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Loneliness and health of older adults

The role of cultural heritage and relationship quality

Casabianca, E.

Kovacic, M.

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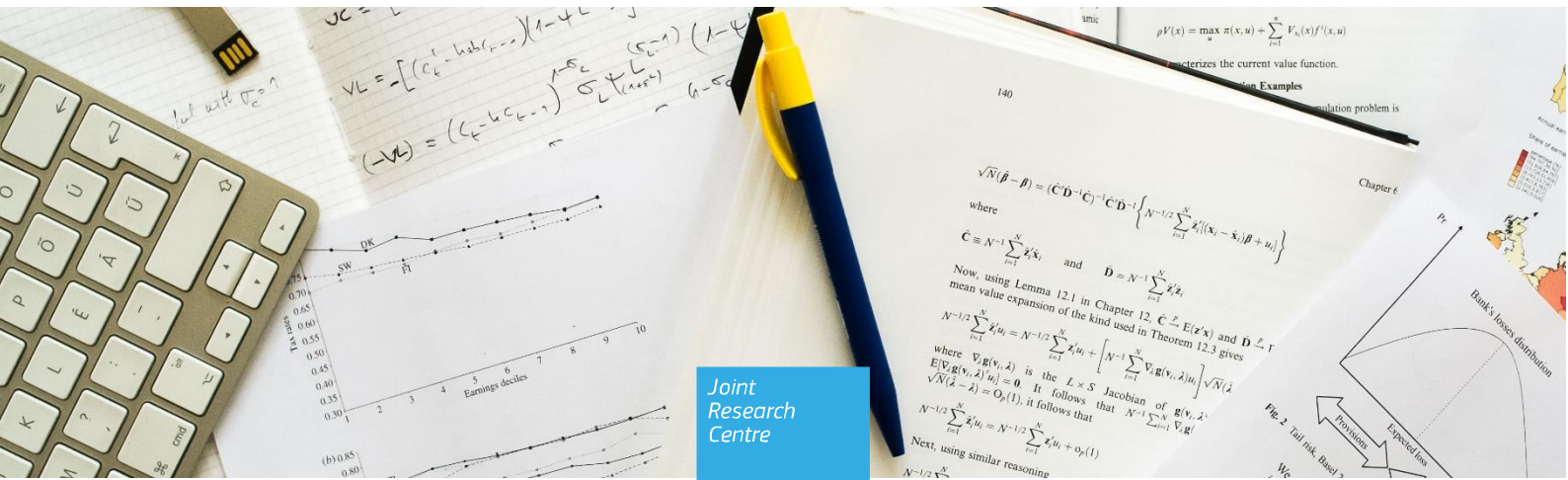

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Contact information
Name: Matija Kovacic
Address: European Commission, Joint Research Centre (JRC), Via Enrico Fermi, 2749, 21027 Ispra (VA), Italy
Email: matija.kovacic@ec.europa.eu

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Executive summary

We estimate the direct causal effect of loneliness on a variety of health outcomes using a sample of second-generation immigrants among older adults drawn from the Survey of Health, Ageing and Retirement in Europe. In an effort to account for the endogeneity of self-declared loneliness, we explore the link between loneliness and a specific trait of maternal cultural background strongly associated with quality of relations and use the latter as an instrument for loneliness. We thus also assess the importance of cultural heritage in shaping individuals' perceptions of loneliness. Additionally, we investigate one pathway by which some specific ancestral factors may influence the formation of cultural traits in the modern era. Our results suggest that loneliness has a significant impact on health, both mental and physical. Notably, our identification strategy allows us to uncover a larger effect of loneliness on health than that found in an OLS setting. These findings are robust to a battery of sensitivity checks.

Loneliness and health of older adults
The role of cultural heritage and relationship quality

Elizabeth Casabianca[1] and Matija Kovacic*[2]

[1] *European Commission, Joint Research Centre (JRC), Ispra, Italy. ORCID: https://orcid.org/0000-0002-0451-5701*
[2] *European Commission, Joint Research Centre (JRC), Ispra, Italy. ORCID: https://orcid.org/0000-0002-3267-5518*

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Abstract

We estimate the direct causal effect of loneliness on a variety of health outcomes using a sample of second-generation immigrants among older adults drawn from the Survey of Health, Ageing and Retirement in Europe. In an effort to account for the endogeneity of self-declared loneliness, we explore the link between loneliness and a specific trait of maternal cultural background strongly associated with quality of relations and use the latter as an instrument for loneliness. We thus also assess the importance of cultural heritage in shaping individuals' perceptions of loneliness. Additionally, we investigate one pathway by which some specific ancestral factors may influence the formation of cultural traits in the modern era. Our results suggest that loneliness has a significant impact on health, both mental and physical. Notably, our identification strategy allows us to uncover a larger effect of loneliness on health than that found in an OLS setting. These findings are robust to a battery of sensitivity checks.

Keywords: Loneliness, relationship quality, culture, mental health, physical health.

JEL Classification: I12, I14, J14, D91, Z13.

*Corresponding author: E-Mail: matija.kovacic@ec.europa.eu; matija.kovacic@unive.it; Joint Research Centre (JRC), Via E. Fermi 2749 - I-21027 - Ispra (Va) - ITALY.

Declarations

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1 Introduction

Loneliness is generally understood as the negative experience (or feeling) arising when an individual perceives a significant mismatch between actual and desired (or ideal) social interaction (Perlman and Peplau, 1981; Peplau et al., 1982). In other words, individuals feel lonely when current circumstances do not fulfill their ideal targets (Erber and Gilmour, 2013). According to this definition, one might feel lonely despite enjoying a large social network and a high quantity of social connections (van Baarsen et al., 2001; Albert, 2021).

Loneliness is widely recognized as being a public health issue. A meta-analytic review of nearly 150 studies by Holt-Lunstad et al. (2015) finds that the risk of premature mortality linked to loneliness is stronger than the risk associated with obesity and physical inactivity. Extensive literature, prevalently psychological, also documents consistent associations between loneliness and mental and physical health. Studies reveal that lonelier individuals are at higher risk of depression, suicidal ideation and suicide attempts, cardiovascular disease and cognitive decline (Cacioppo et al., 2014a; Cacioppo and Cacioppo, 2018; Cacioppo and Hawkley, 2009; Cacioppo et al., 2014b; Leigh-Hunt et al., 2017; Steptoe et al., 2013; Stickley et al., 2013; Stickley and Koyanagi, 2016; Valtorta et al., 2016, among many others). Besides being a public health issue, loneliness is an economic problem, too. Lonely people are more likely to use healthcare services (e.g. doctor visits, hospital admissions). Thus, loneliness may be associated with higher healthcare expenditure (Kung et al., 2021). The cost of loneliness to employers can be substantial and linked to increased absence, loss of productivity and increased voluntary turnover resulting from low job satisfaction (Michaelson et al., 2021). A first attempt at estimating the effects of loneliness on economic growth, finds that regions with a higher share of lonely people have a more limited capacity to generate additional wealth (Burlina and Rodríguez-Pose, 2021).

Despite this large body of evidence, studies so far are mainly based on descriptive analysis or simple multivariate regression models. Hence, they are only able to reveal *correlations* and can say little about *causation*. Courtin and Knapp (2017) call for more research on causal pathways that "better link the evidence of the risk factors for loneliness [...] and their evidence on their impact on health". We are responding to this call and with this paper, we fill existing gaps in the related literature.

We estimate the causal impact of loneliness on a variety of health-related measures using individual-

level data drawn from the Survey of Health, Ageing and Retirement in Europe (SHARE, Börsch-Supan, 2008). SHARE is a multidisciplinary longitudinal survey on ageing which focuses on individuals aged 50+ and their spouses. It contains rich information on individuals' mental and physical health statuses and allows us to link information on the respondents' current situation to retrospective childhood data, including parents' country of origin. It also includes questions that allow us to build metrics that correspond to widely recognized measures of loneliness: the three-item version of the Revised UCLA Loneliness scale (Russell et al., 1978) - an indirect measure of loneliness - and the single-item loneliness scale, which asks about loneliness directly. This set of features makes SHARE particularly suitable for our purposes. Moreover, the sample is representative of the older population, who is especially vulnerable to loneliness and its health-related implications (Vozikaki et al., 2018). While loneliness can affect people of all ages, older adults are more exposed to the risk of feeling lonely because they are more likely to experience life transitions and disruptive life events, such as retirement and bereavement, that increases loneliness. The absence of supportive relationships, low-quality or unfulfilling relationships is another factor associated to increased loneliness among older people (Victor et al., 2005).

To isolate the impact of loneliness on health, our identification strategy consists of three primary elements.

First, we explore how certain cultural dimensions affect loneliness. A number of studies show the importance of culture, defined as the set of social values and norms shared by people in a place or time, in determining individual's experiences of loneliness. This literature mainly focuses on the distinction between *individualistic* and *collectivistic* cultures (Hofstede et al., 2010) based on the *quantity* and extension of social networks within a society, which are more limited in the former compared to the latter. Hence, people in individualistic societies with weaker social connections should feel more lonely compared to those in collectivistic societies. Yet, when it comes to cross-cultural comparisons, this association does not always hold and the evidence is still rather mixed (for example, Lykes and Kemmelmeier, 2014; Van Tilburg et al., 2004). We argue that one reason for these discrepancies is conceptual in nature. Loneliness is not just about the *quantity* or frequency of social interactions. Instead, it is the negative feeling arising from the perceived discrepancy between actual and ideal *quality* of social relationships. The key role of quality of social contacts in predicting

loneliness has been already uncovered to a degree (Pinquart and Sörensen, 2003; Hawkley et al., 2008; Beller and Wagner, 2018). When evaluating actual social relations, individuals are more concerned with the *quality* of their social ties independent of the perceived desired size of their social networks. Based on this evidence, we link loneliness to indulgent *vis*-à-*vis* restraint cultures (Hofstede et al., 2010), a specific cultural trait strongly associated with quality of relations, extraversion, happiness and high importance of having friends and positive feelings. While individuals in indulgent societies place more value in enjoying life without social restrictions, in restraint societies the prevalent belief is that enjoyment is somewhat wrong. Our focus on this dimension of culture represents one of the contributions of our work to the related literature.

Second, we limit our main analytical sample to native individuals with at least one foreign-born parent (i.e. second-generation immigrants) to whom we assign the cultural trait belonging to their parents' country of origin. This "epidemiological approach" (Galor et al., 2020; Bernhofer et al., 2021, among other) allows us to separate the effect of culture from other country-specific factors, otherwise captured by a single "country effect". In other words, we exploit the exogenous variation in parental cultural background while keeping the other country-specific factors invariant. Our model is based on two key assumptions: parents' foreign cultural background is transmitted to their children and it is long lasting, meaning that it affects individuals' beliefs, emotions and choices throughout life. Although this assumption might be strong, existing evidence shows that cultural values are transferred from parents to children, and rarely change in life (Beugelsdijk and Welzel, 2018).

Third, we use the degree of restraint of maternal country of origin as an instrument for individual self-declared loneliness. More specifically, we find that maternal cultural background shows a statistically significant effect on self-reported loneliness. This is in line with extant evidence on the inter-generational transmission of attitudes and behaviour (among the most recent contributions see Cipriani et al., 2013; Sgroi et al., 2020). In an extension of our analysis, we investigate one possible pathway by which some specific ancestral factors may have influence on the formation of cultural traits associated with higher levels of restraint in the modern era.

The combination on these three elements allow us to estimate a direct causal effect of loneliness on

multiple health outcomes. Anticipating our main results, we find that loneliness has a significant impact on individuals' health status. More specifically, loneliness increases the probability of depression, suicidal ideation, and functional decline. Among physical health-related factors and medications, loneliness increases the likelihood of diabetes, hypertension and stroke. Notably, our identification strategy allows us to uncover a larger effect of loneliness on health than that found in a simple OLS setting, which confirms the presence of a strong reverse causality between loneliness and health. More specifically, the effect of instrumented loneliness is 3.5 times larger in magnitude than the non-instrumented one for depressive symptoms, 2.5 for suicidal intentions and 6.4 times larger for functional decline. Our baseline results are robust to a number of sensitivity checks. Our empirical framework also allows us to find that individuals with mothers' originating from more restraint societies are more likely to report feelings of loneliness. We take this result as evidence for the importance of quality *vis*-à-*vis* quantity of relations in shaping individuals' perceived loneliness.

The rest of the paper is organized as follows: Section 2 discusses the association between loneliness and the dimensions of culture that capture the quantity and quality of individuals' social interactions. Section 3 presents the empirical strategy used to identify the causal impact of loneliness on health and Section 4 presents the data used. Our main results are discussed in Section 5, followed by some extensions of our analysis and sensitivity checks in Section 6 . Section 7 concludes.

2 Loneliness, relationship quantity versus quality

A recent stream of literature suggests that certain dimensions of culture play a prominent role in determining individuals' experiences of loneliness (Heu et al., 2021b). One cultural aspect that may interact with loneliness experiences is that related to the degree of social embeddedness of individuals in social networks, i.e. the *quantity* of social interactions people have. An important distinction here is between *less* and *more* socially embedded cultures. In the former, individuals are less embedded in tight social networks (e.g. families or communities), spend more time or are more likely to live alone, have less stable and less long lasting relationships, are more independent from each other when making choices and laxer rules governing social

relationships. Another dimension of culture that may be linked to loneliness is that associated with the perceived *quality* of social relationships. Indeed, the evaluation of actual social relations may rely also on quality of connections. Even though individuals face the same target in terms of the extent of social relations (i.e. quantity or variety), they may have different evaluations of such relationships (i.e. perceived quality). Quality and variety are distinct concepts and there is no reason to assume *a priori* that higher (lower) quantity implies higher (lower) quality.

