

Lonely times? Living alone and loneliness among UK adults during COVID-19

Maria Sironi,
Social Research Institute,
University College London, London, United Kingdom
ORCID: 0000-0002-8005-7255, m.sironi@ucl.ac.uk

Jenny Chanfreau,
Department of Sociology and Criminology,
University of Sussex, Brighton, United Kingdom

Afshin Zilanawala,
Department of Social Statistics and Demography,
University of Southampton, Southampton, United Kingdom

Abstract

The increase in living alone has been one of the major demographic shifts of recent decades. Concurrently, there has been an alarming media coverage of a 'loneliness epidemic' as a serious public health concern affecting people's health. However, the common conflation of loneliness, social isolation and living alone hampers our understanding of the implications of this major demographic trend. People who live alone might be very socially active outside of the household and not feel lonely. The physical distancing measures in the UK in the first year of the COVID-19 pandemic provide a context in which we can study the role of living alone on loneliness without the confounding effect of different levels of social connectedness. Whereas the lockdown measures were imposed on all households, the isolation effect of this policy was much greater for individuals who were living alone and unable to physically socialise with other people. The period of social restriction and quarantining may have contributed to feelings of loneliness differently for those living alone and those sharing a household with others. We investigate the association between living alone and loneliness using the COVID-19 surveys of three largescale nationally representative British cohort studies, and we study the role of economic activity, family relationships and interpersonal social support during the pandemic in explaining this association. Results indicate that those consistently living alone throughout the pandemic, compared to those who never lived alone, report a higher risk of lack of companionship, and of feeling isolated, left out, and lonely.

Keywords: Living alone; Loneliness; COVID-19; Social Isolation.

1. Introduction

The rise in the prevalence of living alone (i.e. one-person households, also referred to as solo living) has been one of the major demographic shifts in recent decades in many high-income societies. Today, one in three people lives alone in western societies (Eurostat Statistics Explained, 2022; U.S. Census Bureau, 2021) and the most recent estimates show that in 2021, of all households, 29.6% were one-person households in the United Kingdom (Sharfman & Cobb, 2022). These trends are not homogeneous across subgroups and urban-rural areas (Choi & Ramaj, 2023), with higher prevalences in cities and among older people. Concurrently, an alarming media coverage of a ‘loneliness epidemic’ as a serious public health concern affecting people’s physical and mental health (Leland, 2022; The Economist, 2018) has emerged in recent years. Although there is a clear body of evidence showing that loneliness has a negative impact on health (Courtin & Knapp, 2017; Hawkey & Cacioppo, 2010; Huxhold et al., 2022), it is unclear whether and to what extent solo living can influence the levels of loneliness. Individuals who live by themselves can feel lonely and/or be socially isolated, but they can also have very large and active social networks, and might not perceive feelings of loneliness. Lack of clarity regarding these overlapping yet subtly distinct concepts, i.e. living alone, social isolation, and loneliness, obscures whether living alone per se poses a potential health concern.

Both loneliness and social isolation have been found to be independently associated with worse physical and mental health outcomes, such as depression, anxiety, cardiovascular diseases, and all-cause mortality (Pantell et al., 2013; Raymo et al., 2015; Steptoe et al., 2013; Stickley et al., 2013; Umberson et al., 2010; Umberson & Karas Montez, 2010). Also, current literature has identified associations between loneliness and social isolation, but with mixed findings: several studies report that being socially isolated is correlated with greater risks of feeling lonely (Arpino, 2023; Danvers et al., 2023; Harasemiw et al., 2019); whereas other studies show that loneliness is a predictor of change in social isolation and not vice versa (Domènech-Abella et al., 2019) and that loneliness can trigger social exclusion (Huxhold et al., 2022). Living alone can be considered a risk

factor for social isolation and loneliness, but very few studies have investigated the association between living alone and loneliness: the scarce existing evidence shows that those living alone report higher levels of loneliness (de Jong Gierveld et al., 2012; de Jong Gierveld & Tesch-Römer, 2012; Van Tilburg et al., 2021). Thus, conceptual distinction between living alone, social isolation and loneliness is needed in empirical research to develop a better understanding of the association between living alone per se and feelings of loneliness.

The COVID-19 pandemic resulted in a unique context to study the association between living alone and loneliness: the physical distancing measures introduced in the UK in the first year of the pandemic restricted in-person social contact to individuals who shared the same household. Those living alone, for several months, could not see and physically interact with anyone, until support bubbles were introduced in June 2020. Even after the introduction of support bubbles, their social interactions were limited to only one other household. Hence, during the first year of COVID-19 lockdowns, individuals living alone could not compensate for the lack of the social and physical contact through interactions and social networks with family, friends and other people outside of their household, except for online interactions. As a consequence of declines in face-to-face social interaction, it is also possible that some individuals decided to change their living arrangements and move in with family, friends or partners. With the implementation of social distancing and quarantine measures, such conditions provide an opportunity to study the role of living alone on loneliness, without the confounding effect of access and opportunity to different levels of social connectedness.

Using the COVID-19 survey of three nationally representative British cohort studies of individuals born in 1958, 1970, and 1989-90, we investigate the association between living alone during the pandemic and different components of loneliness - feeling lack of companionship, feeling left out, isolated and lonely. We also explore the role of several potential explanatory factors for this association, including economic activity during the pandemic, the existence of family relationships (partner or children) and the level of social support perceived by the respondent.

2. Background

2.1 Living alone, Loneliness, and social isolation

The definition of 'living alone' is relatively standard, and it is based on household composition, i.e. one-person households. Recent estimates from the UK suggest 30% of all households in 2023 have just one resident (Office for National Statistics, 2024). This masks considerable variation by age and region within the country. Over half of those living alone are aged 65 years or more whereas less than one-fifth (17.5%) of individuals 25-44 years old live alone. About a quarter of households in London are one-person households compared to over a third in Scotland (Office for National Statistics, 2024). Between 2018 and 2028, the number of one-person households is projected to increase by nearly 10% (Office for National Statistics, 2020).

The terms loneliness and social isolation are more complex, and often these two terms are conflated and used interchangeably across research and policy due to inconsistent definitions (Wang et al., 2017; Wigfield et al., 2022). Loneliness is defined as a negative subjective feeling resulting from a gap between the desired and the actual level of social connectedness, perceiving inadequacy in the quantity or quality of social relationships (Huxhold et al., 2022; Hwang et al., 2020; Jeste et al., 2020). In contrast, social isolation is an objective state, and it is usually measured by the amount and frequency of individuals' social interactions and social support (Banerjee & Rai, 2020; Zavaleta et al., 2017). Thus, it is possible to feel lonely despite being socially connected or not feel lonely when socially isolated (Mansfield, Di Gessa, et al., 2024).

The existing literature has provided evidence of the negative impact of loneliness on both physical and mental health outcomes (Courtin & Knapp, 2017). Several studies, using different measures of loneliness, found a clear association between loneliness and depression (Cacioppo et al., 2006; Theeke et al., 2012), subjective well-being (Coyle & Dugan, 2012; Domènech-Abella et al., 2019; Vanderweele et al., 2012), cognitive functioning (Hawkey & Cacioppo, 2010), heart diseases (Kamiya et al., 2010; Sorkin et al., 2002), and overall mortality (Luo et al., 2012). According to Hawkey & Cacioppo (2010) several mechanisms could explain these associations. First,

according to psychological theories, feeling lonely puts individuals in a state of hypervigilance and greater perception of social threats, creating anxiety and stress. Second, loneliness and hypervigilance can impair the capacity for self-regulation, with an impact on lifestyle and health behaviours (e.g. fewer physical activities, worse eating habits, alcohol abuse). Third, loneliness has been found to be associated with lower sleep quality, and sleep problems are risk factors for several other health issues (Matricciani et al., 2018). Fourth, it is possible that feelings of loneliness accumulate over the life-course, starting in childhood, and this has an impact on physiological functioning that can influence cardiovascular health risk factors, e.g. high blood pressure (Hawkey & Cacioppo, 2010).

Social isolation, in terms of lack of social contacts and social support, is also associated with similar health outcomes: depression, anxiety, worse self-reported health, cardiovascular diseases, physical inactivity, and cognitive decline especially among older adults (Pantell et al., 2013; Sepúlveda-Loyola et al., 2020; Stickley et al., 2013; Umberson & Karas Montez, 2010). Larger and more diverse social networks are associated with better mental health (Litwin & Levinsky, 2022). Social support has shown benefits for both mental and physical health: sharing living arrangements or sharing some life experiences with other people can promote positive health behaviours, and having family relationships with friends and family can enhance feelings of belonging (Domènech-Abella et al., 2019; Harasemiw et al., 2019).

Even though social isolation and loneliness are distinct and different concepts, evidence has shown that they can influence each other. Current literature has identified associations between social isolation and loneliness, but with mixed findings. Several studies report that being socially isolated is correlated with greater risks of feeling lonely, especially in old age (Arpino, 2023; Dahlberg, 2021; Danvers et al., 2023; Harasemiw et al., 2019; Mansfield, Di Gessa, et al., 2024): spending more time alone, having less frequent in-person contacts with family and friends, having fewer interactions with the community and volunteering organizations have a significant association with different loneliness measures. Other studies have shown that loneliness is a

predictor of change in social isolation and diminished social networks, but not vice versa (Domènech-Abella et al., 2019), potentially explained by the Evolutionary Theory of Loneliness which claims that people who feel lonely tend to exhibit selfish behaviour, which in turn negatively affects their social networks (Cacioppo & Cacioppo, 2018).

The literature on the link between living alone and health is very limited. A meta-analysis (that included also measures of loneliness and social isolation) has established higher risks of mortality for those living alone (Holt-Lunstad et al., 2015). A longitudinal analysis on German data showed that living alone predicts worse cognitive performance, physical functioning and peak flow, but there was a very weak association with mental health (Beller & Wagner, 2018). More recent evidence, using electronic health records and several longitudinal surveys in the UK, suggests those who live alone have a greater risk for common mental health problems, severe mental illness, as well as lower life satisfaction (McElroy et al., 2023). The few articles that looked at the role of living alone on loneliness showed that solo living is associated with a higher risk of feeling lonely (de Jong Gierveld et al., 2012; de Jong Gierveld & Tesch-Römer, 2012; Snell, 2017; Van Tilburg et al., 2021).

