27.1.49)	1.17*** (1.07–1.28)
Household type				
≥2 persons hh	1.51*** (1.37–1.66)	1.42*** (1.26–1.60)	1.37*** (1.26–1.48)	0.96 (0.88–1.04)
Pre-pandemic health				
Poor	1.53*** (1.38–1.70)	1.44*** (1.27–1.64)	1.55*** (1.43–1.68)	1.76*** (1.62–1.90)
Health change				
Worsened	1.43*** (1.20–1.71)	1.50*** (1.20–1.87)	1.69*** (1.48–1.93)	1.78*** (1.57–2.02)
Restrictions				
Weak	0.67 (0.43–1.04)	0.54* (0.30–0.97)	0.76 (0.48–1.20)	0.32** (0.15–0.70)
Interactions				
*Female*restriction*	1.09 (0.97–1.23)	1.09 (0.95–1.25)	1.13* (1.02–1.24)	0.92 (0.83–1.01)
*70 yrs>*weak restr*	1.09 (0.95–1.25)	1.09 (0.93–1.29)	1.13* (1.01–1.26)	0.94 (0.84–1.05)
*High edu*weak restr*	0.96 (0.83–1.10)	1.04 (0.88–1.22)	1.10 (0.98–1.23)	1.05 (0.94–1.18)
*Not employed*weak restr*	1.18* (1.02–1.37)	1.51*** (1.28–1.78)	1.12 (0.99–1.26)	1.08 (0.95–1.23)
≥2 persons hh weak restr*	0.92 (0.80–1.05)	0.93 (0.79–1.10)	1.03 (0.91–1.16)	1.01 (0.90–1.14)
Poor prepand health weak restr*	0.93 (0.80–1.08)	0.97 (0.82–1.15)	0.93 (0.82–1.05)	1.02 (0.91–1.14)
*Worsened health*weak restr*	1.14 (0.87–1.49)	1.01 (0.74–1.38)	1.04 (0.84–1.28)	1.21* (1.01–1.46)
Random parts:				
Between-country variance	0.26 (0.15–0.47)	0.48 (0.27–0.85)	0.30 (0.17–0.53)	0.93 (0.53–1.63)
ICC	0.07	0.13	0.08	0.22
aic	29365.38	23267.83	40216.79	39725.47
bic	29509.31	23411.75	40360.71	39869.39
N	35,105	35,105	35,105	35,105

Unweighted data. OR: Odds ratios. ICC: Inter Class Correlation Coefficient.
Significance level: *$p < .05$; **$p < .01$; ***$p < .001$.