A useful framework to categorize cultures along the quantity *vis*-à-*vis* quality dimensions has been introduced by Hofstede et al. (1991), and further extended by Hofstede et al. (2010). According to their model, cultures can be categorized along the following dimensions, among others[1]:

1. **Individualism versus Collectivism**. Roughly speaking, individualism and collectivism are about the degree to which people in a society are integrated into groups. Collectivistic cultures are those in which people strongly integrate into cohesive groups, often extended families (so-called "joint" families) that continue protecting them in exchange for unquestioning loyalty. Individuals identify themselves with the society and have greater emphasis on the welfare of the entire group. Individualistic cultures, on the other side, are characterized by looser ties between the members of the society. Everyone is expected to look after him/herself and his/her immediate family (so-called "stem" families). Having a "close, intimate friend" is a value that is more likely in individualist societies.

2. **Indulgence versus Restraint**. This dimension is closely related to "happiness" (or subjective well-being) and strongly associated with a high importance of having friends. According to the authors, indulgent societies are generally happier since they gratify enjoying life without social restrictions that hamper one's freedom of choice, involve frequently in leisurely activities with friends or alone, actively involve in sports, have lenient sexual norms, etc. Restraint societies, on the other hand, are

[1] Initially developed to analyze how the culturally embodied beliefs differ in terms of work objectives (Hofstede et al., 1991), the model has been further expanded by Hofstede et al. (2010) using the data from the Chinese Values Survey and from the World Values Survey data for representative samples of the population in 93 societies. The authors develop a six-dimensional model of national culture on the values of its members and how these values relate to behaviour. The values reflecting cultural differences have been grouped into six dimension. As our focus is on the cultural traits specifically related to the quantity and quality of social relationships, we limit our analysis to the distinction between individualistic and restraint societies. The other four dimensions are described in Appendix A. The six-dimension data matrix is available at `https://geerthofstede.com/research-and-vsm/dimension-data-matrix/`. For further details see Hofstede et al. (2010). .

characterized by stricter social norms and prohibitions. The prevalent belief in these cultures is that the enjoyment of different types of indulgence (leisurely activities, spending, sports etc.) is somewhat wrong. The cognitive evaluation of one's life and/or a description of one's feeling is generally more positive in indulgent than in restraint societies.[2] Indeed, Kuppens et al. (2006) show that individuals from indulgent societies are more likely to remember positive feelings (emotions). In a similar fashion, McCrae (2002) finds that indulgence correlates positively with extraversion and negatively with neuroticism (tendency to experience negative feelings).

The extent to which different cultures score within each dimension is captured by an index normalized between 0 and 100. The indices do not measure the absolute level of attributes rather they express the position of societies relative to each other. Table C.2 (in Appendix C) provides the full list of countries included in Hofstede et al.'s (2010) model of national culture and the corresponding index of individualism and restraint. Worth noting is that, Beugelsdijk and Welzel (2018) shows that the values within each cultural dimension are transferred from parents to children, and rarely change in later life. By comparing two successive generations 30 years apart, the authors find only a modest worldwide shift towards more indulgence. However, the position of countries relative to each other remained the same. The country scores hence can be assumed to be stable over time. This provides ground for our key assumptions: parents' cultural background is passed on to children and its effect is long-lasting.

Understanding which of these cultural dimensions affects the propensity to feel lonely (net of the other individual and country characteristics) is not straightforward.

If we assign more weight to quantity of social interactions, then individuals in collectivist cultures with strong social networks and extended family ties, should feel less lonely than individuals in individualist societies with weaker social connections, tinier family ties and more individualistic values. Yet, when it comes to cross-cultural comparative data, this association generally does not hold. The empirical evidence mostly reports lower levels of loneliness in individualistic than in collectivist societies (Dykstra, 2009, Lykes and Kemmelmeier, 2014, Fokkema et al., 2012,van Tilburg et al., 1998, Anderson, 1999), which may seem

[2]Indulgence does not require the realization of life satisfaction and positive emotional feelings at the same time. As stated by the authors, these two traits are somewhat related but the correlation is not very strong.

counter-intuitive. In some cases, the evidence provides contradictory findings (van Tilburg et al., 2004, Rokach et al., 2001, Jiang et al., 2018, Heu et al., 2019, Heu et al., 2021b).

This mixed evidence may be due to several factors. First, most empirical studies based on traditional cross-country comparisons fail to separate the effect of culture from other country-specific factors such as economic and institutional arrangements. Second, attempts to identify the effect of culture across individuals who share the same current environment but have different national origins (*i.e.*, first-generation immigrants) confound social values with the individuals' minority status, which may itself affect loneliness. In addition, this strategy runs into selection problems since the factors influencing the probability of migrating may also affect the individual's general attitudes toward loneliness. We will return to this point in Section 3.[3] Last, but not least, the individualist-collectivist dimension of culture may not be the most appropriate to predict individuals' feelings of loneliness. In other words, the issue might also be conceptual in nature and more emphasis should be put on alternative dimensions of culture.

If we place more importance on the quality of social interactions, then individuals in restraint societies with stricter social norms and prohibitions may be more at-risk of loneliness compared to individuals in indulgent societies where enjoyment of one's life is more valued. A possible mechanism underlying the association between the degree of restraint of a society and loneliness of its people is the level of individualâs satisfaction with the quality of their actual social relationships, regardless of their quantity. Figure B.1 (in Appendix B) shows that there is a positive relationship between restraint and the degree of dissatisfaction with personal relationships (panel a). Moreover, the observed positive relationship holds for both high, intermediate and low levels of individualism. Individualism, on the other hand, does not show any clear correlation with overall satisfaction (panel b). Furthermore, there is some evidence suggesting that the quality of social contacts is more relevant than their quantity in predicting loneliness (Pinquart and Sörensen, 2003; Hawkley et al., 2008; Beller and Wagner, 2018). A similar pattern has been confirmed by Taylor et al. (2018). The authors find that qualitative aspects of social relationships were more strongly related to

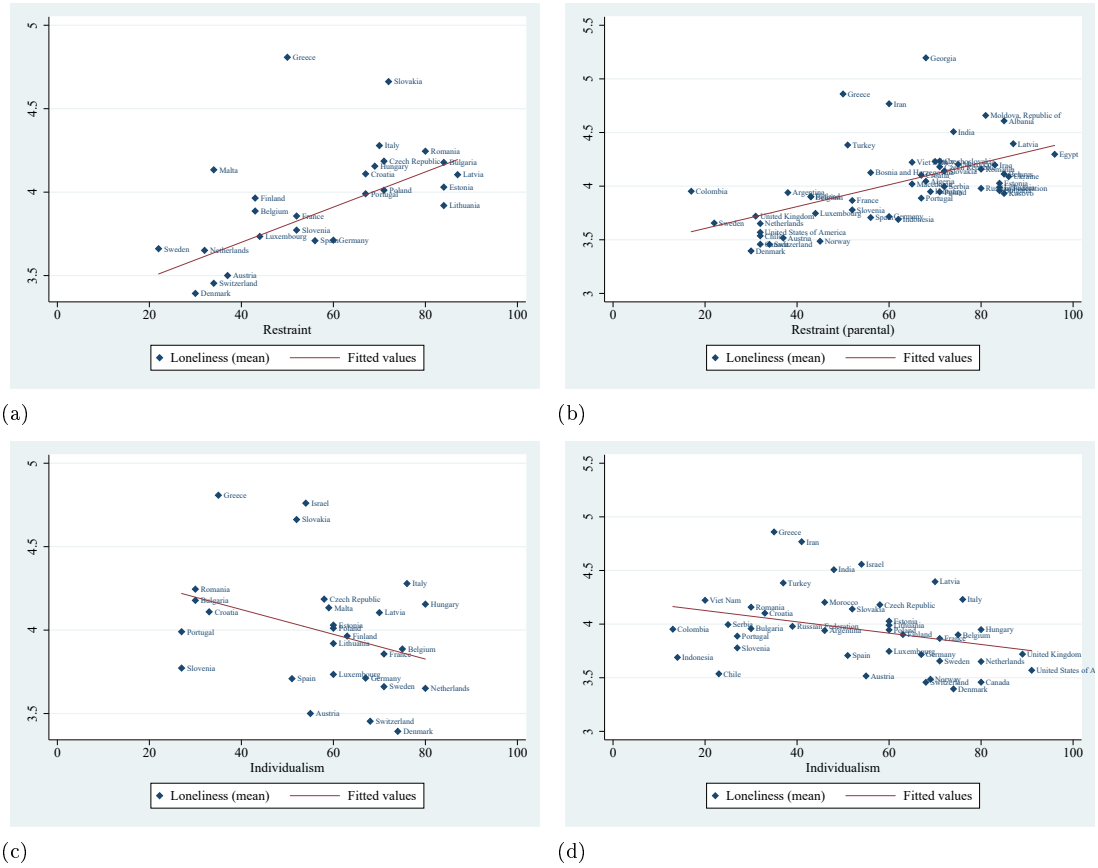
[3] Another possible explanation for these discrepancies, taken from the psychological literature, is that risk factors for loneliness also differ between individualistic and collectivist societies. While solitude and social isolation represent the main risk factors in the former, as we move towards cultures with more stricter rules governing social relationships, loneliness may arise as one's lack of freedom to choose relationships (Heu et al., 2021b)

depression than the quantitative ones. Figure 1 (panel a) confirms this intuition. It shows the average level of loneliness among individuals aged 50 or older in 26 European countries and Israel against the indices of restraint from Hofstede et al. (1991) and Hofstede et al. (2010). The positive association between loneliness and restraint indicates that individuals originating from restraint societies are on average more susceptible to feel lonely. The correlation remains strong even when considering the level of restraint of parental country of origin (panel b). In panel (c) and (d), we consider individualism instead of restraint. It shows that individualistic societies report lower loneliness, which is in line with the majority of the existing empirical evidence. However, compared to the restraint dimension, the pattern is less pronounced and the dispersion is higher. If satisfaction is more important than quantity, then a greater general tendency to evaluate negatively actual social relationships as a result of restraint societies' stricter social norms and prohibitions may increase the risk of loneliness. This assumption finds support in Heu et al. (2021b)'s *culture-loneliness framework* according to which more restrictive norms about social relationships positively influence the likelihood of emotional and perceived isolation.[4]

In conclusion, tipping the balance from quantity to quality, or from individualism-collectivism to restraint-indulgence, provides us with a valuable framework to identify the causal impact of loneliness on health. In what follows, we present our empirical strategy and hypotheses. We first establish the robust relationship between loneliness and restraint. Once we have described our identification strategy, we move to the second part of the analysis and estimate the direct causal effect of loneliness on multiple health outcomes.

[4]Emotional isolation occurs when an individual does not have individually fulfilling, high-quality, or responsive relationships. Perceived isolation, instead, results from perceived ideal-actual discrepancies regarding social relationships (Heu et al., 2021b).

Figure 1: Loneliness (country mean) across cultural dimensions in Hofstede et al. (2010)



(a) (b)

(c) (d)

Source: SHARE and Hofstede et al. (2010).
Note: The averages are based on the respondents from the Survey of Health Ageing and Retirement in Europe (SHARE), waves 5, 6, 7, and 8 for which the information on loneliness was available (Börsch-Supan, 2008).

3 Empirical strategy

3.1 Sample selection and identification strategy

As already mentioned in the previous section, the ambiguity in the relationship between certain dimensions of culture and loneliness may be both empirical and conceptual. Given the fact that traditional estimation approaches fail to separate the effect of selected dimensions of culture from the other country-specific factors such as economic and institutional arrangements, which all contribute to a single "country effect" (Giuliano, 2007), the identification of specific cultural traits should compare individuals born and raised in the same economic and institutional environments but whose cultural values are potentially different. This strategy underlies the so-called "epidemiological approach" (Giuliano, 2007, Fernández, 2011, Galor and Özak, 2016,

Galor et al., 2020, Bernhofer et al., 2021), and focuses on native individuals with one or both foreign-born parents (*i.e.*, second-generation immigrants). For the cultural hypothesis to be consistent, immigrants who are identical in all aspects except for their cultural backgrounds should experience different levels of loneliness. The epidemiological approach relies on three main assumptions: i) cultural values and beliefs are vertically transmitted from parents to children, ii) cultural values systematically vary across individuals having different cultural backgrounds; and iii) despite the heterogeneity in their cultural backgrounds, individuals living in the same country (or region) face identical economic and institutional arrangements. Our main analytical sample, therefore, consists of native individuals with one or both foreign-born parents. This identification strategy allows us to exploit the exogenous variation in parental cultural backgrounds while keeping the other country-specific factors invariant.[5]

3.2 Hypotheses

Our framework consists of a set of hypotheses that we test empirically using data described in Section 4. The first hypothesis tests the assumption that a greater general tendency to evaluate actual social relationships negatively as a result of the stricter social norms and prohibitions that characterize restraint societies increases the risk of loneliness:

Hypothesis 1 ***Relationship quality and loneliness***

Individuals with cultural backgrounds characterized by negative cognitive evaluations of one's life and feelings are, on average, more likely to feel lonely, ceteris paribus.

The relationship between negative evaluations of relationship quality and loneliness should hold independently of the ideal variety of social connections. We do not rule out the possibility of loneliness occurring at all levels of social embeddedness (van Staden and Coetzee, 2010; Heu et al., 2021a), but argue that individual satisfaction with social situations is more important than the size of social networks or the degree of physical isolation. Formally, two individuals, i and j, with the same ideal targets in terms of social embeddedness,

[5]Another key assumption of our framework is that cultural heritage is long-lasting, meaning that it affects individual's beliefs, emotions and choices throughout their life.