However, a limitation of existing research is that living alone is often used as a proxy measure of social isolation (Beller & Wagner, 2018; Mansfield, Di Gessa, et al., 2024; Mansfield, Henderson, et al., 2024), but we also know that those living alone can be very socially connected, and this is especially true since the digital revolution, internet diffusion and the existence of social media (Coget et al., 2002; Jeste et al., 2020). As others have argued (Mansfield, Di Gessa, et al., 2024), it is salient to continue to clarify the conceptualization of loneliness. We respond to this call by investigating the association between living alone and loneliness with the aim to provide further insight on whether living alone could be a concerning public health issue, given that greater loneliness could subsequently impact physical and mental health.

2.2 Living alone and loneliness in COVID-19 times

During the first year of the COVID-19 pandemic the UK government took extensive measures to reduce the spread of the virus, such as extended lockdowns in spring and summer 2020, and in December 2020. All non-essential businesses had to close, most people were required to work from home and people were not allowed to meet people from other households. These social and physical distancing measures had different implications for people living alone and people sharing their household with parents, partners, children, or roommates (Evandrou et al., 2021). Those who were living alone, for several months – until support bubbles were introduced in June 2020 – could not see and physically interact with anyone. Support bubbles allowed one-person households to have in-person contact with the residents of one other household only. The conditions created by the COVID-19 pandemic provide a unique context to study the role of living alone for loneliness, without the confounding effect of different levels of social connectedness.

The impact of lockdown measures on feelings of loneliness and people's ability to maintain social contact with others varied by sociodemographic characteristics (e.g. age and gender), economic activity (Bu et al., 2020), family networks (Wu, 2020) and social support (Dahlberg, 2021), other than by living arrangements. The measures adopted by the UK government when the outbreak started had a severe impact on people's employment status and working mode. More than 800,000 people lost their job, and through the Coronavirus Job Retention Scheme more than 11 million jobs were furloughed (a temporary scheme to pay workers 80% of their salary for the hours that could not be worked due to the pandemic) (Powell et al., 2022). Also, everyone who could shift to working from home had to do so, except for key workers who continued to physically attend their workplaces (e.g. doctors, nurses, workers involved in food production and distribution, transportation, sanitation, public safety and national security etc.). All schools and universities closed and education had to continue online, affecting not only students directly but also their household members. There are several ways in which employment status could explain the association between living alone and loneliness. Employment was a source of social

interactions (online interactions for those working from home and physical interactions for key workers) and provided a sense of belonging that could mitigate the isolation of those living alone. Furthermore, being employed (but also furloughed) provided some financial stability in very uncertain times, and this could reduce stress and anxiety. Indeed, the literature on employment status during COVID-19 suggest that being unemployed or economically inactive was associated with higher loneliness levels (Bu et al., 2020; Mansfield, Di Gessa, et al., 2024; Raymo & Wang, 2022; Van Tilburg et al., 2021).

In extended periods of reduced in-person social interactions, family relationships could also explain the association between solo living and loneliness. Coresiding with a partner and/or with children during the pandemic provided companionship, a sense of purpose driven by caregiving activities, but also physical and emotional support to buffer against challenges of public health crises (Li & Wang, 2020). Some of these aspects are also relevant for non-coresidential partners or children. Those in a romantic non-cohabiting relationship were unable to interact in person due to government restrictions, but a romantic relationship may still have provided companionship, emotional support, and a person to talk to about the extraordinary situation. The same is true for children, whether grown up and living with others or younger in age and living with a former partner. The link between having a partner and feeling less lonely during the pandemic has been clearly established, whereas the evidence on children reports mixed findings, potentially due to the difficulties in combining work and caring activities (Arpino, 2023; Arpino et al., 2022; Delaruelle et al., 2023; Mansfield, Di Gessa, et al., 2024; Van Tilburg et al., 2021).

Similar explanations are in place when considering interpersonal social support. Specifically, in the pandemic conditions of lockdown and social distancing, we refer to social support as having someone to rely on for help and support and to listen if needed. Social support is often used as a proxy measure of social connectedness/isolation, even in special circumstances of physical isolation. Social support has been found to alleviate feelings of loneliness, both during and before the pandemic (Vlachantoni et al., 2022; Zhang & Dong, 2022). During the pandemic, digital social

interactions increased and became more common across all households, especially for education and work purposes, but also to enhance social relationships by serving as a substitute for physical gatherings. However, the extent to which digital interaction could mitigate the restricted physical contact was contingent on having the technology and the ability to make this shift. This is less the case among older adults who are, on average, less comfortable with new technologies and (if retired) had fewer opportunities for digital interaction (Haase et al., 2021). A further reason to account for age is due to the higher prevalence of living alone in older ages (Mansfield, Henderson, et al., 2024) and the lower likelihood of experiencing loneliness during COVID-19 among older adults compared to young adults in the UK (Li & Wang, 2020).

2.3 Contribution

In this study, we investigate the association between living alone during COVID-19 (between spring 2020 and winter 2021) and different components of loneliness in the UK, to understand how the context of physical and social isolation differentially impacted levels of loneliness of those living alone and those sharing a household with other people. This aim not only attempts at overcoming the existing conceptual limitations in the field of loneliness and social isolation but also provides insights about loneliness during public health crises. We do this by using the COVID-19 survey of three nationally representative British cohort studies of individuals born in 1958, 1970, and 1989-90. Against the backdrop of COVID-19 mitigation measures, our main contribution to the literature lies in isolating the role of solo living and its association with levels of loneliness. Although the physical distancing and lockdown measures were imposed on all households, their isolation effect was much greater for individuals who were living alone and unable to socialise with other household members during this time. Finally, exploiting the richness of the COVID-19 surveys, we are able to consider a longer time period during the pandemic, considering three different data collections in May 2020, September/October 2020, and

February/March 2021 and investigate the explanatory roles of economic activity during the pandemic, existence of family relationships, and interpersonal social support.

3. Data and Methods

Our analyses use data from three nationally representative British cohort studies: the 1958 National Child Development Study (NCDS), the 1970 British Cohort Study (BCS70), and Next Steps. Briefly, the NCDS and BCS70 are both a birth cohort studies that have followed individuals born in Great Britain (i.e. England, Scotland, and Wales) in a particular week in 1958 and in 1970, respectively. The Next Steps study has followed a cohort of individuals all born in 1989-90 since the age of 14, when study members were enrolled in a study of pupils at secondary schools in England (formerly knowns as the Longitudinal Study of Young People in England).

In 2020, cohort members from all three studies were asked to complete an online COVID-19 survey (UCL Centre for Longitudinal Studies, 2024) to gather information about the effects of the pandemic on their lives. Three waves of data collections during the pandemic were carried out. The first online survey (Wave 1) was conducted in May 2020, during the first and most stringent lockdown, and focused on how the pandemic outbreak in March 2020 had changed people's social and economic lives. Cohort members were aged 62, 50, and 29-30, in the respective cohorts, at the time. The second online wave took place in September/October 2020 to understand how people reacted to the easing of lockdown restrictions from June 2020. The third wave (a mix of online and telephone interviews) occurred in February/March 2021, when the third lockdown was underway. For Wave 1 mass postal mailings were not possible, limiting contact to those cohort members whose email addresses were known to the survey team prior to the pandemic outbreak. In Waves 2 and 3 a combination of email and postal invitations was possible, boosting contact and thus response rates. We use non-response weights provided with the datasets to restore sample representativeness and to maximise analytic sample size.

This study used data from all three waves of data collections for the analyses, but we constructed our analytic sample beginning with the third wave of data collection, which is when our key dependent variables were assessed. Across the three studies, a total of 16,806 respondents participated in the third COVID-19 data collection wave in February/March 2021 and we include in our analysis all for whom analytic weights are available ($n = 16,608$) and who provided information on the outcome variables, living arrangement and key controls and explanatory variables (described below). The total analytic sample consists of 15,458 respondents pooled across the three cohort studies. To maximize sample size, given the varying response rates across studies as well as waves (see Table 1), we operationalized our key independent variable of interest, living alone (discussed below) drawing first on Wave 3 data and then incorporating information from Waves 1 and/or 2, where available for each respondent. More specifically, our analytic sample was 6,205 in NCDS, 5,296 in BCS70, and 3,957 in Next Steps. The response rates across each study and wave, analytic sample size and the wave composition of the analytic sample are summarized in Table 1.

Table 1. Response rates and number of waves available for each cohort study

Study	COVID-19 survey wave response rates	Analytic sample size	Percent of respondents by waves of available data
NCDS	Wave 1 (57.9%) Wave 2 (53.9%) Wave 3 (52%)	6,205	Waves 3, 2 and 1: 64.5% Wave 3 plus one prior wave: 24.1% Wave 3 only: 11.4%
BCS70	Wave 1 (40.4%) Wave 2 (43.9%) Wave 3 (40%)	5,296	Waves 3, 2 and 1: 54% Wave 3 plus one prior wave: 16.2% Wave 3 only: 29.8%
Next Steps	Wave 1 (20.3%) Wave 2 (31.8%) Wave 3 (29%)	3,957	Waves 3, 2 and 1: 34.4% Wave 3 plus one prior wave: 22.3% Wave 3 only: 43.3%
Pooled		15,458	

3.1 Outcome of Interest: Loneliness

We examined loneliness as our key dependent variable of interest. This self-reported measure was assessed at Wave 3 and uses the 4-item UCLA Loneliness scale (ULS-4) (Hughes et al., 2004) asking respondents how often they felt a lack of companionship, left out, isolated from others, or lonely, with response options on a three-point Likert scale ('hardly ever', 'some of the time', or 'often'). We dichotomized each of these component items between those who answered 'hardly ever' (=0) and those in the other two more frequent categories (=1). There is no validated cut-off for 'feeling lonely' nor is there a way to operationalize gradations of loneliness (Das et al., 2021). Our approach is in line with other research that uses these questions as binary variables (Perissinotto et al., 2012). In addition, we generated the sum score of the four component items listed above creating a Loneliness index score ranging from 4 to 12 (Cronbach's alpha = 0.91) whereby higher scores indicate more frequent occurrences of feeling lonely.

3.1 Living Alone

Using information on household composition, we determine whether an individual was living alone or with other individuals (e.g. partner, children, parents, grandparents, grandchildren, siblings, friends, etc.). Given that our key dependent variable was assessed at Wave 3, and that not all individuals participated in every wave, to maximize sample size for analyses we began operationalizing our measure of living alone from Wave 3 and supplemented with information from Waves 1 and/or 2, where available. We created a variable based on the maximum number living arrangement observations available:

- *Living alone*: for those who are only observed living alone;
- *Transitioned to living alone*: for those who were not living alone initially, but transitioned to living alone in wave 2 or in wave 3 (having information on at least two waves);

- *Transitioned to living with others*: for those living alone initially but subsequently transitioned to living with others in wave 2 or in wave 3, either because they moved in with someone else or had someone move in with them (having information on at least two waves);
- *Transitory arrangements*: for those not living alone in wave 1, living alone in wave 2, not living alone in wave 3 or vice versa;
- *Living with others*: for those who are only observed living with others (the reference category).

Details on the number of waves of available data for each living arrangement category within the living alone variable described below are in Appendix Table A1.

3.2 Covariates

The association between solo living and loneliness might be influenced by other confounding or explanatory variables that should be taken into account in the analysis. All models include background controls for gender (coded as 1 for female), cohort and ethnicity (White (reference), Black, Asian, and Other). Ethnicity was drawn from pre-pandemic surveys to maximize sample size. To analyse whether observed associations between living alone and loneliness were explained by *economic activity during the pandemic*, we include employment status during COVID-19, assigning respondents to one of five categories depending: ‘In paid work’ (reference), ‘In paid work – key worker’, ‘Furloughed’, ‘Not in paid work/In education’. We include the role of *family relationships* which accounts for whether the respondent has any children (coresident or not), and whether they have a partner (coresident or not). To consider the role of *social support*, we include two variables: ‘Whether the respondent can count on people to help if sick’ and ‘Whether the respondent can rely on people to listen to their problems’ measured on a four-point Likert scale: ‘not at all (reference)’; ‘a little’; ‘somewhat’; ‘a great deal’. For these three explanatory variables we used Wave 3 answers or the most recent prior wave if missing at Wave 3.

3.3 Analytical Strategy

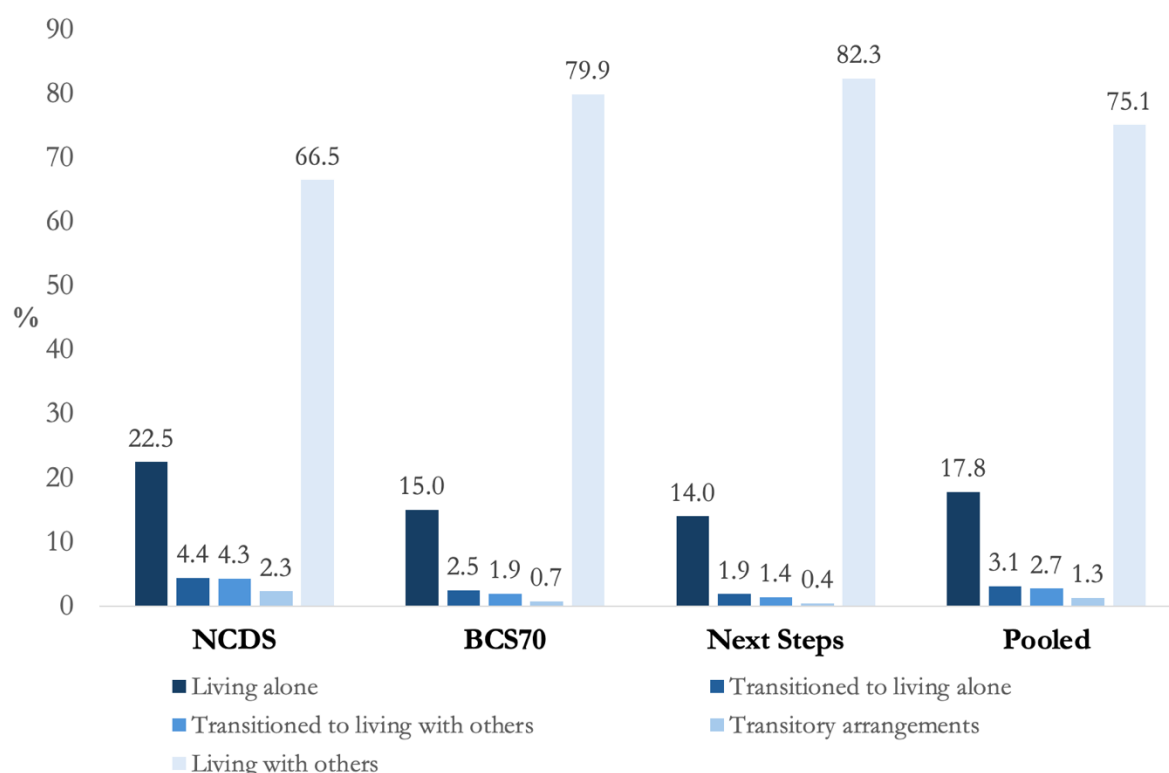
We took a two-step analytical approach for each of the five outcome variables measuring loneliness at Wave 3. In our first regression models (M1) we predict loneliness from living alone, adjusting for gender, cohort and ethnicity. We then added each set of potential explanatory variables (economic activity, family relationships, and social support) to M1 separately in turn before adding them all together in the fully adjusted model (M2). This allowed us to assess the separate and additive effects of these variables on the association between solo living and each outcome. The analytic method varied by the outcome of interest. We implemented logistic regressions for the four binary components of the UCLA loneliness scale (ULS-4), and OLS regression for the Loneliness index score.

4. Results

4.1 Descriptive Statistics

Figure 1 reports the patterns of living alone in the pooled sample and across different cohorts. In all cohorts the largest group is that of those continuously living with others, but with large differences across cohorts: 66.5% for those born in 1958, 79.9% for those born in 1970, and 82.3% for those born in 1989-1990. Nearly 18% of the sample reported living alone throughout the pandemic and there was less variation between the cohorts; about 23% among those born in 1958, 15% for those born in 1970, and 14% for respondents born in 1989-1990. These cohort differences are reflected when looking at women and men separately (see Table A1 in the Appendix), although in all cohorts more men than women lived alone.

Figure 1. Proportions of Living Alone



Note: Weighted percentages. Sample size (unweighted): NCDS 6,205; BCS70 5,296; Next Steps 3,957; Pooled 15,458.

Table 2 reports information on the five loneliness variables and the explanatory variables included in the analyses. Of the four binary dimensions of loneliness, nearly forty percent of the sample felt a lack of companionship, isolated, or lonely. The prevalence of each loneliness component and the average of the loneliness scale increase in younger cohorts. Specifically, loneliness is highest in the Next Steps cohort (1989-1990), with 49% reporting lack of companionship, 47% feeling left out, 59% feeling isolated and 57% feeling lonely some of the time or often. These respondents were 31-32 in February/March 2021, and it is possible that lockdown measures affected their daily routine and activities more than those of older cohorts. The prevalence is lower among the cohorts born in 1970 and 1958, ranging from 31% (feeling left out in NCDS) to 47% (feeling isolated in BCS70). These scores result in a higher average of the Loneliness index score for Next Steps (i.e. 6.7) and lower for NCDS (i.e. 5.8).

Table 2. Descriptive Statistics

	NCDS	BCS70	Next Steps	Pooled
Loneliness				
% Feeling Lack of Companionship (Some of the time/Often)	36.6	40.1	48.5	40.8
% Feeling Left Out	30.9	33.6	46.5	35.8
% Feeling Isolated	42.8	46.8	59.4	48.4
% Feeling Lonely	34.6	39.2	57.3	42.0
Loneliness index score, Mean (Rang 4-12)	5.8	6.0	6.7	6.1
<i>St. Err.</i>	(0.057)	(0.058)	(0.078)	(0.037)
Background Controls				
% Female	47.6	49.2	54.4	49.9
Ethnicity (%)				
<i>White</i>	96.1	96.0	69.8	89.3
<i>Black</i>	1.6	0.4	7.0	2.6
<i>Asian</i>	1.6	3.1	17.6	6.2
<i>Other</i>	0.7	0.6	5.6	1.9
Explanatory Variables				
Economic Activity (%)				
<i>In Paid Work</i>	24.6	35.7	34.3	30.8
<i>In Paid Work - Key Worker</i>	23.4	39.5	40.0	33.1
<i>Furloughed</i>	7.1	7.3	8.9	7.6
<i>Not in Paid Work</i>	44.9	17.5	16.8	28.5
Family Relationships				
In a Relationship (%)	79.0	79.9	72.7	77.7
Any Children (%)	79.5	78.1	39.1	68.6
Social Support				
Can Count on People to Help if Sick (%)				
<i>Not at All</i>	4.9	6.4	5.2	5.5
<i>A Little</i>	15.7	17.1	16.1	16.3
<i>Somewhat</i>	16.0	19.4	19.2	18.0
<i>A Great Deal</i>	63.4	57.1	59.5	60.3
Can Rely on People to Listen to Problems (%)				
<i>Not at All</i>	4.4	5.0	4.1	4.5
<i>A Little</i>	15.0	15.4	14.3	15.0
<i>Somewhat</i>	23.6	25.0	21.1	23.4
<i>A Great Deal</i>	57.0	54.6	60.6	57.1
N	6,205	5,296	3,957	15,458

Notes: Percentages and means weighted, sample size unweighted.