$E(x_i) = E(x_j) = E(\overline{x})$, may have different evaluations of actual relationships, $x < E(\overline{x})$. Suppose that $x_i > x_j$. Since loneliness is conceptualized as an unpleasant feeling arising from the perceived discrepancy between existing and optimal quality, *i.e.*, $L = |x - E(\overline{x})|$, the individual with a higher evaluation of actual social embeddedness will feel less lonely, *i.e.*, $L(x_i) < L(x_j)$. This yields our second hypothesis:

Hypothesis 2 ***Relationship quality and quantity, and loneliness***

Individuals with cultural backgrounds characterized by negative cognitive evaluations of their lives and feelings are, on average, more likely to feel lonely, regardless of the extent of social networks, frequency of social interactions, and degree of integration into social groups, ceteris paribus.

Finally, to analyze the relationship between culture, loneliness and health, we empirically validate the following hypothesis:

Hypothesis 3 ***Loneliness increases the likelihood of mental and physical health problems***

Increasing loneliness negatively affects mental and physical health-related outcomes and functional decline, ceteris paribus.

3.3 Empirical model

According to our hypotheses, the perception of relationship quality may have a direct influence on loneliness, which in turn affects individuals' mental and physical health. This chain mechanism can be analyzed by means of a two-stage estimation model. In the first stage, we estimate the relationship between parental cultural background and loneliness (Hypotheses 1 and 2). We choose restraint as our preferred cultural dimension as it is strongly associated with perceived quality of relations. In the second stage we quantify the causal effect of loneliness on health (Hypothesis 3). The empirical problem, therefore, consists in estimating the following causal relationship:

$$Health_{i,p,c} = \alpha + \beta L_i + \psi X_i + \rho FE_i + \eta_i, \tag{1}$$

where $Health_{i,p,c}$ is an indicator measuring mental or physical health of individual i with parental ancestry

p, born and currently residing in country c, L_i denotes a measure of the individual i's loneliness, X_i is a full set of individual level characteristics, and FE_i are the country of current residence and wave fixed effects.

In the first stage we empirically validate Hypothesis 1 by estimating the effects of parental cultural background and other covariates on loneliness:

$$L_i = \alpha + \pi_{i1} RES_i + \pi_{i2} X_i + \pi_{i3} FE_i + \zeta_i \tag{2}$$

where RES_i denotes the index of restraint of the parental country of origin. In order to verify Hypothesis 2, we separately estimate Equation 2 by adding the index of individualism associated to individual $i's$ parental country of origin, IND_i:

$$L_i = \alpha + \pi_{i1} RES_i + \pi_{i2} IND_i + \pi_{i3} X_i + \pi_{i4} FE_i + \zeta_i \tag{3}$$

Since we expect that more restraint cultural backgrounds increase the risk of loneliness, we anticipate coefficient π_{i1} to be positive. By plugging the first stage fitted values from Equation (2) in the second stage equation we obtain the reduced form model for health-related outcomes:

$$Health_{i,p,c} = \alpha + \beta \widehat{L_i} + \psi X_i + \gamma FE_i + error_i. \tag{4}$$

Since loneliness is expected to affect the incidence of mental and physical health problems, the empirical validation of Equation (4) should yield a positive coefficient of L. Given the particularities of our empirical strategy, in all model specifications robust standard errors are clustered both at the country of residence and the parental country of origin level.

For the two-stage empirical model (2) and (4) to work, the cultural marker we employ must satisfy two basic requirements: a) it must be correlated with the endogenous variable (instrument relevance), and b) it must be uncorrelated with the error term (independence). Moreover, the exclusion restriction requires that the level of restraint of the parental country of origin should not have any direct impact on individuals' health other than through its direct impact on loneliness. Despite the fact that the exclusion restriction cannot be directly tested and the literature lacks evidence of direct cultural effects on health outcomes, we provide some reassuring statistical evidence showing that RES_i has no direct impact on health, and that it

does not indirectly influence health through other factors, such as unhealthy behaviours (physical inactivity, smoking, drinking, and unhealthy dietary habits). In addition, we run an over-identification test, which provides further proof that the exclusion restriction is satisfied.

4 Data

The individual-level data employed in this study are drawn from the Survey of Health, Ageing and Retirement in Europe (SHARE, Börsch-Supan, 2008). SHARE is a multidisciplinary longitudinal survey on ageing which focuses on individuals aged 50+ and their spouses. The survey contains both the regular and retrospective waves (SHARELIFE). The regular rounds collect information on the individuals' current situation, such as health, working situation, social network/relations, accommodation, economic situation/assets, behavioural risks, and expectations. In addition, two survey rounds add retrospective information on multiple dimensions of the respondents' past (health, health care, accommodation, working career, household situation and performance at school during childhood, number of children, childbearing for women, emotional experiences in early life, relationship with parents, adverse childhood experiences, etc.). Our sample includes individuals who were interviewed in four consecutive waves, namely 5, 6, 7, and 8 (release 8.0.0), for which information on loneliness is available.[6] What makes SHARE data particularly suited for the purposes of our analysis is the availability of a rich set of information on individuals' physical and mental health conditions, as well as drug consumption. In addition, the retrospective component of the SHARE data allows to link the information on the respondents' current situation to the retrospective childhood/adulthood data. Below we describe the variables used in the analysis. Table C.1 (in Appendix C) reports summary statistics, while Table C.3 reports the list of countries included in the analysis.

Health outcomes

[6] We consider a pool of individuals in which respondents interviewed in more than one wave are treated as separate observations since loneliness and some other individual-specific characteristics may change from one wave to another. When considering the pooled sample of individuals, however, the number of observations increases. Thus, we perform a robustness check by only considering refreshers, *i.e.*, if the same individual appears in more than one wave, we only include in our sample the first recorded observation. Section 6 includes results using the sample of refreshers.

We consider six health indicators: EURO-D depression scale (Prince et al., 1999), which ranges from 1 (absence of depressive symptoms) to 12 (severe depressive symptoms);[7] number of limitations with activities of daily living (ADL); body mass index (BMI); number of chronic diseases, and self-assessed health (ranging from excellent to poor). In addition, we consider a set of binary variables referring to the consumption of drugs (medicines) for six health problems, namely anxiety, sleeping problems, cholesterol, diabetes, pain and high blood pressure. As for the ADL measure, the respondents are given a list of ten everyday activities and asked to declare whether they have any difficulty doing each of these activities excluding any difficulties that they expect to last less than three months. Similarly, for chronic diseases, the respondents are given a list with 21 different items and asked how many of them they have been diagnosed or for how many they are currently being treated for or bothered by. Together with the overall prevalence (intensity of occurrence) of chronic diseases, we also estimate separately the effect of loneliness on five different physical health-related factors, namely diabetes, high blood pressure, stomach or duodenal ulcer, and peptic ulcer, high blood cholesterol and stroke. The onset of these factors is captured by a set of binary variables.

Loneliness

To assess loneliness, a short three-item version (Hughes et al., 2004) of the Revised UCLA Loneliness scale (henceforth, R-UCLA) (Russell et al., 1978) was used. The exact wording of the items are: *How often do you feel isolated from others?*, *How often do you feel you lack companionship?*, *How often do you feel left out?*. In each case, the available responses are: *1. Often, 2, Some of the time, 3. Hardly ever or never.* A sum score was computed, therefore the scale ranges from 3 (not lonely) to 9 (very lonely). It has been shown that this tool has favorable psychometric characteristics (Hughes et al., 2004). A multi-item measure that does not mention loneliness directly can be particularly useful when dealing with particular population groups, such as older people. This is because older people are often reluctant to admit to loneliness (Qualter et al., 2021). Also, there is variation in how people understand the term "loneliness" and a multi-item

[7] The EURO-D depression scale consists of 12 elements connected to psychological health: depression, pessimism, willingness to die, guilt complexes, sleeping difficulties, lack of interests, irritability, lack of appetite, fatigue, lack of concentration, inability to take pleasure from normal activities and a tendency to cry. Each item is of equal weighting and is reported with a 0 if the symptom is absent and a 1 when it is present.

measure that does not mention loneliness directly can help to alleviate these concerns.

In addition to a multi-item measure of loneliness, we also consider a direct explicit measure on how often the respondent feels lonely. The question is as follows: *How often do you feel lonely?*. The available response categories are: *1. Often; 2. Some of the time, and 3. Hardly ever or never*. We define the individual as "lonely" if s/he answers "1. Often" or "2. Some of the time".

Other controls

As for the other individual-level characteristics, we consider a rich set of demographic and socio-economic information. Among demographics, we include age, gender, marital status, number of children, and whether a respondent lives alone in the household. Marital status is dichotomized into a binary variable, assigning value 1 if the respondent is legally married, or in a legally registered civil union, and 0 corresponds to separated, divorced or never married. Socio-economic variables include the highest educational attainment and occupational status. In addition, we control for the highest level of parental educational attainment (whether either one or both parents hold a tertiary degree). Finally, to account for the household financial situation, we include the household net worth (assets) and total expenditure (in deciles).[8]

Retrospective data allows us to consider a set of childhood circumstances. We control for a specific set of early-life conditions called "Adverse Childhood Circumstances". According to the adult attachment theory proposed by Hazan and Shaver (1987), early experiences in attachment relationships are likely to influence adult attachment styles and general perception of social relations. The authors suggest that individuals with secure attachments early in life tend to be more positive about themselves and their relationships than their peers with insecure early-life attachments. In order to control for these condition we rely on the retrospective SHARELIFE component of the survey which asks respondents to report information on exposure to child neglect and childhood physical abuse, either from mother, father or third parties. More precisely, we consider the following item capturing the quality of the child-parent relationship: *How would you rate the relationship with your mother/your father (or the woman/man that raised you)? 1. Excellent 2. Very good 3. Good*

[8]We also considered total household income as an alternative to household expenditure and net assets. The results do not change significantly.

4. Fair 5. Poor. The relationship with mother/father in childhood is rated as problematic/negative, if the respondent answers "4. Fair" or "5. Poor". As a sensitivity check, we consider an additional set of childhood circumstances including physical abuse during childhood, absence of a parent, and the respondents' health status when they were 15 years old.[9] In addition, we check whether the inclusion of the frequency of contact with children resizes the effect of loneliness. Finally, we also control for genetic and linguistic distances between country of residence and parental country of origin. As shown by Becker et al. (2020), these measures significantly correlate with differences in preferences such as risk aversion, altruism, positive and negative reciprocity, patience and trust, with the effects being particularly pronounced for prosocial traits. Linguistic distances measure the degree to which two countries' languages differ from each other (Fearon, 2003). Genetic distances, on the other hand, quantify the expected genetic distance between two randomly drawn individuals, one from each country, according to the contemporary composition of the population (Spolaore and Wacziarg, 2009, 2018). We use the composite measure of ancestral or temporal distance that is computed as the unweighted average of the standardized values (z-scores) of linguistic and genetic distances.

5 Results

Cultural heritage, relationship quality and loneliness

Table 1 reports the coefficients from a linear model in which the individual's self-declared loneliness is regressed on their parental cultural backgrounds (approximated with the indices of restraint and/or individualism) and the full set of covariates (see Equation 2 and 3). Together with the standard definition of second-generation immigrants, *i.e.*, natives with either one or both foreign-born parents (columns 1 and 2), we also consider two alternative definitions, namely, native individuals with a foreign-born mother and a native or foreign-born father (columns 3 and 4), and those with a foreign-born father and a native or foreign-born mother. (columns 5 and 6).[10] The results do not change significantly even when we restrict our

[9] Physical harm and lack of understanding are addressed by the following questions: *How often did your mother/your father push, grab, shove, throw something at you, slap or hit you? 1. Often 2. Sometimes 3. Rarely 4. Never*, and *How much did your mother/your father (or the woman/man that raised you) understand your problems and worries? 1. A lot 2. Some 3. A little 4. Not at all.*

[10] Even though second-generation immigrants (approximately 10% of the sample) were born and raised in the same economic

sample to individuals with foreign-born mothers and native fathers, and/or with foreign-born fathers and native mothers. We do not report the results for the subset of immigrants with both foreign-born parents only because the sample coverage was not sufficient to produce reliable estimates.

The results strongly support Hypotheses 1 and 2. Indeed, the coefficients of parental restraint confirm that cultural backgrounds with a stronger tendency to evaluate negatively the quality of actual social relationships positively affect the risk of loneliness. This is true independently of the variety of connections or the extent of social networks as approximated by the index of individualism (column [2], [4] and [6]). Interestingly, only the mother's cultural heritage shows a significant impact, indicating that parents' cultural origins have unequal effects on shaping children's attitudes in the process of socialization and perception of the quality of their social relationships (column 3 and 4 *vis*-á-*vis* column 5 and 6). This is in line with the existing empirical evidence on inter-generational transmission of attitudes and behavior (Fernández et al., 2004, Cipriani et al., 2013, Dohmen et al., 2012, Farré and Vella, 2013, Dohmen et al., 2011, Sgroi et al., 2020, among others).

In light of this empirical evidence, we believe that the degree of restraint associated with maternal country of origin represents a suitable instrument for loneliness in our model of health.

and institutional environment as native individuals, they may still be of feel "marginalised" compared to their peers because of their parental foreign origin and/or because they belong to ethnic enclaves (minorities), which may affect the risk of loneliness (Madsen et al., 2016). Figure B.2 (in Appendix B) shows the incidence of loneliness (measured on the R-UCLA scale) among natives and second-generation migrants. The difference in means of loneliness between second-generation immigrants and the rest of the population is not statistically different from 0, which alleviates potential concerns related to the representativity of our sample. The t-test statistic is -1.0470 with a corresponding two-tailed p-value $0.2951 > 0.05$. Furthermore, according to the Kolmogorov-Smirnov test, the null hypothesis of equal distribution of loneliness between second-generation immigrants and the rest of the sample cannot be rejected ($p = 0.315$).

Table 1: The effect of parental restraint on loneliness. SG immigrants (either one or both parents born abroad; foreign-born mothers; foreign-born fathers).

Variable	Either or both	Either or both	Foreign Mother	Foreign Mother	Foreign Father	Foreign Father
Restraint_Mother	0.005***	0.004***	0.006***	0.005***		
	(0.001)	(0.001)	(0.002)	(0.002)		
Restraint_Father	-0.000	-0.001			0.001	0.001
	(0.002)	(0.002)			(0.001)	(0.001)
Individualism_Mother		-0.001		-0.001		
		(0.002)		(0.002)		
Individualism_Father		0.001				-0.001***
		(0.002)				(0.000)
Age	0.002	0.000	0.002	0.000	0.000	-0.001
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Female	0.045	0.026	-0.010	-0.026	0.096**	0.090*
	(0.040)	(0.050)	(0.060)	(0.074)	(0.047)	(0.050)
Low Education	0.146**	0.105*	0.199***	0.175**	0.143***	0.101**
	(0.058)	(0.055)	(0.071)	(0.069)	(0.053)	(0.050)
High Education	-0.079	-0.076	-0.027	-0.024	-0.115	-0.108
	(0.057)	(0.060)	(0.058)	(0.055)	(0.093)	(0.097)
Retired	-0.067	-0.070	-0.143*	-0.127	-0.145	-0.134
	(0.084)	(0.068)	(0.083)	(0.096)	(0.129)	(0.142)
Unemployed	0.071	0.046	0.066	0.048	-0.021	-0.053
	(0.117)	(0.144)	(0.111)	(0.152)	(0.134)	(0.178)
Disabled	0.578***	0.574***	0.436***	0.483***	0.491***	0.493***
	(0.129)	(0.138)	(0.038)	(0.033)	(0.133)	(0.157)
Employed	-0.277***	-0.304***	-0.409***	-0.416***	-0.368***	-0.388***
	(0.104)	(0.082)	(0.124)	(0.126)	(0.123)	(0.126)
Married	-0.200***	-0.188**	-0.270***	-0.313***	-0.193***	-0.154*
	(0.071)	(0.089)	(0.095)	(0.107)	(0.066)	(0.082)
Divorced	-0.114	-0.098	-0.131	-0.184	-0.172**	-0.148
	(0.105)	(0.142)	(0.130)	(0.157)	(0.083)	(0.117)
Widowed	-0.113	-0.102	-0.100	-0.110	-0.189	-0.154
	(0.146)	(0.163)	(0.203)	(0.221)	(0.158)	(0.177)
Number of children	-0.035**	-0.041**	-0.044***	-0.053***	-0.054**	-0.067***
	(0.016)	(0.016)	(0.010)	(0.013)	(0.025)	(0.024)
Live alone	0.407***	0.413***	0.343***	0.311***	0.497***	0.520***
	(0.107)	(0.086)	(0.113)	(0.103)	(0.154)	(0.121)
Education parents (tertiary)	-0.085	-0.076	-0.084	-0.073	-0.122	-0.092
	(0.102)	(0.099)	(0.120)	(0.119)	(0.112)	(0.110)
Relationship parents (adverse)	0.120**	0.120**	0.125*	0.122*	0.107**	0.111**
	(0.048)	(0.057)	(0.066)	(0.073)	(0.048)	(0.051)
Absent parent	0.106*	0.060	0.137*	0.118	0.091	0.037
	(0.056)	(0.060)	(0.074)	(0.083)	(0.073)	(0.077)
HH net wealth	-0.058***	-0.059***	-0.058***	-0.063***	-0.054***	-0.057***
	(0.008)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)
HH expenditure	0.007	0.003	-0.001	-0.003	0.002	-0.004
	(0.014)	(0.012)	(0.015)	(0.014)	(0.018)	(0.017)
Additional controls:						
Country of residence	Yes	Yes	Yes	Yes	Yes	Yes
Year (SHARE wave)	Yes	Yes	Yes	Yes	Yes	Yes
N. Observations	4395	3956	3315	3022	2944	2604

Notes: *The table reports the coefficients of linear estimations (OLS). Robust standard errors are clustered at the country of residence and parental country of origin level. "Foreign Mother" indicates individuals with foreign-born mothers (and native or foreign-born fathers). "Foreign Father" indicates individuals with foreign-born fathers (and native or foreign-born mothers). Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Loneliness and health

Table 2 reports the coefficients from a two-stage model where self-reported loneliness has been instrumented with the maternal country of origin's degree of restraint.[11] According to the Stock and Yogo (2005)

[11] Our baseline specification considers second-generation immigrants defined as native individuals with one or both foreign-

rule of thumb, the F-statistic (F-test=24.04) confirms the strength of our instrument (shown at the bottom of column 1). Since it is not possible to directly test the exogeneity of the instrument, we cannot exclude *a-priori* that maternal culture may directly influence health or that its effect may impact health through some other factors, such as unhealthy behaviours. Table C.4 (in Appendix C) shows the effects of the maternal restraint on a wide range of health outcomes and four indicators of unhealthy behaviour for lonely and non-lonely individuals (as measured by R-UCLA scale).[12] Estimates suggest that there is no direct association between the restraint indicator and health, and unhealthy behaviour. The only exception is EURO-D (and the probability of practicing vigorous sports), where the effect of maternal restraint is statistically significant, but only among lonely individuals. While the lack of a direct link between maternal restraint and health does not imply that the exclusion restriction is satisfied, this finding may be viewed as reassuring, suggesting that the effect of maternal cultural background influences health only indirectly through loneliness. Moreover, when instrumenting loneliness with both the maternal and paternal restraint, the Sargan test statistic (0.91) confirms that the over-identification restrictions are valid.[13]

In line with the results from Table 1, the first stage coefficients in Table 2 (column 1) suggest that loneliness is particularly pronounced for individuals living alone and among those with disabilities. Similarly, adverse early life conditions such as the absence of a parent or a low-quality parent-child relationship correlate positively with loneliness. Meanwhile, wealthier, married, and/or employed individuals with more kids feel less lonely.[14] These findings are in line with previous research (Beutel et al., 2017; ; Soest et al., 2018; Hajek and König, 2020).

The results from the second-stage (columns 2-6) suggest that loneliness directly increases the probability of depression (Eurod), functional decline (Adl), and high body mass index (Bmi). More specifically, a gradual increase in loneliness causes a 1.81 point increase in the intensity of depressive symptoms as measured by the

born parents. The maternal restraint for individuals with foreign-born fathers and native mothers is identical to their country of birth restraint score. The results, however, are robust to the exclusion of these individuals, *i.e.,* when we focus only on second-generation immigrants with foreign-born mothers (Table C.7, in Appendix C).

[12] Individuals scoring 0 on the R-UCLA scale are considered as "non-lonely"; individuals scoring R-UCLA>0 are defined as "lonely").

[13] This additional evidence is available upon request.

[14] The interpretation of the association between loneliness and emotional experiences such as the parent-child relationship requires caution since it may be subject to recall bias and "colouring". However, by assessing the internal and external consistency of the measures of childhood socio-economic status and health, Havari and Mazzonna (2015) found that overall respondents seem to remember fairly well their childhood conditions.

EURO-D scale (ranging from 0 to 12), 0.45 more limitations in daily activities, and a 4.5 point increase in the body mass index.[15] Finally, loneliness does not significantly influence the incidence of chronic conditions or the perception of general health. This result is in line with Bekhet and Zauszniewski (2012) who finds no association between loneliness and physical health indicators (number of chronic conditions and functional status), but contradicts Richard et al. (2017) and Jessen et al. (2017) who report a significantly higher likelihood of self-reported chronic diseases and impaired health conditions in lonely individuals. On the other hand, evidence for a negative effect of loneliness on reductions in daily activities appears to be well established (Buchman et al., 2010; Perissinotto et al., 2012).[16]

When considering physical health-related factors separately (Table 3) we see that loneliness increases the probability of diabetes by 6% and high blood pressure by 12%.[17] This is in line with Richard et al. (2017) although the estimated effect of loneliness here is much lower.

It is worth noting that the effect of instrumented loneliness is 3.5 times larger in magnitude than the non-instrumented one for depressive symptoms, 2.5 for suicidal intentions, and 6.4 times larger for functional decline, which confirms the presence of a strong reverse causality between loneliness and health. In addition to health outcomes, loneliness significantly affects the prevalence of drug use for sleeping problems, anxiety, pain, and high blood pressure (Table 4). Being lonely increases the probability of medication for high blood pressure by 14%, for anxiety by 3.3% , for pain by 8.4% and for sleeping problems by 4.5%. The effect of loneliness on major depressive disorder and anxiety is in line with the evidence from cross-sectional studies (Domènech-Abella et al. (2018), Jeuring et al. (2018)).

[15] Table C.5 (in Appendix C) reports results for each of the 12 components of the EURO-D measure. It shows that the baseline results of Table 4 (column 2) is driven by the following elements: willingness to die (column 3), lack of interest (column 5), lack of concentration (column 9), inability to take pleasure from normal activities (column 10) and tendency to cry (column 11).

[16] The results do not change significantly when we limit our sample to only refreshers, *i.e.*, when considering only the first recorded observation of individuals appearing in more than one wave (see Table C.6, in Appendix C). We also performed the estimation on native individuals with both parents born in a country different from the respondent's country of birth and residence. Nevertheless, the size of the sample drops significantly, which makes the interpretation of the results difficult.

[17] In this case the dependent variables are all binary, *i.e.*, they equal 1 if an individual suffers from a specific health problem, and 0 otherwise. A consistent estimation of the direct effects of loneliness on binary health outcomes requires a non-linear IV estimation technique, such as a recursive bivariate probit model, in which both the dependent and the endogenous variable are binary. For this purpose, we dichotomize loneliness as measured on the R-UCLA such that individuals scoring 0 on the R-UCLA scale are considered as "non-lonely", and those scoring R-UCLA>0 are defined as "lonely".

Table 2: The effect of loneliness on health. Baseline specification. SG immigrants (either one or both parents born abroad).

Variable	1ST **Loneliness**	2ND **Eurod**	2ND **Adl**	2ND **Bmi**	2ND **Chronic**	2ND **SAH**
Restraint_Mother	0.005***					
	(0.001)					
Loneliness (R-UCLA)		1.806***	0.449***	4.475*	0.039	0.220
		(0.481)	(0.098)	(2.449)	(0.506)	(0.379)
Age	0.003	0.001	0.004	-0.059***	0.037***	0.016***
	(0.002)	(0.008)	(0.003)	(0.019)	(0.004)	(0.002)
Female	0.060	0.586***	-0.008	-0.563	0.021	-0.023
	(0.041)	(0.015)	(0.017)	(0.419)	(0.098)	(0.045)
Low Education	0.152***	0.076	0.014	0.076	0.254***	0.176***
	(0.058)	(0.189)	(0.056)	(0.632)	(0.089)	(0.067)
High Education	-0.085*	-0.006	0.004	0.124	-0.117	-0.178***
	(0.051)	(0.169)	(0.030)	(0.382)	(0.096)	(0.067)
Retired	-0.074	0.173	0.032	0.829	-0.007	0.023
	(0.077)	(0.198)	(0.071)	(0.622)	(0.085)	(0.063)
Unemployed	0.057	0.317	-0.061	-1.441	-0.214	0.092
	(0.114)	(0.314)	(0.085)	(0.973)	(0.134)	(0.075)
Disabled	0.576***	0.549	0.218**	-2.518*	1.254***	0.778***
	(0.118)	(0.342)	(0.099)	(1.481)	(0.324)	(0.226)
Employed	-0.282***	0.301	0.077	0.725	-0.303**	-0.135
	(0.104)	(0.266)	(0.075)	(0.931)	(0.128)	(0.130)
Married	-0.222***	0.346	0.104	0.125	-0.126	-0.072
	(0.076)	(0.266)	(0.090)	(1.031)	(0.147)	(0.076)
Divorced	-0.138	0.451**	0.124	-0.081	0.050	0.016
	(0.114)	(0.176)	(0.089)	(0.866)	(0.116)	(0.072)
Widowed	-0.154	0.361	0.170**	0.639	0.137	0.037
	(0.150)	(0.262)	(0.073)	(1.031)	(0.102)	(0.078)
Number of children	-0.031***	0.054	0.017	0.222**	-0.032	-0.013
	(0.011)	(0.044)	(0.011)	(0.094)	(0.025)	(0.015)
Live alone	0.419***	-0.705***	-0.223***	-2.624***	-0.233	-0.206
	(0.100)	(0.154)	(0.065)	(0.987)	(0.242)	(0.188)
Education parents (tertiary)	-0.097	0.190	0.031	-0.759	-0.048	-0.070
	(0.100)	(0.127)	(0.041)	(0.535)	(0.051)	(0.059)
Relationship parents (adverse)	0.116**	0.002	-0.080***	-0.651*	-0.066	-0.022
	(0.049)	(0.043)	(0.014)	(0.346)	(0.078)	(0.049)
Absent parent	0.154**	-0.049	-0.045	-0.062	0.166*	-0.040
	(0.063)	(0.172)	(0.040)	(0.600)	(0.093)	(0.060)
HH net wealth	-0.052***	0.038	0.009	0.166	-0.047	-0.042*
	(0.009)	(0.026)	(0.007)	(0.120)	(0.032)	(0.023)
HH expenditures	0.007	-0.000	0.002	-0.064	0.014**	-0.003
	(0.014)	(0.026)	(0.006)	(0.074)	(0.006)	(0.005)
Loneliness (R-UCLA)		0.516***	0.073***	0.047	0.099***	0.101***
NO instruments		(0.066)	(0.017)	(0.081)	(0.023)	(0.017)
Additional controls:						
Country of residence	Yes	Yes	Yes	Yes	Yes	Yes
Year (SHARE wave)	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	24.04	—	—	—	—	—
1st stage p-value	0.0002	—	—	—	—	—
N. Observations	4579	4579	4579	4579	4579	4579

Notes: *The table reports the coefficients of two-stage linear estimations. Robust standard errors are clustered at the country of residence and parental country of origin level. Abbreviations: 1ST - first stage estimates; 2ND - second stage estimates; SAH - self-assessed health. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: The effect of loneliness on physical health: single outcomes. SG immigrants (either one or both parents born abroad).