The demographic characteristics and explanatory factors varied by cohorts. The youngest cohort includes more women than men and is more diverse in terms of ethnicity, reflecting the increasing diversity of the population over time, as well as the Next Steps study covering England rather than Great Britain and not being restricted to individuals born in the country. The *economic activity* variable reflects the life course stages of the cohorts. Over half (55.1%) of the 1958 cohort is employed (24.6% in paid work, 23.4% key workers and 7.1% furloughed) and 44.9% are not in paid work, most of whom are presumably retired. In contrast, 83% of each of the 1970 and 1989-

1990 cohorts are employed, with similar proportions of key workers (nearly 40%). Looking at *family relationships*, over three-quarters of the sample are in a relationship (cohabiting or not-cohabiting), and this characteristic varied little between the cohorts. Nearly forty percent of those born in 1989-1990 have a child (coresident or living elsewhere), whereas nearly 80% of those in the 1958 and 1970 cohort have a child. The *social support* variables are more homogeneous across cohorts and about 80% people in each cohort report being able to count on someone to help if sick or rely on someone to listen to problems either ‘somewhat’ or ‘a great deal’.

4.2 Regression Analysis on the Association between Living Alone and Loneliness

The regression results predicting each of the five loneliness variables from living alone, adjusting for gender, cohort and ethnicity, are reported in Table 3. Living alone throughout the pandemic has a significant association with all the four components of loneliness measured in the ULS-4: odds ratios are highest (worse outcomes) among those living alone, but there is also a significant association for those who transitioned to living alone (except for ‘feeling left out’). The other two transitory living arrangements are not significantly associated with any measure of loneliness. Loneliness measures are consistently worse among women and younger cohorts. Ethnicity does not have a strong association with loneliness.

The second step in our analysis is to add the three sets of variables that may explain the association between living alone and loneliness: economic activity, family relationships, and social support. We first add each separately to Model 1 (M1) before including all variables in a fully adjusted model (M2). The results for all models are shown in Figure 2. The top panel (A) reports the odds ratios for the living alone variable from regressions for each binary outcome, whereas the bottom panel (B) reports the coefficients of living alone for the loneliness index score. Tables including the results with full models can be found in the Appendix Tables A2-A5.

Table 3. M1 Regression Models: Living arrangement and Loneliness outcomes, adjusting for background controls

	Lack of Companionship	Feeling Left Out	Feeling Isolated	Feeling Lonely	Loneliness Index Score
	OR	OR	OR	OR	β
Living Alone (Ref: Living with others)					
Living alone	2.891*** (0.279)	1.869*** (0.178)	1.944*** (0.190)	2.724*** (0.268)	1.332*** (0.119)
Transitioned to living alone	1.408*** (0.126)	1.163* (0.107)	1.258*** (0.111)	1.392*** (0.125)	0.302*** (0.0961)
Transitioned to living with others	1.063 (0.0956)	1.131 (0.104)	1.142 (0.0996)	1.108 (0.100)	0.0925 (0.0894)
Transitory arrangements	1.042 (0.124)	1.115 (0.137)	1.120 (0.128)	1.040 (0.126)	0.0463 (0.117)
Female (Ref: Male)	1.487*** (0.0936)	1.389*** (0.0922)	1.504*** (0.0921)	1.859*** (0.121)	0.541*** (0.0704)
Cohort (Ref: NCDS)					
BCS70	1.272*** (0.0923)	1.200** (0.0937)	1.250*** (0.0887)	1.335*** (0.101)	0.306*** (0.0793)
Next Steps	1.656*** (0.149)	1.972*** (0.185)	2.153*** (0.193)	2.814*** (0.259)	0.906*** (0.104)
Ethnicity (Ref: White)					
Black	1.325 (0.343)	1.205 (0.308)	0.869 (0.226)	1.032 (0.268)	0.406 (0.351)
Asian	1.315* (0.188)	1.080 (0.158)	0.792 (0.114)	0.949 (0.135)	0.150 (0.170)
Other	1.709* (0.494)	1.415 (0.428)	1.168 (0.348)	1.221 (0.384)	0.550 (0.386)
Constant	0.357*** (0.0244)	0.320*** (0.0247)	0.520*** (0.0351)	0.297*** (0.0223)	5.214*** (0.0689)
N	15,458				

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Weighted regressions.

Participating in paid work during the pandemic, and specifically during strict lockdown periods, could have explained some of the negative associations between living alone and loneliness. Employment provided, other than financial stability, the opportunity to stay preoccupied and to interact with colleagues, online or in person for key workers who physically attended their workplaces. We find that not working has a strong association with higher risks of loneliness, for all components. Being furloughed is associated only with a higher risk of feeling lonely and with higher values of the continuous measure. Key workers do not differ, in terms of loneliness, from others regularly employed. Importantly, however, economic activity does not

change the substantive findings, either in terms of magnitude or statistical significance, on the association between living alone and loneliness (see Table A2).

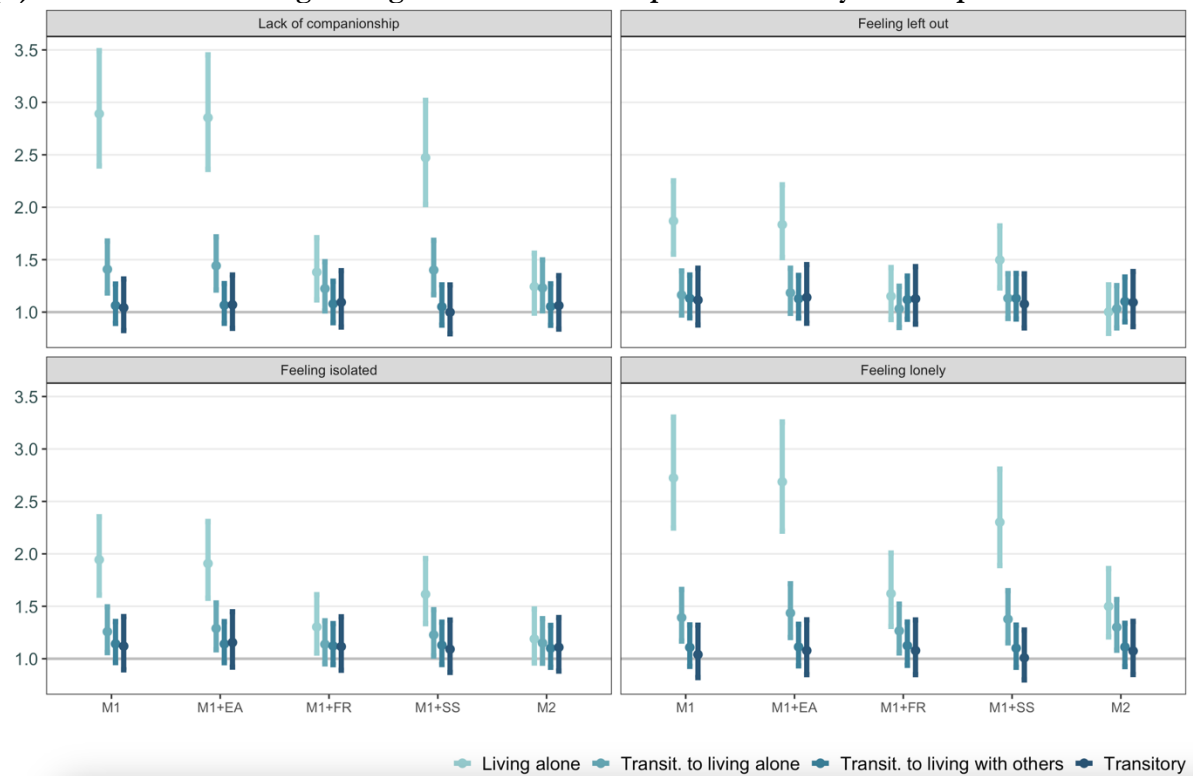
Family relationships, i.e. having a partner or having children, could mitigate the negative associations between living alone and loneliness. This is especially true for coresident partners and children, but also among those not living with them, as it might potentially increase the quantity and the quality of interactions with people they care about and who care for them. Results show that being in a relationship reduces the odds of feeling a lack of companionship, left out, isolated and lonely, as expected. This is not the case for having children. Including family relationships in the model attenuates substantially the association between the living alone variable and loneliness (see Table A3). Specifically, living alone is not associated with ‘feeling left out’. However, despite a nearly 60% reduction in the coefficient this living arrangement remains associated with the overall loneliness score. ‘Transitioning into living alone’ is only associated with ‘lack of companionship’ and ‘feeling lonely’, after adjusting for family relationships.

Adding social support to M1, shows that those who have receive support (somewhat, and a great deal) from people to listen to problems report lower odds of loneliness on all outcomes (see Table A4), whereas the help people could receive if sick seems less relevant. As with family relationships, social support attenuates but does not fully explain the association between living alone and loneliness. Compared with those who continuously lived with other people, those who lived alone throughout reported higher levels of loneliness.