Variable	2ND **Chol.**	2ND **Diabetes**	2ND **Pressure**	2ND **Ulcer**	2ND **Stroke**
Lonely (dich. UCLA)	-0.183***	0.060***	0.117***	-0.011	0.019*
	(0.023)	(0.016)	(0.032)	(0.021)	(0.010)
Age	0.002**	0.000	0.003***	-0.000	0.000*
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Female	0.012	-0.010***	-0.007	-0.005	-0.003*
	(0.009)	(0.004)	(0.007)	(0.004)	(0.002)
Low Education	0.036**	0.009*	0.027**	0.006	0.007**
	(0.015)	(0.005)	(0.013)	(0.005)	(0.003)
High Education	-0.023**	-0.003	-0.014*	-0.008*	0.001
	(0.010)	(0.004)	(0.008)	(0.005)	(0.002)
Retired	-0.014	0.001	0.001	0.007	0.002
	(0.019)	(0.007)	(0.011)	(0.009)	(0.004)
Unemployed	-0.028	-0.016	-0.018	-0.006	-0.005
	(0.034)	(0.011)	(0.018)	(0.013)	(0.007)
Disabled	0.101***	0.017*	0.060***	0.032**	0.015***
	(0.029)	(0.010)	(0.020)	(0.015)	(0.006)
Employed	-0.077***	-0.020***	-0.031**	-0.014	-0.006
	(0.020)	(0.008)	(0.016)	(0.012)	(0.004)
Married	-0.037*	-0.015*	-0.026*	-0.018*	-0.001
	(0.022)	(0.008)	(0.013)	(0.011)	(0.005)
Divorced	-0.014	-0.016*	-0.015	0.003	0.004
	(0.025)	(0.008)	(0.012)	(0.009)	(0.004)
Widowed	-0.004	-0.004	-0.003	0.012	-0.000
	(0.024)	(0.008)	(0.014)	(0.008)	(0.004)
Number of children	-0.009**	-0.003**	-0.005**	-0.001	0.000
	(0.004)	(0.001)	(0.003)	(0.001)	(0.001)
Live alone	0.039*	0.002	0.027*	-0.017***	-0.000
	(0.021)	(0.006)	(0.016)	(0.006)	(0.003)
Education parents (tertiary)	-0.029*	-0.010*	-0.026**	-0.001	-0.000
	(0.017)	(0.006)	(0.011)	(0.006)	(0.003)
Relationship parents (adverse)	0.026**	0.004	0.008	0.002	0.001
	(0.012)	(0.003)	(0.008)	(0.003)	(0.002)
Absent parent	0.033*	0.015**	0.022**	0.011**	0.004
	(0.018)	(0.007)	(0.009)	(0.005)	(0.004)
HH net wealth	-0.006**	-0.004***	-0.004***	-0.003**	-0.001
	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)
HH expenditure	0.002	-0.000	-0.000	0.000	0.001
	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)
Additional controls:					
Country of residence	Yes	Yes	Yes	Yes	Yes
Year (SHARE wave)	Yes	Yes	Yes	Yes	Yes
1st stage F	10.10	—	—	—	—
1st stage p-value	0.0058	—	—	—	—
N. Observations	4575	4575	4575	4575	4575

Notes: *The table reports the average marginal effects of bivariate probit estimations. Robust standard errors are clustered at the country of residence and parental country of origin level. Abbreviations: 1ST - first stage estimates; 2ND - second stage estimates. Lonely (dich. UCLA) is the dichotimized version of the R-UCLA loneliness scale. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: The effect of loneliness on drug consumption. SG immigrants (either one or both parents born abroad).

Variable	1ST **Loneliness**	2ND **Sleeping**	2ND **Chol.**	2ND **Anxiety**	2ND **Pain**	2ND **Diabetes**	2ND **Pressure**
Restraint_Mother	0.002***						
	(0.001)						
Lonely (dich. UCLA)		0.048***	0.071*	0.033*	0.084***	0.058***	0.138***
		(0.014)	(0.038)	(0.017)	(0.015)	(0.017)	(0.023)
Age	0.001	0.001***	0.002***	-0.000	0.000*	0.001**	0.003***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
Female	0.009	0.016***	-0.007	0.023***	0.015***	-0.010***	-0.006
	(0.020)	(0.003)	(0.006)	(0.007)	(0.005)	(0.003)	(0.007)
Low Education	0.046**	0.013***	0.020**	0.018**	0.018***	0.006	0.030**
	(0.021)	(0.004)	(0.010)	(0.007)	(0.004)	(0.004)	(0.013)
High Education	-0.025*	-0.004	-0.003	0.005	-0.004	-0.003	-0.013*
	(0.015)	(0.003)	(0.005)	(0.004)	(0.003)	(0.004)	(0.007)
Retired	-0.013	0.003	0.004	0.002	-0.002	-0.003	-0.003
	(0.010)	(0.006)	(0.009)	(0.007)	(0.006)	(0.006)	(0.010)
Unemployed	-0.031	0.011	0.007	0.008	-0.014	-0.013	-0.013
	(0.042)	(0.010)	(0.015)	(0.011)	(0.011)	(0.009)	(0.017)
Disabled	0.135***	0.044***	0.053**	0.062***	0.034***	0.007	0.048***
	(0.034)	(0.007)	(0.023)	(0.015)	(0.008)	(0.008)	(0.016)
Employed	-0.094***	-0.005	-0.029**	-0.015*	-0.020***	-0.021***	-0.032**
	(0.025)	(0.006)	(0.013)	(0.008)	(0.006)	(0.007)	(0.013)
Married	-0.086***	0.006	-0.012	-0.001	0.004	-0.014**	-0.025*
	(0.019)	(0.006)	(0.012)	(0.008)	(0.007)	(0.007)	(0.013)
Divorced	-0.079***	0.006	-0.001	-0.000	0.002	-0.012*	-0.015
	(0.030)	(0.006)	(0.012)	(0.008)	(0.007)	(0.007)	(0.012)
Widowed	-0.046	0.005	0.003	-0.001	0.010	-0.006	0.001
	(0.041)	(0.008)	(0.012)	(0.009)	(0.007)	(0.007)	(0.013)
Number of children	-0.012*	-0.002	-0.004*	-0.005***	0.000	-0.002*	-0.006***
	(0.006)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
Lives alone	0.126***	0.014**	0.005	0.014*	0.009*	0.002	0.016
	(0.033)	(0.006)	(0.008)	(0.008)	(0.005)	(0.006)	(0.013)
Education parents (tertiary)	-0.042	-0.001	-0.017**	-0.002	-0.007	-0.011**	-0.025***
	(0.032)	(0.005)	(0.008)	(0.007)	(0.007)	(0.005)	(0.009)
relationship parents (adverse)	0.062***	0.007*	0.000	0.012**	0.004	0.004	0.011
	(0.016)	(0.004)	(0.005)	(0.005)	(0.004)	(0.003)	(0.008)
Absent parent	0.057	0.006	0.016*	-0.000	0.008**	0.014***	0.014
	(0.035)	(0.004)	(0.009)	(0.005)	(0.004)	(0.005)	(0.008)
HH net wealth	-0.013***	-0.001	-0.000	-0.002**	-0.003***	-0.003***	-0.003**
	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
HH expenditure	0.002	0.000	0.001	-0.000	0.001	-0.000	0.000
	(0.004)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Additional controls:							
Country of residence	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year (SHARE wave)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	10.15	—	—	—	—	—	—
1st stage p-value	0.0057	—	—	—	—	—	—
N. Observations	4576	4576	4576	4576	4576	4576	4576

Notes: *The table reports the average marginal effects of bivariate probit estimations. Robust standard errors are clustered at the country of residence and parental country of origin level. Abbreviations: 1ST - first stage estimates; 2ND - second stage estimates. Lonely (dich. UCLA) is the dichotimized version of the R-UCLA loneliness scale. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

6 Extensions and sensitivity analysis

In this section, we test the robustness of the results from our baseline specification. We first investigate one possible pathway by which some specific ancestral factors may have influenced the formation of cultural traits associated with a higher level of restraint in the modern era, and then we assess the predictive power

of these historical proxies in explaining the effects of loneliness on health. Second, we perform several sensitivity tests on the baseline specification from Table 2, including: i) direct question on loneliness; ii) inclusion of additional adverse childhood conditions and health status early in life; iii) control for the frequency of contact with children (for a sub-set of individuals with offspring); and iv) inclusion of genetic and linguistic distances between the respondents' country of birth and parental country of origin as strong correlates with prosocial traits (Falk et al., 2018; Becker et al., 2020). Finally, we show that our baseline results are robust to alternative definitions of our sample. These additional factors may represent important correlates of loneliness and health outcomes later in life.

Restraint, loneliness and health in a historical perspective

As in the case of most social traits, there may be plenty of factors that have contributed to the formation of cultural characteristics. In order to strengthen the previous findings, we test one possible channel through which some specific ancestral factors may have influenced the emergence of predominant cultural characteristics and their transmission across generations. Hofstede et al. (2010) and Minkov (2009) suggest that the origins of observed differences in restraint across countries may be rooted in the pre-industrial intensity of agricultural production. Highly intensive agricultural systems were characterized by hard work, alternation of food abundance and starvation, conflicts for the territory, and exploitation. Moreover, high intensity of production required restrained discipline, adequate planning, and savings for the future (Hofstede et al., 2010). Higher exposure of ancestral populations to these factors in the pre-industrial era may have triggered adaptation and learning processes that have gradually increased the persistence of traits related to stronger discipline and stricter social norms in the population.

Table 5 shows the relationship between agricultural potential during the pre-1500 period and crop expansion associated with "Columbian Exchange" (the expansion of suitable crops for cultivation in the post-1500 period), and restraint, taking into account continental fixed effects and other climatic conditions that may have influenced agricultural productivity. The findings back up Minkov (2009)'s intuition. Increased degrees of restriction are closely linked to higher crop yield potential in the pre-1500 period. A one-standard-

deviation rise in agricultural yield potential corresponds to a 5.67-point increase in restraint (column 3). After controlling for the expansion of crops accessible for cultivation in the post-1500CE period, the effect of crop yield is reduced, but it is still significant at the 10% significance level.

We also account for past population density and urbanization, which may have been influenced positively by higher crop yield potential and, as a result, had a direct impact on the degree of restraint. In this way, we are able to separate the effect of potential crop yield from the long-term effect of the other historical traits. Even after controlling for urbanization and population density, the effect of historical yield remains statistically significant.

Table 5: The effect of ancestral agricultural and climatic conditions on the degree of restraint.

Variable	**Yield**	**Yield**	**Yield**	**Yield,CE**	**Yield,CE**
Crop Yield (Anc., pre-1500)	2.678**	3.348**	5.672***	2.639*	3.829*
	(1.337)	(1.389)	(1.543)	(1.354)	(2.090)
Crop Growth Cycle (Anc., pre-1500)	-0.139	-0.065	-0.614***	0.027	-0.289
	(0.121)	(0.130)	(0.220)	(0.117)	(0.322)
Crop Yield Change (post-1500)				-4.917	-4.679
				(3.590)	(4.413)
Crop Growth Cycle Change (post-1500)				5.210*	7.518**
				(2.899)	(3.157)
Absolute Latitude	-11.864	-7.480	-10.284	-7.864	-9.063
	(7.492)	(7.742)	(8.309)	(7.253)	(7.855)
Neolithic Transition Timing	-0.218	1.302	1.943	-0.149	-1.933
	(4.188)	(4.215)	(5.581)	(3.421)	(5.352)
Mean Elevation	2.733	1.509	-4.191	-0.205	-2.971
	(3.016)	(3.204)	(5.864)	(2.677)	(5.518)
Terrain Roughness	-4.350	-2.664	0.948	-1.949	0.458
	(2.995)	(2.796)	(3.470)	(2.716)	(3.053)
Pct. Land in Tropics	-5.683	-5.968	-3.132	-5.718	-1.539
	(4.401)	(4.561)	(5.658)	(4.275)	(5.248)
Precipitation	-5.749	-4.222	-8.539	-5.079	-8.453*
	(5.149)	(5.056)	(5.193)	(4.316)	(4.647)
Population density in 1500 CE		-0.492**		-0.552***	
		(0.191)		(0.160)	
Urbanization rate in 1500 CE			-0.630		-0.802*
			(0.473)		(0.461)
R2	0.449	0.490	0.547	0.532	0.585
N. Observations	88	88	64	88	64

Notes: *The results are based on data from Galor and Özak (2016) and Hofstede et al. (2010). Robust standard errors are clustered at the country of level. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The negative and economically significant effects of urbanization and population density may be attributed to the fact that highly intensive agricultural societies were characterized by extended families and village communities, whereas in more urbanized societies, the predominant family structure was nuclear (Hofstede et al., 2010). Finally, the predicted power of ancestral agricultural potential is further confirmed

in Table 6, where we regress loneliness on the predicted restraint from Table 5 (column 5). In line with the results from Table 1, only the mother's cultural background shows a significant impact on loneliness. Finally, the findings in Table 7 show that culture, even when approximated by historical agro-climatic conditions, is a good instrument for loneliness. The effects of loneliness on mental health, functional decline, and BMI, are very similar to those reported in Table 2 for the baseline specification.

Table 6: The effect of parental restraint on loneliness. SG immigrants (either one or both parents born abroad; foreign-born mother; foreign-born father).

Variable	**Either or both**	**Either or both**	**Either or both**	**Foreign Mother**	**Foreign Father**
Restraint_Mother (fitted)	0.008***		0.009***	0.009**	
	(0.003)		(0.003)	(0.003)	
Restraint_Father (fitted)		0.002	-0.000		0.002
		(0.003)	(0.004)		(0.003)
Full set of v. Table 2	Yes	Yes	Yes	Yes	Yes
Additional controls:					
Country of residence	Yes	Yes	Yes	Yes	Yes
Year (SHARE wave)	Yes	Yes	Yes	Yes	Yes
N. Observations	4402	4202	4030	3151	2758

Notes: *The table reports the coefficients of linear estimations (OLS). Robust standard errors are clustered at the country of residence and parental country of origin level. "Foreign Mother" indicates individuals with foreign-born mothers (and native or foreign-born fathers). "Foreign Father" indicates individuals with foreign-born fathers (and native or foreign-born mothers). Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: The effect of loneliness on health. Baseline specification. SG immigrants (either one or both parents born abroad).

Variable	1ST **Loneliness**	2ND **Eurod**	2ND **Adl**	2ND **Bmi**	2ND **Chronic**	2ND **SAH**
Fitted values	0.008***					
	(0.003)					
Loneliness (R-UCLA)		1.893***	0.412*	4.957*	0.285	0.474
		(0.705)	(0.218)	(2.892)	(0.565)	(0.407)
Additional controls:						
Country of residence	Yes	Yes	Yes	Yes	Yes	Yes
Year (SHARE wave)	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	9.40	—	—	—	—	—
1st stage p-value	0.0074	—	—	—	—	—
N. Observations	4402	4402	4402	4402	4402	4402

Notes: *The table reports the coefficients of two-stage linear estimations. Abbreviations: 1ST - first stage estimates; 2ND - second stage estimates. Robust standard errors are clustered at the country of residence and parental country of origin level. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Additional sensitivity checks

Tables 8 to 11 report a battery of additional robustness checks for our baseline specification of Table 2.

The evidence in Table 8 confirms the strength of parental restraint even when the individuals are directly asked whether and how often they feel lonely. In line with the previous findings, the effect of loneliness is significant for mental health, functional decline, and body mass index. Being lonely translates into a 9.2 unit increase in depression and 2.2 more limitations in daily activities, and increases the body mass index by 23.8 points.

Table 8: The effect of loneliness on health. SG immigrants (either one or both parents born abroad), direct question on loneliness.

Variable	1ST **Loneliness**	2ND **Eurod**	2ND **Adl**	2ND **Bmi**	2ND **Chronic**	2ND **SAH**
Restraint_mother	0.001***					
	(0.000)					
Lonely (direct question)		9.157***	2.198***	23.785*	0.541	1.333
		(2.234)	(0.504)	(13.352)	(2.740)	(2.029)
N. Observations	4699	4699	4699	4699	4699	4699
Full set of v. Table 2	Yes	Yes	Yes	Yes	Yes	Yes
Country of residence	Yes	Yes	Yes	Yes	Yes	Yes
Year (SHARE wave)	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	59.44	—	—	—	—	—
1st stage p-value	0.0056	—	—	—	—	—

Notes: *The table reports the coefficients of two-stage linear estimations. Abbreviations: 1ST - first stage estimates; 2ND - second stage estimates. Robust standard errors are clustered at the country of residence and parental country of origin level. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Similarly, the inclusion of an additional adverse childhood condition (harm from parents) and health conditions in early life does not alter the effect of loneliness (Table 9).

Table 9: The effect of loneliness on health. SG immigrants (either one or both parents born abroad), additional adverse childhood conditions and health status during childhood

Variable	1ST **Loneliness**	2ND **Eurod**	2ND **Adl**	2ND **Bmi**	2ND **Chronic**	2ND **SAH**
Restraint_Mother	0.005***					
	(0.001)					
Loneliness (R-UCLA)		1.765***	0.487***	5.330*	-0.146	0.224
		(0.663)	(0.139)	(2.994)	(0.480)	(0.422)
Relationship parents (adverse)	0.058	-0.011	-0.088***	-0.431	-0.131**	-0.036
	(0.050)	(0.046)	(0.013)	(0.329)	(0.059)	(0.036)
Harm from parents	0.098*	-0.068	-0.023	-0.441	0.131	-0.039
	(0.056)	(0.114)	(0.021)	(0.451)	(0.081)	(0.064)
Harm from third parties	0.252***	-0.214	-0.058	-1.264	0.153	-0.034
	(0.053)	(0.266)	(0.059)	(0.960)	(0.269)	(0.167)
Understanding parents (lack of)	0.161***	0.111	-0.013	-0.887*	0.172**	0.017
	(0.050)	(0.161)	(0.031)	(0.537)	(0.084)	(0.065)
Health when 15yo	0.040	0.073	0.012	-0.275	0.147***	0.112***
	(0.028)	(0.046)	(0.018)	(0.270)	(0.028)	(0.028)
N. Observations	4040	4040	4040	4040	4040	4040
Full set of v. Table 2	Yes	Yes	Yes	Yes	Yes	Yes
Country of residence	Yes	Yes	Yes	Yes	Yes	Yes
Year (SHARE wave)	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	20.70	—	—	—	—	—
1st stage p-value	0.0005	—	—	—	—	—

Notes: *The method of estimation is a two-stage linear estimation. Abbreviations: 1ST - first stage estimates; 2ND - second stage estimates. Robust standard errors are clustered at the country of residence and parental country of origin level. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The likelihood of loneliness may be influenced as well by the frequency of parent-offspring interactions (contacts). In Table 10 we control for three different frequency levels (with contact on a daily basis as the reference category): frequent contact (several times a week), fair contact (once a week or every two weeks) and rare contact (once a month, less than once a month, never). Loneliness is positively associated with rare contact with children, and the effects are similar to those shown in Tables 2 and 9.

Table 10: The effect of loneliness on health. SG immigrants (either one or both parents born abroad). Sub-sample with kids: frequency of the contact with children

Variable	1ST **Loneliness**	2ND **Eurod**	2ND **Adl**	2ND **Bmi**	2ND **Chronic**	2ND **SAH**
Restraint_Mother	0.007***					
	(0.001)					
Loneliness (R-UCLA)		1.748***	0.369***	4.648***	0.265	0.181
		(0.455)	(0.095)	(1.155)	(0.448)	(0.299)
Frequent contact	0.029	-0.007	-0.022	0.038	0.079*	-0.027
	(0.052)	(0.093)	(0.023)	(0.238)	(0.047)	(0.046)
Fair contact	0.130**	-0.140	-0.046	-0.671*	-0.003	0.039
	(0.057)	(0.229)	(.)	(0.405)	(0.053)	(0.081)
Rare contact	0.362***	-0.283	-0.082	-1.995**	0.073	0.072
	(0.111)	(0.331)	(0.067)	(0.819)	(0.139)	(0.132)
N. Observations	2806	2806	2806	2806	2806	2806
Full set of v. Table 2	Yes	Yes	Yes	Yes	Yes	Yes
Country of residence	Yes	Yes	Yes	Yes	Yes	Yes
Year (SHARE wave)	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	33.33	—	—	—	—	—
1st stage p-value	0.0000	—	—	—	—	—

Notes: *The method of estimation is a two-stage linear estimation. Reference category: every-day contact. Abbreviations: 1ST - first stage estimates; 2ND - second stage estimates. Robust standard errors are clustered at the country of residence and parental country of origin level. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

As expected, genetic and linguistic distances reduce the effect of loneliness, although the effect is not significant (Table 11, column 1). This is not surprising evidence since these measures strongly correlate with cross-cultural differences in pro-social traits. The effect of loneliness on mental health remains highly significant. Loneliness still positively relates to functional decline and higher BMI, although the relationship is statistically weaker compared to our baseline results.

Table 11: The effect of loneliness on health. SG immigrants (either one or both parents born abroad), temporal distances from Becker et al. (2020)

Variable	1ST **Loneliness**	2ND **Eurod**	2ND **Adl**	2ND **Bmi**	2ND **Chronic**	2ND **SAH**
Restraint_Mother	0.005*** (0.001)					
Loneliness (R-UCLA)		1.342*** (0.468)	0.294* (0.176)	6.382* (3.757)	-0.180 (0.745)	0.209 (0.554)
Ancestral distance (z-score)	-0.034 (0.029)	0.016 (0.060)	0.001 (0.011)	0.350 (0.325)	-0.056 (0.061)	-0.036 (0.039)
N. Observations	3609	3609	3609	3609	3609	3609
Full set of v. Table 2	Yes	Yes	Yes	Yes	Yes	Yes
Country of residence	Yes	Yes	Yes	Yes	Yes	Yes
Year (SHARE wave)	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	11.44	—	—	—	—	—
1st stage p-value	0.0038	—	—	—	—	—

Notes: *The method of estimation is a two-stage linear estimation. Abbreviations: 1ST - first stage estimates; 2ND - second stage estimates. Robust standard errors are clustered at the country of residence and parental country of origin level. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Finally, we show that our baseline results are robust to alternative definitions of our sample. Table C.6 reports results on the sample of refreshers, *i.e.*, we only consider the first observation of respondents who appear more than once in the main sample. Our findings also hold if we exclude from our sample first-generation immigrants and consider respondents with mothers born abroad only (Table C.8 and C.7, respectively).

7 Conclusions

In this paper, we estimate the direct causal effect of loneliness on a variety of health outcomes using a sample of second-generation immigrants among older adults in Europe. In an effort to account for the endogeneity of self-declared loneliness, we use a specific trait of maternal cultural background strongly associated with perceived quality of relationships as an instrument for loneliness. We therefore also assess the importance of cultural heritage is shaping individuals' perceptions of loneliness.

We contribute to the related literature in a number of ways. First, we estimate a direct causal effect on loneliness on multiple health outcomes. Second, we link loneliness to the degree of *restraint* of a society, a specific cultural trait strongly associated with quality of relations, extraversion, happiness and high importance of having friends and positive feelings. In an extension of our analysis, we also investigate one

possible pathway by which some specific ancestral factors may have influence on the formation of cultural traits associated with higher levels of restraint in the modern era. Third, in order to separate the effect of culture from other country-specific factors, we focus on a sample of second-generation immigrants to whom we assign the cultural trait belonging to their mothers' country of origin.

We find that loneliness has a significant impact on individual's health status. More specifically, loneliness increases the probability of depression, suicidal ideation, and functional decline. Among physical health-related factors and medications, loneliness increases the likelihood of diabetes, hypertension and stroke. Our baseline results are robust to a number of sensitivity checks. We also uncover a strong relationship between the *quality* of relations and loneliness. The risk of loneliness significantly increases among individuals with more restraint cultural backgrounds compared to their peers with more indulgent cultural heritages. This result holds independently of the variety and frequency of social interactions. Based on this evidence, we use maternal cultural background as an instrument for individuals' self-declared loneliness in our model of health, which proves to be a strong and valid instrument. This is in line with extant evidence on the inter-generational transmission of attitudes and behaviour from mothers to their children.

Our results are in line with the related literature, which however only show *correlations* and no *causation* between loneliness and health. More importantly, our identification strategy allows us to uncover a larger effect of loneliness on health than that found in an OLS setting, which confirms the presence of a strong reverse causality between loneliness and health.

A few implications derive from our work. Loneliness poses a serious threat to health with repercussion both from a social and economic point of view. Cultural heritage and perceived quality of social relations play a prominent role in shaping individuals' experiences of loneliness. In this context, the need to implement effective policies and interventions targeted at reducing loneliness becomes imperative. However, one-size-fits-all solutions may not be the most appropriate. When designing loneliness interventions, policy makers will also have to account for the diverse ways in which individuals experience loneliness across societies with different cultural backgrounds.

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A Hofstede et al. (1991) and Hofstede et al.'s (2010) dimensions of culture

In addition to the two cultural dimensions described in Section 2, (Hofstede et al., 1991) and Hofstede et al.'s (2010) six-dimensional model of national culture includes the following four cultural dimensions:

1. **Uncertainty Avoidance**. This dimension refers to a society's tolerance for ambiguity. It is conceptually different from risk avoidance. Cultures oriented to uncertainty avoidance are more prone to support stricter rules, laws, and norms aimed at reducing the ambiguity and offering "one-size-fits-all" solutions. On the other side, cultures accepting ambiguity prefer fewer rules and more freedom in expressing different opinions. According to Hofstede et al. (2010), this dimension is conceptually associated to indulgence.[18]

2. **Long Term versus Short Term Orientation**. This dimension defines the extent to which a society looks toward the future rather than resorting to the past. Short-term oriented societies look to the past experiences to deal with the current challenges, and maintain a rather static and fixed mindset. Long-term oriented cultures, on the other side, are more flexible, susceptible to change, and ready to cope with uncertain future challenges. Moreover, long term oriented societies value relationships while short term oriented societies focus more on tradition.

3. **Power Distance**. Power distance measures how people in a society relate to each other on a hierarchical scale. High power distance cultures assign a higher weight to a person or authority, while low power distant societies emphasize the equal treatment of everyone.