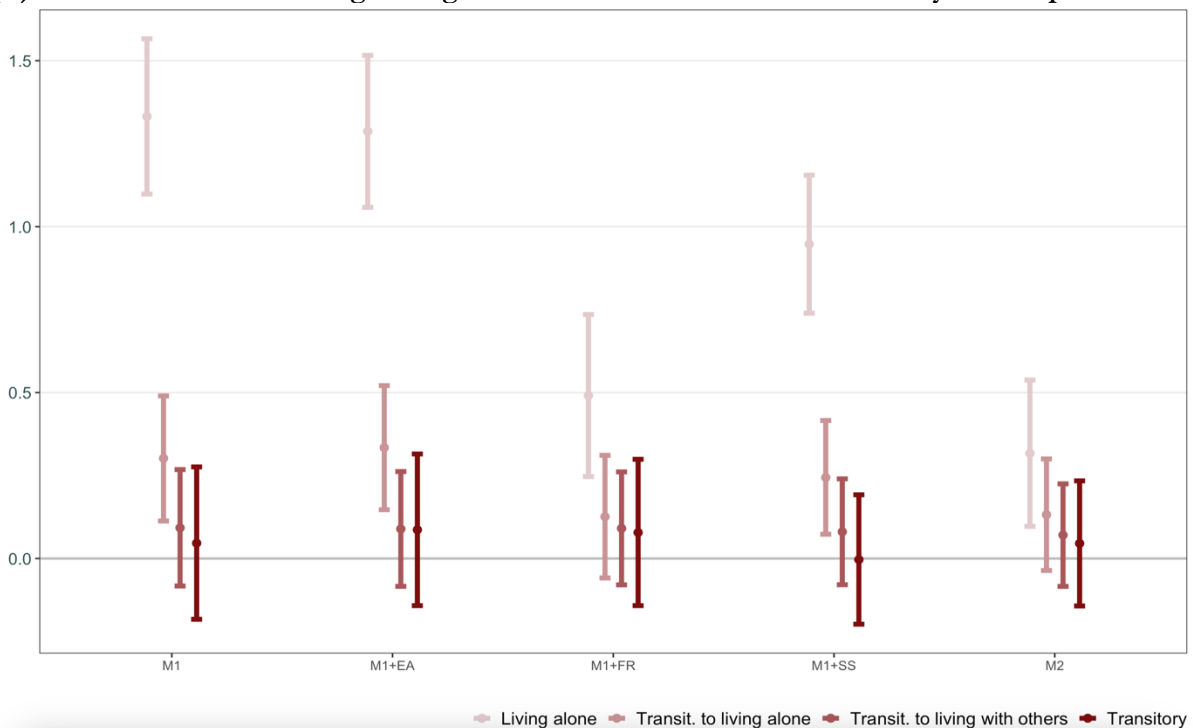
Although the explanatory variable sets did not fully explain the association between living alone and loneliness, they may do so jointly when added together, along with gender, cohort and ethnicity (M2). The odds of feeling a lack of companionship, left out or isolated do not vary substantively by living arrangement in the fully adjusted model, but importantly, living alone throughout the pandemic remains associated with increased loneliness for both the binary ‘feeling lonely’ component and the sum index score (Figure 2; see Table A5 for full results).

Figure 2. Living alone and Loneliness: Results from regression models.

(A) Odds Ratios of Living Arrangement for each component of the by model specification



(B) OLS Coefficients of Living Arrangement for the Loneliness index score by model specification



Notes: Weighted analyses. Model 1 (M1) includes background controls only; M1+EA includes economic activity; M1+FR includes family relationships; M1+SS includes social support; M2 includes all variables. N=15,458.

Specifically, for those living alone throughout the COVID survey waves, the odds of feeling lonely are 50% higher, and the Loneliness index score is on average 0.32 points higher, compared to those living with others. Those who transitioned to living alone have higher odds of feeling a lack of companionship and lonely compared to those always living with others.

4.3 Robustness Checks

To test the sensitivity of our main results to various analytic decisions, we conducted a series of specification checks (available upon request). First, we extracted family social class at age 10-14 from the original datasets and included it in all the model specification as an additional control variable. The sample size decreases to 13,715 because of missing data, so we decided not to include it in the main analysis. The results are anyway robust to the inclusion of family social class. Second, we considered the possible associations between general health with both living arrangements and loneliness. It is possible that poor health is a determinant of living alone. We added self-reported general health, which asked respondents about what their health had been three months before the COVID-19 outbreak, to our fully adjusted model. Worse self-reported health is, as expected, associated with higher odds of loneliness, but our main findings for living alone do not change. We also included a self-assessment of pre-pandemic mental health, asked retrospective in the Covid-19 survey (waves 2 and 3). Unfortunately, this question has a high number of missing values, resulting in a considerably smaller sample size ($N=8,971$). Notwithstanding, worse mental health before COVID-19 is associated with greater loneliness; however, living alone and transitioning to living alone continue to have a strong association with feeling isolated and lonely. Third, given the correlation between relationship status and well-being, we also added two variables related to divorce and widowhood to M2: whether any immediate family member died or whether the respondent separated from a partner in the 12 months before or since the outbreak (asked in Waves 2 and 3). Separation has a strong association with all four components of loneliness and experiencing the death of an immediate family member is associated with feeling isolated and

feeling lonely. The association between living alone and loneliness remains robust. Fourth, we also controlled for loneliness components in Wave 2 (N=11,932-11,944 depending on the outcome) with very similar results for feeling isolated and feeling lonely. Fifth, given the large descriptive differences in loneliness, but also in living arrangements, across cohorts we investigated the possibility that the association between living alone and loneliness would vary by cohort. Thus, we added an interaction term between cohort and living arrangement. The association between living alone and loneliness did not differ across cohorts. Sixth, we also examined three different categorizations of the living arrangement variable in separate models: a) Never living alone vs living alone at least one wave; b) Always living alone vs never alone/not all the waves; c) Always living alone vs never living alone vs living alone some of the waves. These specifications confirm that living alone is associated with higher odds of loneliness. This association is stronger for those always living alone, but it is also present among those observed living alone at least some of the time, which validates the more detailed operationalization considered in this analysis. Seventh, we also ran models using an alternative approach in measuring the four binary loneliness components by grouping the ‘some of the time’ answers with the ‘hardly ever’ answers (vs ‘often’). This measure could classify respondents as ‘severely lonely’ (Das et al., 2021). Results for this variation show that always living alone is the only living arrangement that is associated with feeling left out, isolated and lonely. Finally, to exploit the longitudinal dimension of the COVID-19 surveys, to account for unobserved time invariant factors and to investigate whether a change in living arrangements was associated with loneliness, we ran a fixed effects model on respondents who had at least two waves of data, one of which is Wave 3. The sample for the difference model is based only on those who reported a change in their living arrangements (i.e. 3,002-3,900 depending on the outcome). Results indicate that a change in living alone status is not related to a change in loneliness.

5. Discussion and Conclusions

The COVID-19 pandemic provided a study context to clarify the relationship between living alone and loneliness without the interrelated and confounding effect of social connectedness outside the household. Our empirical contribution was to examine the relationship between living alone and loneliness during the first year of the COVID-19 pandemic in three British cohort studies. We find a strong association between living alone and higher odds of reporting loneliness some of the time or often. In particular, consistently living alone during the pandemic was the living arrangement associated with the highest levels of loneliness compared to those who never lived alone, but also those transitioning into living alone were lonelier than those never living alone at least on some components of loneliness (e.g. feeling lonely). Among the tested explanatory factors, family relationships (having a partner or children) attenuated the association between living alone and loneliness the most, followed by social support and lastly by economic activity. Nonetheless, even when including all these three variables in the regression models, living alone remained associated with higher odds of feeling lonely and higher scores on average on the Loneliness index.

Our findings show the importance of studying the influence of living arrangements on loneliness, but also that it is essential not to conflate the concepts of living alone, loneliness and social isolation if we want to understand their impact on physical and mental health. The physical distancing from people outside of the household during strict lockdowns forced individuals to a state of social isolation that was a complete isolation for those living alone. Hence, during the COVID-19 pandemic the influence of living alone on loneliness was not confounded by social interactions external to household members.

The study is not without limitations. Unfortunately, not all respondents were interviewed in all the three COVID-19 Survey waves. Hence, for some observations we have information on living arrangements for only one or two waves. However, based on questions in the survey on whether the household composition changed since before the outbreak, we observed that of those who were observed as living alone and interviewed only in Wave 2 and Wave 3 or only in Wave 3,

about 90% reported no change, lending credibility to the living alone category capturing a consistent state. Additionally, the surveys do not include detailed information on type and frequency of online interactions by the respondent. The only related question asks about frequency in participating in an online community activity during the previous week, but this question has more than 20% missing values. The surveys do include a battery of questions on time use, but these variables were only included in Wave 1 and Wave 2 questionnaires and including them would substantially restrict the sample size. This limitation though is a promising avenue for future research to interrogate varied social contact modalities (e.g. telephone and video calls, texting) that transcend face-to-face contact when examining loneliness.

Our findings have implications both for future research and for policy. The negative association between living alone and loneliness could represent a public health concern, given the impact of loneliness on worse physical and mental health outcomes. Future research should investigate whether these negative implications of living alone continued even after the lockdown restrictions have been lifted and in the pandemic's aftermath. Returning to the normal levels of social interactions, also with people outside of the household, may well have allowed individuals who live alone to engage in social activities that ensure their living arrangement does not entail loneliness. Given that family relationships, and in particular having a partner, had the largest attenuating effect on the association, our analysis suggests future loneliness research needs to robustly capture social connectedness/isolation separately from living alone. However, the results also suggest substantive implications for future public health strategies in crisis situations when social lives are disrupted, as well as for the current moment if the cumulative negative effects of the COVID-19 lockdowns protracted even after life went back to pre-pandemic routines. Policy makers may need to pay more attention to the social needs of one-person households, an important subgroup of the population that has been growing in most high-income countries and especially among older adults.