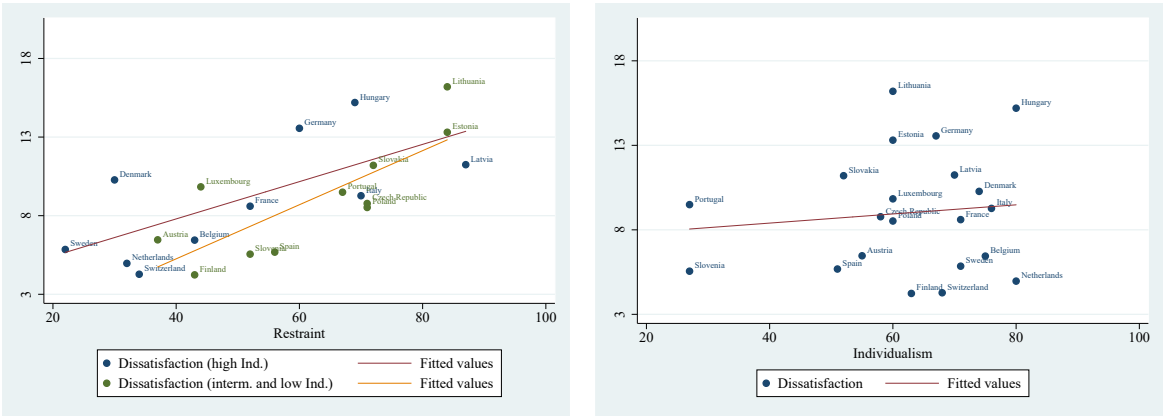
4. **Masculinity versus Femininity**. Masculinity is about the distinction of gender roles. In masculine societies gender roles are clearly distinct. Men are supposed to be assertive, tough, and focused on material success; women are supposed to be more modest, tender, and concerned with the quality of life. Femininity stands for a society in which social gender roles overlap: both men and women are supposed to be modest, tender, and concerned with the quality of life.[19]

[18] However, the authors did not find objective ways of measuring and theorizing this association.
[19] Hofstede et al. (2010), page 140.

Table C.9-C.11 report results using the first three dimensions of maternal cultural background as an instrument for loneliness. They show that these alternative dimensions of culture do not represent a valid instrument.

B Additional figures

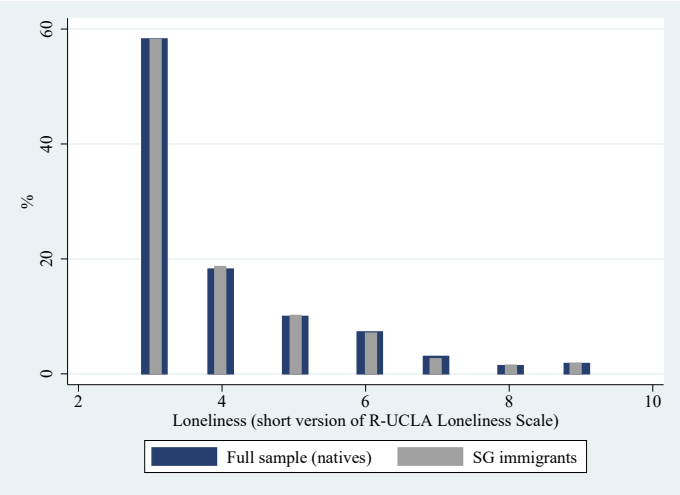
Figure B.1: Degree of dissatisfaction (%) with personal relationships versus restraint and individualism



(a) (b)

Note: The country-level data on satisfaction comes from the 2018 World Gallup survey, available at `https://stats.oecd.org/index.aspx?lang=en` (Accessed: December 7, 2021). Satisfaction with personal relationships refers to the mean score of survey respondents who rate their satisfaction with their personal relationships on an 11-point scale, from 0 (not at all satisfied) to 10 (completely satisfied). The variable refers to the respondent's opinions or feelings
Source: 2018 Gallup Survey and Hofstede et al. (2010).

Figure B.2: Loneliness across natives and second-generation immigrants, R-UCLA loneliness scale.



Source: SHARE data.

C Additional tables

Table C.1: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Loneliness (R-UCLA)	3.883	1.355	3	9	4579
Feels lonely	0.234	0.423	0	1	4578
Restraint_Mother	63.637	16.905	0	96	4579
Restraint_Father	63.211	17.774	22	96	4395
Individualism_Mother	56.619	15.787	12	91	4286
Individualism_Father	56.969	15.667	20	91	4068
Age	64.303	8.547	50	94	4579
Female	0.584	0.493	0	1	4579
Depression scale EURO-D	2.305	2.126	0	12	4579
Suicidality (part of EURO-D)	0.066	0.248	0	1	4573
Adl	0.165	0.614	0	6	4579
Body mass index (bmi)	27.408	5.078	15.571	73.462	4579
Number of chronic diseases	1.694	1.557	0	11	4579
Self-perceived health (SAH)	3.083	1.078	1	5	4579
High blood cholesterol	0.24	0.427	0	1	4575
High blood pressure or hypertension	0.389	0.487	0	1	4575
Diabetes or high blood sugar	0.133	0.34	0	1	4575
Stomach or duodenal ulcer, peptic ulcer	0.045	0.207	0	1	4575
Chronic lung disease	0.057	0.232	0	1	4575
Stroke	0.029	0.167	0	1	4575
Drugs for: sleep problems	0.076	0.265	0	1	4576
Drugs for: high blood cholesterol	0.226	0.418	0	1	4576
Drugs for: anxiety or depression	0.075	0.263	0	1	4576
Drugs for: joint pain	0.136	0.343	0	1	4576
Drugs for: diabetes	0.119	0.323	0	1	4576
Drugs for: high blood pressure	0.402	0.49	0	1	4576
Low Education	0.237	0.425	0	1	4579
Medium Education	0.461	0.499	0	1	4579
High Education	0.302	0.459	0	1	4579
Retired	0.497	0.5	0	1	4579
Unemployed	0.026	0.16	0	1	4579
Disabled	0.045	0.207	0	1	4579
Employed	0.368	0.482	0	1	4579
Married	0.679	0.467	0	1	4579
Divorced	0.131	0.338	0	1	4579
Widowed	0.112	0.315	0	1	4579
Number of children	2.236	1.363	0	14	4579
Lives alone	0.211	0.408	0	1	4579
Parental education (tertiary, either one or both)	0.161	0.368	0	1	4579
Relationship parents (adverse)	0.549	0.498	0	1	4579
Absent parent	0.116	0.32	0	1	4579
Harm from parents	0.278	0.448	0	1	4527
Harm third parties	0.083	0.276	0	1	4579
Understanding parents (lack of)	0.436	0.496	0	1	4552

Source: SHARE data, (Hofstede et al., 2010) and (Becker et al., 2020).

Variable	Mean	Std. Dev.	Min.	Max.	N
Every-day contact	0.279	0.449	0	1	3195
Frequent contact	0.271	0.445	0	1	3195
Fair contact	0.279	0.449	0	1	3195
Rare contact	0.17	0.376	0	1	3195
Ancestral distance (z-score)	-0.769	0.816	-3.35	0.683	3609
Health when 15yo	2.314	1.155	1	6	4112
HH net assets (deciles)	6.609	2.58	1	10	4579
HH expenditure (deciles)	4.917	2.935	1	9	4579

Table C.2: List of countries included in (Hofstede et al., 2010) and the corresponding index of individualism and restraint

Country	Individ.	Restr.	Country	Individ.	Restr.
Albania	.	85	Italy	76	70
Algeria	.	68	Jamaica	39	.
Andorra	.	35	Japan	46	58
Argentina	46	38	Jordan	.	57
Australia	90	29	Korea, Republic of	18	71
Austria	55	37	Kosovo	.	85
Azerbaijan	.	78	Kyrgyzstan	.	61
Bangladesh	20	80	Latvia	70	87
Belarus	.	85	Lithuania	60	84
Belgium	75	43	Luxembourg	60	44
Benin	78	.	North Macedonia	.	65
Bosnia and Herzegovina	.	56	Malaysia	26	43
Brazil	38	41	Mali	.	57
Bulgaria	30	84	Malta	59	34
Burkina Faso	.	82	Mexico	30	3
Canada	80	32	Moldova, Republic of	.	81
Central African Republic	73	.	Morocco	46	75
Chile	23	32	Netherlands	80	32
China	20	76	New Zealand	79	25
Colombia	13	17	Nigeria	.	16
Costa Rica	15	.	Norway	69	45
Croatia	33	67	Pakistan	14	100
Cyprus	.	30	Panama	11	.
Czech Republic	58	71	Peru	16	54
Denmark	74	30	Philippines	32	58
Dominican Republic	.	46	Poland	60	71
Ecuador	8	.	Portugal	27	67
Egypt	.	96	Puerto Rico	.	10
El Salvador	19	11	Romania	30	80
Estonia	60	84	Russian Federation	39	80
Finland	63	43	Rwanda	.	63
France	71	52	Saudi Arabia	.	48
Georgia	.	68	Serbia	25	72
Germany	67	60	Singapore	20	54
Ghana	.	28	Slovakia	52	72
Greece	35	50	Slovenia	27	52
Guatemala	6	.	South Africa	65	37
Hong Kong	25	83	Spain	51	56
Hungary	80	69	Suriname	47	.
Iceland	.	33	Sweden	71	22
India	48	74	Switzerland	68	34
Indonesia	14	62	Taiwan	17	51
Iran	41	60	Tanzania, United Republic	.	62
Iraq	.	83	Thailand	20	55
Ireland	70	35	Trinidad and Tobago	16	20
Israel	54	.	Turkey	37	51

Country	Individ.	Restr.	Country	Individ.	Restr.
Uganda	.	48	Venezuela	12	0
Ukraine	.	86	Viet Nam	20	65
United Kingdom	89	31	Zambia	.	58
United States of America	91	32	Zimbabwe	.	72
Uruguay	36	47			

Source: (Hofstede et al., 2010).

Table C.3: List of countries included in the analysis

SG immigrants	Country of interview (27)
	Austria, Germany, Sweden, Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium, Israel, Czech Republic, Poland, Luxembourg, Portugal, Slovenia, Estonia, Croatia, Lithuania, Bulgaria, Cyprus, Finland, Latvia, Malta, Romania, Slovakia.

SG immigrants	Country of origin Mother (62)
	Albania, Algeria, Argentina, Australia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Egypt, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, India, Indonesia, Iran, Iraq, Ireland, Italy, Kosovo, Latvia, Lithuania, Luxembourg, Macedonia, Malta, Moldova, Republic of Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Serbia, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, United States of America, Uruguay, Venezuela, Viet Nam.

Table C.4: The effect of maternal restraint on health and unhealthy behaviour. SG immigrants (either one or both parents born abroad).

	L=0	**L=1**	**L=0**	**L=1**	**L=0**	**L=1**	**L=0**	**L=1**	**L=0**	**L=1**
Variable	Eurod	Eurod	ADL	ADL	BMI	BMI	Chronic	Chronic	SAH	SAH
Restraint_Mother	0.002	0.015***	0.002**	0.002	0.021	0.022	0.001	-0.002	0.000	0.001
	(0.003)	(0.005)	(0.001)	(0.002)	(0.011)	(0.014)	(0.002)	(0.003)	(0.002)	(0.002)
N. Observations	2677	1902	2677	1902	2677	1902	2677	1902	2677	1902
Variable	Cholesterol	Cholesterol	Diabetes	Diabetes	Pressure	Pressure	Ulcer	Ulcer	Stroke	Stroke
Restraint_Mother	-0.001	-0.001	-0.000	0.000	0.001	-0.000	-0.000	0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
N. Observations	2674	1901	2674	1901	2674	1901	2674	1901	2674	1901
Variable	No vig. FA	No vig. FA	No FA	No FA	Smoking	Smoking	Fruit	Fruit	Drinking	Drinking
Restraint_Mother	0.000	0.002**	0.001	0.001	-0.002**	-0.000	-0.000	-0.002	-0.001	-0.000
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N. Observations	2676	1900	2674	1899	2677	1902	2677	1902	1324	850
Full set of v. Table 2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country (of residence) FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year (round) FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: *The method of estimation is OLS.* $L = 0$ *indicates the subset of individuals with* $R - UCLA = 0$ *(not lonely), while* $L = 1$ *indicates individuals with* $R - CLA > 0$ *(lonely). Robust standard errors are clustered at the country of residence and parental country of origin level. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table C.5: The effect of loneliness on single components of the EURO-D scale. SG immigrants (either one or both parents born abroad).