References

- Arpino, B. (2023). Loneliness and social exclusion among older Europeans before and during the COVID-19. *N-IUSSP*.
- Arpino, B., Mair, C. A., Quashie, N. T., & Antczak, R. (2022). Loneliness before and during the COVID-19 pandemic—are unpartnered and childless older adults at higher risk? *European Journal of Ageing*, 19(4), 1327–1338. <https://doi.org/10.1007/S10433-022-00718-X/TABLES/4>
- Banerjee, D., & Rai, M. (2020). Social isolation in Covid-19: The impact of loneliness. *International Journal of Social Psychiatry*, 66(6), 525–527. <https://doi.org/10.1177/0020764020922269>
- Beller, J., & Wagner, A. (2018). Disentangling Loneliness: Differential Effects of Subjective Loneliness, Network Quality, Network Size, and Living Alone on Physical, Mental, and Cognitive Health. *Journal of Aging and Health*, 30(4), 521–539. <https://doi.org/10.1177/0898264316685843>
- Bu, F., Steptoe, A., & Fancourt, D. (2020). Loneliness during a strict lockdown: Trajectories and predictors during the COVID-19 pandemic in 38,217 United Kingdom adults. *Social Science and Medicine*, 265. <https://doi.org/10.1016/J.SOCSCIMED.2020.113521>
- Cacioppo, J. T., & Cacioppo, S. (2018). Loneliness in the Modern Age: An Evolutionary Theory of Loneliness (ETL). In *Advances in experimental social psychology: Vol. Vol. 58* (pp. 127–197). Academic press. <https://doi.org/10.1016/bs.aesp.2018.03.003>
- Cacioppo, J. T., Hughes, M. E., Waite, L. J., Hawkley, L. C., & Thisted, R. A. (2006). Loneliness as a specific risk factor for depressive symptoms: cross-sectional and longitudinal analyses. *Psychology and Aging*, 21(1), 140–151. <https://doi.org/10.1037/0882-7974.21.1.140>
- Coget, J.-F., Yamauchi, Y., & Suman, M. (2002). The Internet, Social Networks and Loneliness. *IT & Society*, 1(1), 180–201. https://digitalcommons.calpoly.edu/mgmt_fac/3/
- Courtin, E., & Knapp, M. (2017). Social isolation, loneliness and health in old age: a scoping review. *Health & Social Care in the Community*, 25(3), 799–812. <https://doi.org/10.1111/HSC.12311>
- Coyle, C. E., & Dugan, E. (2012). Social isolation, loneliness and health among older adults. *Journal of Aging and Health*, 24(8), 1346–1363. <https://doi.org/10.1177/0898264312460275>
- Dahlberg, L. (2021). Loneliness during the COVID-19 pandemic. In *Aging and Mental Health* (Vol. 25, Issue 7, pp. 1161–1164). Routledge. <https://doi.org/10.1080/13607863.2021.1875195>
- Danvers, A. F., Efinger, L. D., Mehl, M. R., Helm, P. J., Raison, C. L., Polsinelli, A. J., Moseley, S. A., & Sbarra, D. A. (2023). Loneliness and time alone in everyday life: A descriptive-exploratory study of subjective and objective social isolation. *Journal of Research in Personality*, 107, 104426. <https://doi.org/10.1016/J.JRP.2023.104426>
- Das, A., Padala, K. P., Crawford, C. G., Teo, A., Mendez, D. M., Phillips, O. A., Wright, B. C., House, S., & Padala, P. R. (2021). A systematic review of loneliness and social isolation scales used in epidemics and pandemics. *Psychiatry Research*, 306, 114217. <https://doi.org/10.1016/J.PSYCHRES.2021.114217>
- de Jong Gierveld, J., Dykstra, P. A., & Schenk, N. (2012). Living arrangements, intergenerational support types and older adult loneliness in Eastern and Western Europe. *Demographic Research*, 27, 167–200. <http://www.jstor.org/stable/26349921>
- de Jong Gierveld, J., & Tesch-Römer, C. (2012). Loneliness in old age in Eastern and Western European societies: Theoretical perspectives. *European Journal of Ageing*, 9(4), 285–295. <https://doi.org/10.1007/S10433-012-0248-2/FIGURES/3>
- Delaruelle, K., Vergauwen, J., Dykstra, P., Mortelmans, D., & Bracke, P. (2023). Marital-history differences in increased loneliness during the COVID-19 pandemic: A European study

- among older adults living alone. *Archives of Gerontology and Geriatrics*, 108, 104923. <https://doi.org/10.1016/j.archger.2023.104923>
- Domènech-Abella, J., Mundó, J., Haro, J. M., & Rubio-Valera, M. (2019). Anxiety, depression, loneliness and social network in the elderly: Longitudinal associations from The Irish Longitudinal Study on Ageing (TILDA). *Journal of Affective Disorders*, 246, 82–88. <https://doi.org/10.1016/J.JAD.2018.12.043>
- Eurostat Statistics Explained. (2022). Household composition statistics - Statistics Explained. *Eurostat*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Household_composition_statistics#Increasing_number_of_households_composed_of_adults_living_alone
- Evandrou, M., Falkingham, J., Qin, M., & Vlachantoni, A. (2021). Changing living arrangements and stress during Covid-19 lockdown: Evidence from four birth cohorts in the UK. *SSM - Population Health*, 13, 100761. <https://doi.org/10.1016/J.SSMPH.2021.100761>
- Haase, K. R., Cosco, T., Kervin, L., Riadi, I., & O'Connell, M. E. (2021). Older Adults' Experiences With Using Technology for Socialization During the COVID-19 Pandemic: Cross-sectional Survey Study. *JMIR Aging*, 4(2). <https://doi.org/10.2196/28010>
- Harasemiw, O., Newall, N., Mackenzie, C. S., Shooshtari, S., & Menec, V. (2019). Is the association between social network types, depressive symptoms and life satisfaction mediated by the perceived availability of social support? A cross-sectional analysis using the Canadian Longitudinal Study on Aging. *Aging and Mental Health*, 23(10), 1413–1422. <https://doi.org/10.1080/13607863.2018.1495176>
- Hawkley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine*, 40(2), 218–227. <https://doi.org/10.1007/s12160-010-9210-8>
- Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and Social Isolation as Risk Factors for Mortality: A Meta-Analytic Review. *Perspectives on Psychological Science*, 10(2), 227–237. https://doi.org/10.1177/1745691614568352/ASSET/IMAGES/LARGE/10.1177_1745691614568352-FIG2.JPEG
- Hughes, M. E., Waite, L. J., Hawkley, L. C., & Cacioppo, J. T. (2004). A Short Scale for Measuring Loneliness in Large Surveys. <http://Dx.Doi.Org/10.1177/0164027504268574>, 26(6), 655–672. <https://doi.org/10.1177/0164027504268574>
- Huxhold, O., Suanet, B., & Wetzel, M. (2022). Perceived Social Exclusion and Loneliness: Two Distinct but Related Phenomena. *Sociological Science*, 9. <https://sociologicalscience.com/articles-v9-17-430/>
- Hwang, T. J., Rabheru, K., Peisah, C., Reichman, W., & Ikeda, M. (2020). Loneliness and social isolation during the COVID-19 pandemic. *International Psychogeriatrics*, 32(10), 1217–1220. <https://doi.org/10.1017/S1041610220000988>
- Jeste, D. V., Lee, E. E., & Cacioppo, S. (2020). Battling the Modern Behavioral Epidemic of Loneliness: Suggestions for Research and Interventions. *JAMA Psychiatry*, 77(6), 553–554. <https://doi.org/10.1001/jamapsychiatry.2020.0027>
- Kamiya, Y., Whelan, B., Timonen, V., & Kenny, R. A. (2010). The differential impact of subjective and objective aspects of social engagement on cardiovascular risk factors. *BMC Geriatrics*, 10(1), 1–10. <https://doi.org/10.1186/1471-2318-10-81/TABLES/3>
- Leland, J. (2022). New York Had an 'Epidemic of Loneliness.' Covid Made It Worse. *The New York Times*. <https://www.nytimes.com/2022/04/20/nyregion/loneliness-epidemic.html>
- Li, L. Z., & Wang, S. (2020). Prevalence and predictors of general psychiatric disorders and loneliness during COVID-19 in the United Kingdom. *Psychiatry Research*, 291, 113267. <https://doi.org/10.1016/J.PSYCHRES.2020.113267>

- Litwin, H., & Levinsky, M. (2022). The Interplay of Personality Traits and Social Network Characteristics in the Subjective Well-Being of Older Adults. *Research on Aging*, 45(7–8), 538–549. <https://doi.org/10.1177/01640275221113048>
- Luo, Y., Hawkey, L. C., Waite, L. J., & Cacioppo, J. T. (2012). Loneliness, Health, and Mortality in Old Age: A National Longitudinal Study. *Social Science & Medicine* (1982), 74(6), 907. <https://doi.org/10.1016/J.SOCSCIMED.2011.11.028>
- Mansfield, R., Di Gessa, G., Patel, K., McElroy, E., Wels, J., Henderson, M., Maddock, J., Stafford, J., Steptoe, A., Richards, M., & Patalay, P. (2024). Examining the Interrelationships Between Social Isolation and Loneliness and Their Correlates Among Older British Adults Before and During the COVID-19 Lockdown: Evidence From Four British Longitudinal Studies. *Innovation in Aging*, 8(1), 1–13. <https://doi.org/10.1093/GERONI/IGAD126>
- Mansfield, R., Henderson, M., Richards, M., Ploubidis, G. B., & Patalay, P. (2024). Lifecourse trajectories and cross-generational trends in social isolation: Findings from five successive British birth cohort studies. *Advances in Life Course Research*, 60, 100613. <https://doi.org/10.1016/J.ALCR.2024.100613>
- Matricciani, L., Bin, Y. S., Lallukka, T., Kronholm, E., Wake, M., Paquet, C., Dumuid, D., & Olds, T. (2018). Rethinking the sleep-health link. *Sleep Health*, 4(4), 339–348. <https://doi.org/10.1016/J.SLEH.2018.05.004>
- McElroy, E., Herrett, E., Patel, K., Piehlmaier, D. M., Gessa, G. Di, Huggins, C., Green, M. J., Kwong, A. S. F., Thompson, E. J., Zhu, J., Mansfield, K. E., Silverwood, R. J., Mansfield, R., Maddock, J., Mathur, R., Costello, R. E., Matthews, A., Tazare, J., Henderson, A., ... Patalay, P. (2023). Living alone and mental health: parallel analyses in UK longitudinal population surveys and electronic health records prior to and during the COVID-19 pandemic. *BMJ Mental Health*, 26(1), 1–10. <https://doi.org/10.1136/BMJMENT-2023-300842>
- Office for National Statistics. (2020). *Household projections for England: 2018-based*. <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/householdprojectionsforengland/2018based>
- Office for National Statistics. (2024). *Families and households in the UK: 2023*. <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2023#toc>
- Pantell, M., Rehkopf, D., Jutte, D., Syme, S. L., Balmes, J., & Adler, N. (2013). Social isolation: A predictor of mortality comparable to traditional clinical risk factors. *American Journal of Public Health*, 103(11), 2056–2062. <https://doi.org/10.2105/AJPH.2013.301261>
- Perissinotto, C. M., Stijacic Cenzer, I., & Covinsky, K. E. (2012). Loneliness in Older Persons: A Predictor of Functional Decline and Death. *Archives of Internal Medicine*, 172(14), 1078–1084. <https://doi.org/10.1001/ARCHINTERNMED.2012.1993>
- Powell, A., Francis-Devine, B., & Clark, H. (2022). Coronavirus: Impact on the labour market. *UK Parliament Research Briefings*. <https://researchbriefings.files.parliament.uk/documents/CBP-8898/CBP-8898.pdf>
- Raymo, J. M., Jean Yeung, J., & Ka-Lok Cheung, A. (2015). Living alone in Japan: Relationships with happiness and health. *Demographic Research*, 32(1), 1267–1298. <https://doi.org/10.4054/DEMRES.2015.32.46>
- Raymo, J. M., & Wang, J. (2022). Loneliness at Older Ages in the United States: Lonely Life Expectancy and the Role of Loneliness in Health Disparities. *Demography*, 59(3), 921–947. <https://doi.org/10.1215/00703370-9937606>
- Sepúlveda-Loyola, W., Rodríguez-Sánchez, I., Pérez-Rodríguez, P., Ganz, F., Torralba, R., Oliveira, D. V., & Rodríguez-Mañas, L. (2020). Impact of Social Isolation Due to COVID-19 on Health in Older People: Mental and Physical Effects and Recommendations. *Journal of Nutrition, Health and Aging*. <https://doi.org/10.1007/s12603-020-1469-2>

- Sharfman, A., & Cobb, P. (2022). Families and households in the UK: 2021 Trends in living arrangements including families (with and without dependent children), people living alone and people in shared accommodation, broken down by size and type of household. *Office for National Statistics*.
- Snell, K. D. M. (2017). The rise of living alone and loneliness in history. *Social History*, 42(1), 2–28. <https://doi.org/10.1080/03071022.2017.1256093>
- Sorkin, D., Rook, K. S., & Lu, J. L. (2002). Loneliness, lack of emotional support, lack of companionship, and the likelihood of having a heart condition in an elderly sample. *Annals of Behavioral Medicine : A Publication of the Society of Behavioral Medicine*, 24(4), 290–298. https://doi.org/10.1207/S15324796ABM2404_05
- Steptoe, A., Shankar, A., Demakakos, P., & Wardle, J. (2013). Social isolation, loneliness, and all-cause mortality in older men and women. *Proceedings of the National Academy of Sciences of the United States of America*, 110(15), 5797–5801. https://doi.org/10.1073/PNAS.1219686110/SUPPL_FILE/PNAS.201219686SI.PDF
- Stickley, A., Koyanagi, A., Roberts, B., Richardson, E., Abbott, P., Tumanov, S., & McKee, M. (2013). Loneliness: Its Correlates and Association with Health Behaviours and Outcomes in Nine Countries of the Former Soviet Union. *PLoS ONE*, 8(7). <https://doi.org/10.1371/journal.pone.0067978>
- The Economist. (2018). Loneliness is a serious public-health problem. *The Economist*.
- Theeke, L. A., Goins, R. T., Moore, J., & Campbell, H. (2012). Loneliness, depression, social support, and quality of life in older chronically ill Appalachians. *The Journal of Psychology*, 146(1–2), 155–171. <https://doi.org/10.1080/00223980.2011.609571>
- Umberson, D., Crosnoe, R., & Reczek, C. (2010). Social relationships and health behavior across the life course. *Annual Review of Sociology*, 36, 139–157. <https://doi.org/10.1146/annurev-soc-070308-120011>
- Umberson, D., & Karas Montez, J. (2010). Social Relationships and Health: A Flashpoint for Health Policy. *Journal of Health and Social Behavior*, 51(1_suppl), S54–S66. <https://doi.org/10.1177/0022146510383501>
- UCL Centre for Longitudinal Studies. (2024). COVID-19 Survey in Five National Longitudinal Cohort Studies: Millennium Cohort Study, Next Steps, 1970 British Cohort Study and 1958 National Child Development Study, 2020–2021. . *UK Data Service*.
- U.S. Census Bureau. (2021). Historical Households Tables. *U.S. Census Bureau*. <https://www.census.gov/data/tables/time-series/demo/families/households.html>
- Van Tilburg, T. G., Steinmetz, S., Stolte, E., Van Der Roest, H., & De Vries, D. H. (2021). Loneliness and Mental Health During the COVID-19 Pandemic: A Study Among Dutch Older Adults. *The Journals of Gerontology: Series B*, 76(7), e249–e255. <https://doi.org/10.1093/GERONB/GBAA111>
- Vanderweele, T. J., Hawkey, L. C., & Cacioppo, J. T. (2012). On the Reciprocal Association Between Loneliness and Subjective Well-being. *American Journal of Epidemiology*, 176(9), 777. <https://doi.org/10.1093/AJE/KWS173>
- Vlachantoni, A., Evandrou, M., Falkingham, J., & Qin, M. (2022). The Impact of Changing Social Support on Older Persons' Onset of Loneliness During the COVID-19 Pandemic in the United Kingdom. *The Gerontologist*, 62(8), 1147–1159. <https://doi.org/10.1093/GERONT/GNAC033>
- Wang, J., Lloyd-Evans, B., Giacco, D., Forsyth, R., Nebo, C., Mann, F., & Johnson, S. (2017). Social isolation in mental health: a conceptual and methodological review. *Social Psychiatry and Psychiatric Epidemiology*, 52(12), 1451–1461. <https://doi.org/10.1007/S00127-017-1446-1/TABLES/2>
- Wigfield, A., Turner, R., Alden, S., Green, M., & Karania, V. K. (2022). Developing a New Conceptual Framework of Meaningful Interaction for Understanding Social Isolation and

- Loneliness. *Social Policy and Society*, 21(2), 172–193.
<https://doi.org/10.1017/S147474642000055X>
- Wu, B. (2020). Social isolation and loneliness among older adults in the context of COVID-19: a global challenge. *Global Health Research and Policy*, 5, 27. <https://doi.org/10.1186/s41256-020-00154-3>
- Zavaleta, D., Samuel, K., & Mills, C. T. (2017). Measures of Social Isolation. *Social Indicators Research*, 131(1), 367–391. <https://doi.org/10.1007/S11205-016-1252-2/TABLES/2>
- Zhang, X., & Dong, S. (2022). The relationships between social support and loneliness: A meta-analysis and review. *Acta Psychologica*, 227, 103616.
<https://doi.org/10.1016/J.ACTPSY.2022.103616>

Appendix

Table A1. Weighted Proportions of Living Alone over time, across cohorts and gender

	NCDS	BCS70	Next Steps	Pooled
Living alone	22.5	15.0	14.0	17.8
Transitioned to living alone	4.4	2.5	1.9	3.1
Transitioned to living with others	4.3	1.9	1.4	2.7
Transitory arrangements	2.3	0.7	0.4	1.3
Living with others	66.5	79.9	82.3	75.1
N	6,205	5,296	3,957	15,458
Men				
Living alone	23.2	16.8	17.5	19.7
Transitioned to living alone	3.6	2.3	1.8	2.8
Transitioned to living with others	4.2	1.6	1.2	2.6
Transitory arrangements	2.2	0.7	0.4	1.2
Living with others	66.8	78.7	79.1	73.7
N	2,874	2,236	1,481	6,591
Women				
Living alone	21.7	13.2	11.0	15.9
Transitioned to living alone	5.3	2.6	1.9	3.4
Transitioned to living with others	4.3	2.2	1.5	2.9
Transitory arrangements	2.5	0.8	0.4	1.3
Living with others	66.2	81.1	85.1	76.5
N	3,331	3,060	2,476	8,867

Note: Of those 'Living with others' 50.6% have information in three waves, 31.7% in two waves, and 17.7% in one wave; Of those 'Transitioned to living with others' 65.6% have information in three waves and 34.4% in two waves; Of those 'Transitioned to living alone' 61% have information in three waves and 39% in two waves; Of those 'Living alone' 43.2% have information in three waves, 30.5% in two waves, and 26.3% in one wave.

Table A2. M1 + Economic Activity

	Lack of Companionship	Feeling Left Out	Feeling Isolated	Feeling Lonely	Loneliness Index Score
	OR	OR	OR	OR	β
Living Alone (Ref: Living with others)					
Living alone	2.854*** (0.277)	1.834*** (0.176)	1.908*** (0.186)	2.687*** (0.264)	1.287*** (0.117)
Transitioned to living alone	1.442*** (0.129)	1.184* (0.109)	1.289*** (0.113)	1.436*** (0.130)	0.334*** (0.0953)
Transitioned to living with others	1.066 (0.0960)	1.128 (0.103)	1.141 (0.0997)	1.113 (0.101)	0.0892 (0.0883)
Transitory arrangements	1.070 (0.129)	1.140 (0.141)	1.155 (0.134)	1.078 (0.132)	0.0866 (0.116)
Female (Ref: Male)	1.425*** (0.0916)	1.332*** (0.0899)	1.431*** (0.0891)	1.768*** (0.116)	0.460*** (0.0706)
Cohort (Ref: NCDS)					
BCS70	1.472*** (0.116)	1.367*** (0.115)	1.484*** (0.112)	1.617*** (0.129)	0.544*** (0.0816)
Next Steps	1.936*** (0.183)	2.280*** (0.227)	2.598*** (0.250)	3.476*** (0.328)	1.160*** (0.106)
Ethnicity (Ref: White)					
Black	1.306 (0.339)	1.181 (0.299)	0.849 (0.220)	1.015 (0.262)	0.372 (0.341)
Asian	1.312* (0.187)	1.069 (0.156)	0.783* (0.113)	0.944 (0.136)	0.139 (0.167)
Other	1.598* (0.438)	1.322 (0.387)	1.074 (0.303)	1.120 (0.333)	0.417 (0.352)
Economic Activity During COVID-19 (Ref: Paid work)					
Paid work - key worker	0.959 (0.0716)	1.011 (0.0779)	0.970 (0.0702)	0.950 (0.0714)	-0.0418 (0.0758)
Furloughed	1.261* (0.175)	1.120 (0.161)	1.237 (0.168)	1.387** (0.186)	0.324** (0.153)
Not in paid work	1.629*** (0.147)	1.599*** (0.155)	1.790*** (0.163)	1.869*** (0.176)	0.848*** (0.102)
Constant	0.290*** (0.0239)	0.261*** (0.0244)	0.404*** (0.0331)	0.224*** (0.0193)	4.869*** (0.0788)
N	15,458				

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Weighted regressions.

Table A3. M1 + Family Relationships

		Lack of Companionship	Feeling Left Out	Feeling Isolated	Feeling Lonely	Loneliness Index Score
		OR	OR	OR	OR	β
Living Alone (Ref: Living with others)						
	Living alone	1.381*** (0.151)	1.151 (0.125)	1.303** (0.141)	1.621*** (0.177)	0.491*** (0.125)
	Transitioned to living alone	1.224** (0.119)	1.032 (0.0998)	1.138 (0.104)	1.266** (0.118)	0.126 (0.0942)
	Transitioned to living with others	1.079 (0.100)	1.119 (0.105)	1.122 (0.0995)	1.125 (0.105)	0.0908 (0.0868)
	Transitory arrangements	1.094 (0.136)	1.127 (0.139)	1.116 (0.129)	1.078 (0.132)	0.0783 (0.113)
Female (Ref: Male)		1.449*** (0.0906)	1.369*** (0.0907)	1.493*** (0.0903)	1.827*** (0.117)	0.486*** (0.0648)
Cohort (Ref: NCDS)						
	BCS70	1.233*** (0.0879)	1.165** (0.0888)	1.219*** (0.0843)	1.308*** (0.0966)	0.255*** (0.0714)
	Next Steps	1.564*** (0.149)	1.800*** (0.175)	1.948*** (0.186)	2.786*** (0.266)	0.782*** (0.0984)
Ethnicity (Ref: White)						
	Black	1.070 (0.293)	1.048 (0.263)	0.768 (0.195)	0.876 (0.228)	0.173 (0.322)
	Asian	1.187 (0.182)	0.995 (0.154)	0.735** (0.109)	0.868 (0.132)	0.0205 (0.166)
	Other	1.489 (0.393)	1.285 (0.347)	1.075 (0.297)	1.079 (0.294)	0.358 (0.332)
In a Relationship (cohabiting or not, Ref: No)		0.189*** (0.0180)	0.395*** (0.0372)	0.476*** (0.0447)	0.315*** (0.0302)	-1.714*** (0.115)
Any Children (cohabiting or not, Ref: No)		1.113 (0.0932)	0.926 (0.0755)	0.885 (0.0698)	1.113 (0.0886)	0.0326 (0.0826)
Constant		1.460*** (0.195)	0.791* (0.105)	1.139 (0.144)	0.766** (0.101)	6.772*** (0.146)
N		15,458				

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Weighted regressions.

Table A4. M1 + Social Support

		Lack of Companionship	Feeling Left Out	Feeling Isolated	Feeling Lonely	Loneliness Index Score
		OR	OR	OR	OR	β
Living Alone (Ref: Living with others)						
	Living alone	2.473*** (0.252)	1.497*** (0.150)	1.615*** (0.158)	2.302*** (0.233)	0.947*** (0.106)
	Transitioned to living alone	1.401*** (0.132)	1.133 (0.109)	1.227** (0.113)	1.377*** (0.126)	0.244*** (0.0873)
	Transitioned to living with others	1.051 (0.0975)	1.131 (0.110)	1.129 (0.103)	1.101 (0.102)	0.0804 (0.0813)
	Transitory arrangements	0.999 (0.118)	1.077 (0.130)	1.091 (0.127)	1.009 (0.120)	-0.00334 (0.0994)
	Female (Ref: Male)	1.583*** (0.105)	1.478*** (0.106)	1.561*** (0.0993)	1.983*** (0.137)	0.562*** (0.0643)
Cohort (Ref: NCDS)						
	BCS70	1.227*** (0.0945)	1.147 (0.0967)	1.203** (0.0890)	1.297*** (0.104)	0.224*** (0.0727)
	Next Steps	1.864*** (0.180)	2.297*** (0.233)	2.356*** (0.220)	3.194*** (0.313)	0.960*** (0.0939)
Ethnicity (Ref: White)						
	Black	1.369 (0.343)	1.237 (0.300)	0.866 (0.210)	1.022 (0.253)	0.417 (0.292)
	Asian	1.074 (0.190)	0.850 (0.144)	0.653*** (0.107)	0.781 (0.128)	-0.119 (0.179)
	Other	1.639* (0.461)	1.301 (0.419)	1.100 (0.319)	1.140 (0.355)	0.383 (0.335)
Can Count on People to Help if Sick (Ref: Not at all)						
	A little	1.030 (0.191)	1.014 (0.191)	1.311 (0.250)	1.023 (0.189)	-0.126 (0.221)
	Somewhat	0.880 (0.165)	0.883 (0.162)	1.032 (0.193)	0.859 (0.156)	-0.397* (0.225)
	A Great Deal	0.750 (0.136)	0.768 (0.139)	0.857 (0.156)	0.762 (0.136)	-0.527** (0.218)
Can Rely on People to Listen to Problems (Ref: Not at all)						
	A little	0.931 (0.198)	0.713* (0.140)	0.707 (0.155)	0.890 (0.177)	-0.861*** (0.241)
	Somewhat	0.510*** (0.106)	0.401*** (0.0775)	0.505*** (0.108)	0.508*** (0.0997)	-1.743*** (0.243)
	A Great Deal	0.189*** (0.0398)	0.145*** (0.0291)	0.237*** (0.0510)	0.238*** (0.0479)	-2.714*** (0.240)
	Constant	1.272 (0.281)	1.412* (0.284)	1.558** (0.329)	0.940 (0.198)	7.803*** (0.244)
N		15,458				

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Weighted regressions.

Table A5. M1 + Economic Activity + Family Relationships + Social Support

		Lack of Companionship	Feeling Left Out	Feeling Isolated	Feeling Lonely	Loneliness Index Score
		OR	OR	OR	OR	β
Living Alone (Ref: Living with others)						
	Living alone	1.243* (0.145)	1.002 (0.117)	1.189 (0.131)	1.499*** (0.165)	0.317*** (0.112)
	Transitioned to living alone	1.231** (0.123)	1.031 (0.103)	1.150 (0.108)	1.301*** (0.123)	0.132 (0.0857)
	Transitioned to living with others	1.053 (0.100)	1.101 (0.108)	1.100 (0.101)	1.112 (0.105)	0.0707 (0.0789)
	Transitory arrangements	1.063 (0.129)	1.093 (0.133)	1.109 (0.129)	1.074 (0.128)	0.0455 (0.0961)
	Female (Ref: Male)	1.504*** (0.102)	1.427*** (0.104)	1.492*** (0.0959)	1.876*** (0.132)	0.468*** (0.0616)
Cohort (Ref: NCDS)						
	BCS70	1.315*** (0.107)	1.226** (0.107)	1.373*** (0.104)	1.497*** (0.121)	0.351*** (0.0692)
	Next Steps	1.958*** (0.211)	2.309*** (0.250)	2.529*** (0.269)	3.802*** (0.400)	1.021*** (0.0937)
Ethnicity (Ref: White)						
	Black	1.143 (0.349)	1.089 (0.279)	0.776 (0.194)	0.879 (0.234)	0.213 (0.283)
	Asian	0.972 (0.177)	0.793 (0.136)	0.614*** (0.0995)	0.728* (0.123)	-0.205 (0.171)
	Other	1.377 (0.345)	1.144 (0.332)	0.973 (0.258)	0.965 (0.252)	0.167 (0.274)
Economic Activity During COVID-19 (Ref: Paid work)						
	Paid work - key worker	0.949 (0.0757)	1.021 (0.0830)	0.975 (0.0721)	0.941 (0.0730)	-0.0338 (0.0682)
	Furloughed	1.084 (0.143)	0.993 (0.139)	1.159 (0.153)	1.251* (0.168)	0.147 (0.115)
	Not in paid work	1.355*** (0.0757)	1.396*** (0.0830)	1.657*** (0.0721)	1.657*** (0.0730)	0.559*** (0.0682)
	In a Relationship (cohabiting or not, Ref: No)	0.211*** (0.0214)	0.487*** (0.0500)	0.590*** (0.0568)	0.381*** (0.0368)	-1.292*** (0.106)
	Any Children (cohabiting or not, Ref: No)	1.095 (0.0969)	0.888 (0.0773)	0.866* (0.0708)	1.105 (0.0921)	-0.00513 (0.0764)
Can Count on People to Help if Sick (Ref: Not at all)						
	A little	1.132 (0.209)	1.084 (0.206)	1.389* (0.268)	1.091 (0.202)	-0.0416 (0.205)
	Somewhat	0.951 (0.179)	0.935 (0.175)	1.092 (0.206)	0.913 (0.168)	-0.302 (0.211)
	A Great Deal	0.822 (0.149)	0.821 (0.150)	0.912 (0.169)	0.819 (0.145)	-0.414** (0.204)
Can Rely on People to Listen to Problems (Ref: Not at all)						
	A little	1.025 (0.212)	0.753 (0.150)	0.753 (0.169)	0.973 (0.188)	-0.723*** (0.221)
	Somewhat	0.603** (0.123)	0.442*** (0.0873)	0.561*** (0.123)	0.592*** (0.115)	-1.487*** (0.227)

	A Great Deal	0.219*** (0.0450)	0.161*** (0.0331)	0.265*** (0.0585)	0.278*** (0.0550)	-2.410*** (0.224)
Constant		3.389*** (0.849)	2.229*** (0.538)	1.976*** (0.497)	1.347 (0.331)	8.417*** (0.268)
N		15,458				

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Weighted regressions.