Variable	2ND **Depr.**	2ND **Pess.**	2ND **Suicid**	2ND **Sleep**	2ND **Interest**	2ND **Irrit.**	2ND **Appet.**	2ND **Fatigue**	2ND **Concen.**	2ND **Enjoy**	2ND **Tear**
Lonely (dich. UCLA)	0.094	0.043	0.050**	0.080	0.093***	-0.144	-0.018	0.047	0.075***	0.089***	0.103***
	(0.251)	(0.030)	(0.022)	(0.122)	(0.030)	(0.117)	(0.038)	(0.100)	(0.021)	(0.016)	(0.028)
Age	0.000	0.001**	0.000*	0.001	0.000	0.000	-0.000	0.002**	-0.000	0.000*	-0.000
	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Female	0.061	-0.008	0.008**	0.058**	0.005	0.014	0.023**	0.043***	-0.000	-0.004	0.069***
	(0.042)	(0.007)	(0.003)	(0.027)	(0.005)	(0.015)	(0.009)	(0.015)	(0.004)	(0.004)	(0.015)
Low Education	0.025	0.012*	0.009*	0.018	0.009***	0.042**	0.018**	0.041***	0.021***	0.014***	0.024**
	(0.026)	(0.007)	(0.005)	(0.015)	(0.003)	(0.018)	(0.009)	(0.015)	(0.006)	(0.004)	(0.010)
High Education	-0.011	-0.011*	-0.008**	-0.022	-0.006**	-0.017	-0.003	-0.016	-0.008**	-0.002	-0.005
	(0.014)	(0.006)	(0.003)	(0.015)	(0.003)	(0.011)	(0.005)	(0.012)	(0.003)	(0.002)	(0.005)
Retired	0.010	-0.009	-0.002	-0.012	0.008	-0.021	-0.003	0.011	0.005	-0.006	0.005
	(0.017)	(0.010)	(0.006)	(0.017)	(0.007)	(0.024)	(0.011)	(0.016)	(0.006)	(0.005)	(0.009)
Unemployed	0.032	0.032*	0.008	-0.021	0.010	-0.024	0.020	0.006	-0.024**	-0.003	0.037**
	(0.035)	(0.017)	(0.010)	(0.028)	(0.008)	(0.038)	(0.016)	(0.028)	(0.011)	(0.008)	(0.017)
Disabled	0.134	0.030**	0.022***	0.090*	0.033***	0.114***	0.035	0.135***	0.042***	0.013**	0.063***
	(0.096)	(0.014)	(0.007)	(0.047)	(0.009)	(0.032)	(0.022)	(0.046)	(0.010)	(0.006)	(0.018)
Employed	-0.024	-0.025**	-0.014**	-0.034	0.000	-0.069***	-0.033**	-0.025	-0.019**	-0.017***	-0.009
	(0.035)	(0.012)	(0.006)	(0.023)	(0.006)	(0.027)	(0.016)	(0.019)	(0.008)	(0.005)	(0.008)
Married	-0.030	-0.007	-0.010	-0.025	-0.003	-0.049	-0.011	-0.032	-0.010	-0.004	-0.010
	(0.033)	(0.010)	(0.006)	(0.023)	(0.006)	(0.039)	(0.015)	(0.022)	(0.009)	(0.005)	(0.009)
Divorced	-0.015	0.003	0.003	-0.008	0.001	-0.029	-0.005	-0.027	-0.001	-0.001	-0.006
	(0.025)	(0.010)	(0.005)	(0.018)	(0.006)	(0.038)	(0.011)	(0.022)	(0.008)	(0.004)	(0.009)
Widowed	-0.021	0.005	-0.004	-0.017	0.002	-0.030	0.002	-0.017	-0.007	-0.000	0.003
	(0.029)	(0.009)	(0.006)	(0.027)	(0.006)	(0.031)	(0.016)	(0.024)	(0.010)	(0.005)	(0.011)
Number of children	-0.006	-0.005**	0.001	-0.002	-0.000	-0.008	-0.000	-0.004	-0.001	-0.002*	-0.000
	(0.007)	(0.002)	(0.001)	(0.003)	(0.001)	(0.006)	(0.002)	(0.004)	(0.001)	(0.001)	(0.002)
Live alone	0.058	0.008	0.005	0.032	0.005	0.043	0.018	0.029	0.003	0.007	0.030**
	(0.058)	(0.011)	(0.005)	(0.024)	(0.004)	(0.045)	(0.013)	(0.027)	(0.005)	(0.005)	(0.012)
Education parents (tertiary)	-0.007	0.002	-0.004	-0.010	0.002	-0.027	-0.004	-0.010	-0.009	-0.004	-0.010
	(0.019)	(0.006)	(0.005)	(0.015)	(0.006)	(0.025)	(0.008)	(0.017)	(0.006)	(0.004)	(0.007)
Relationship parents (adverse)	0.043	0.004	0.004	0.023	0.005**	0.056***	-0.000	0.038***	0.011***	0.003	0.011*
	(0.037)	(0.006)	(0.003)	(0.019)	(0.002)	(0.015)	(0.005)	(0.014)	(0.003)	(0.002)	(0.006)
Absent parent	0.030	0.016**	0.005	0.011	0.002	0.038**	0.005	0.036**	0.008*	0.005	0.015**
	(0.023)	(0.007)	(0.004)	(0.011)	(0.003)	(0.017)	(0.007)	(0.014)	(0.004)	(0.005)	(0.008)
HH net wealth	-0.005	-0.005***	-0.002**	-0.004*	-0.001***	-0.009**	-0.004**	-0.011***	-0.002*	-0.002***	-0.002**
	(0.005)	(0.002)	(0.001)	(0.003)	(0.001)	(0.004)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)
HH expenditure	0.002	0.000	0.001	0.002	0.000	0.002	0.001	0.001	0.001**	0.000	0.000
	(0.002)	(0.001)	(0.000)	(0.001)	(0.000)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Additional controls:											
Country of residence	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year (SHARE wave)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	10.10	—	—	—	—	—	—	—	—	—	—
1st stage p-value	0.0058	—	—	—	—	—	—	—	—	—	—
N. Observations	4576	4567	4573	4579	4575	4571	4579	4576	4570	4574	4572

Notes: *The table reports the average marginal effects of bivariate probit estimations. Lonely (dich. UCLA) is the dichotomized version of the R-UCLA scale. Robust standard errors are clustered at the country of residence and parental country of origin level. Abbreviations: 1ST - first stage estimates; 2ND - second stage estimates. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table C.6: The effect of loneliness on health. Baseline specification. SG immigrants (either one or both parents born abroad). Only refreshers.

Variable	1ST **Loneliness**	2ND **Eurod**	2ND **Adl**	2ND **Bmi**	2ND **Chronic**	2ND **SAH**
Restraint_Mother	0.006***					
	(0.001)					
Loneliness (R-UCLA)		1.866***	0.469***	3.238*	-0.045	0.558
		(0.215)	(0.108)	(1.849)	(0.537)	(0.404)
Age	0.001	0.001	0.004	-0.042***	0.038***	0.017***
	(0.003)	(0.005)	(0.003)	(0.013)	(0.006)	(0.003)
Female	0.033	0.627***	-0.006	-0.521	0.021	-0.046
	(0.055)	(0.076)	(0.029)	(0.432)	(0.099)	(0.035)
Low Education	0.224***	-0.112	-0.042	-0.077	0.212**	0.087
	(0.082)	(0.100)	(0.047)	(0.665)	(0.105)	(0.088)
High Education	-0.143***	0.051	0.044	0.247	-0.107	-0.130
	(0.049)	(0.164)	(0.039)	(0.386)	(0.130)	(0.088)
Retired	0.046	0.143	-0.037	0.407	0.097	0.038
	(0.109)	(0.221)	(0.047)	(0.446)	(0.135)	(0.076)
Unemployed	0.113	0.305	-0.079	-0.965	-0.129	0.126*
	(0.126)	(0.207)	(0.076)	(0.835)	(0.185)	(0.076)
Disabled	0.764***	0.293	0.159	-1.716	1.536***	0.610*
	(0.120)	(0.231)	(0.105)	(1.418)	(0.478)	(0.328)
Employed	-0.189	0.274	0.020	0.300	-0.217**	-0.005
	(0.120)	(0.248)	(0.080)	(0.774)	(0.103)	(0.126)
Married	-0.333***	0.552**	0.116	0.285	-0.112	0.082
	(0.101)	(0.220)	(0.089)	(1.175)	(0.182)	(0.170)
Divorced	-0.217**	0.642***	0.083	-0.052	0.063	0.105
	(0.104)	(0.214)	(0.096)	(0.963)	(0.113)	(0.122)
Widowed	-0.177	0.386	0.110	0.494	0.225**	0.136
	(0.160)	(0.278)	(0.090)	(1.063)	(0.106)	(0.131)
Number of children	-0.047***	0.064	0.027*	0.293*	-0.047*	0.006
	(0.017)	(0.052)	(0.016)	(0.153)	(0.025)	(0.015)
Live alone	0.349***	-0.621***	-0.186**	-1.776**	-0.259	-0.327*
	(0.118)	(0.142)	(0.088)	(0.750)	(0.184)	(0.183)
Education parents (tertiary)	-0.049	0.125	-0.011	-1.012***	-0.047	-0.059
	(0.084)	(0.116)	(0.046)	(0.269)	(0.049)	(0.061)
Relationship parents (adverse)	0.089*	-0.013	-0.057**	-0.399	-0.058	-0.034
	(0.050)	(0.080)	(0.023)	(0.322)	(0.071)	(0.073)
Absent parent	0.177*	-0.101	-0.124**	0.173	0.121	-0.141*
	(0.094)	(0.199)	(0.057)	(0.536)	(0.128)	(0.083)
HH net wealth	-0.038***	0.017	0.004	0.059	-0.045	-0.034**
	(0.012)	(0.021)	(0.008)	(0.082)	(0.027)	(0.017)
HH expenditure	0.013	-0.022	0.000	-0.072	0.021*	-0.007
	(0.011)	(0.014)	(0.004)	(0.049)	(0.011)	(0.005)
Additional controls:						
Country of residence	Yes	Yes	Yes	Yes	Yes	Yes
Year (SHARE wave)	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	27.80	—	—	—	—	—
1st stage p-value	0.0001	—	—	—	—	—
N. Observations	2655	2655	2655	2655	2655	2655

Notes: *The table reports the coefficients of two-stage linear estimations. Robust standard errors are clustered at the country of residence and parental country of origin level. Abbreviations: 1ST - first stage estimates; 2ND - second stage estimates; SAH - self-assessed health. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table C.7: The effect of loneliness on health outcomes. SG immigrants (foreign-born mothers).

Variable	1ST **Loneliness**	2ND **Eurod**	2ND **Adl**	2ND **Bmi**	2ND **Chronic**	2ND **SAH**
Restraint_Mother	0.006***					
	(0.002)					
Loneliness (R-UCLA)		1.815***	0.443**	5.603**	0.191	0.101
		(0.654)	(0.173)	(2.564)	(0.661)	(0.447)
Age	0.002	0.002	0.002	-0.052**	0.038***	0.015***
	(0.004)	(0.006)	(0.004)	(0.024)	(0.006)	(0.001)
Female	-0.010	0.610***	0.015	-0.113	0.030	-0.008
	(0.060)	(0.052)	(0.029)	(0.788)	(0.114)	(0.048)
Low Education	0.199***	0.061	0.048	0.009	0.295**	0.229**
	(0.071)	(0.235)	(0.070)	(0.761)	(0.137)	(0.097)
High Education	-0.027	-0.071	0.007	0.162	-0.034	-0.173***
	(0.058)	(0.205)	(0.034)	(0.460)	(0.096)	(0.049)
Retired	-0.143*	0.297	0.089	1.509	0.102	0.072
	(0.083)	(0.251)	(0.081)	(0.999)	(0.141)	(0.086)
Unemployed	0.066	0.394	-0.011	-1.431	-0.199	0.168*
	(0.111)	(0.352)	(0.103)	(1.278)	(0.152)	(0.089)
Disabled	0.436***	0.851**	0.366***	-2.380*	1.276***	0.892***
	(0.038)	(0.348)	(0.099)	(1.241)	(0.398)	(0.217)
Employed	-0.409***	0.510	0.138	2.089	-0.173	-0.136
	(0.124)	(0.408)	(0.117)	(1.344)	(0.232)	(0.173)
Married	-0.270***	0.443	0.110	0.745	-0.188	-0.166*
	(0.095)	(0.327)	(0.125)	(1.282)	(0.212)	(0.095)
Divorced	-0.131	0.584***	0.095	0.068	-0.003	-0.061
	(0.130)	(0.192)	(0.099)	(1.165)	(0.105)	(0.076)
Widowed	-0.100	0.308	0.177	0.518	0.049	-0.067
	(0.203)	(0.293)	(0.110)	(1.439)	(0.144)	(0.077)
Number of children	-0.044***	0.064	0.017	0.289***	-0.020	-0.017
	(0.010)	(0.061)	(0.014)	(0.101)	(0.032)	(0.016)
Lives alone	0.343***	-0.563*	-0.201*	-2.535**	-0.332	-0.182
	(0.113)	(0.327)	(0.108)	(1.265)	(0.238)	(0.189)
Education parents (tertiary)	-0.084	0.166	0.040	-0.883	0.050	-0.053
	(0.120)	(0.152)	(0.056)	(0.737)	(0.063)	(0.048)
Relationship parents (adverse)	0.125*	-0.063	-0.097***	-0.628	-0.105	0.001
	(0.066)	(0.075)	(0.032)	(0.492)	(0.096)	(0.062)
Absent parent	0.137*	0.023	-0.010	0.285	0.196	0.033
	(0.074)	(0.217)	(0.050)	(0.775)	(0.120)	(0.073)
HH net wealth	-0.058***	0.061	0.012	0.277**	-0.038	-0.048*
	(0.009)	(0.045)	(0.012)	(0.122)	(0.043)	(0.028)
HH net expenditure	-0.001	0.020	0.006	-0.044	0.015**	-0.001
	(0.015)	(0.023)	(0.006)	(0.105)	(0.006)	(0.006)
Country (of residence) FE	Yes	Yes	Yes	Yes	Yes	Yes
Year (round) FE	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	11.19	—	—	—	—	—
1st stage p-value	0.0041	—	—	—	—	—
N. Observations	3315	3315	3315	3315	3315	3315

Notes: *The table reports the coefficients of two stage linear estimations. Robust standard errors are clustered at the country of residence and parental country of origin level. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table C.8: The effect of loneliness on health outcomes. Full sample (first-generation immigrants excluded).

Variable	1ST **Loneliness**	2ND **Eurod**	2ND **Adl**	2ND **Bmi**	2ND **Chronic**	2ND **SAH**
Restraint_Mother	0.007***					
	(0.001)					
Loneliness (R-UCLA)		1.496***	0.304***	2.042	0.384	0.326
		(0.375)	(0.080)	(1.455)	(0.303)	(0.201)
Age	0.006***	0.006	0.007***	-0.058***	0.034***	0.017***
	(0.002)	(0.004)	(0.001)	(0.010)	(0.002)	(0.002)
Female	0.094***	0.513***	-0.017	-1.016***	0.055	-0.020
	(0.034)	(0.049)	(0.013)	(0.286)	(0.048)	(0.029)
Low Education	0.100***	0.114**	0.023*	0.335	0.122***	0.153***
	(0.028)	(0.047)	(0.013)	(0.237)	(0.036)	(0.024)
High Education	-0.013	-0.100***	-0.019**	-0.530***	-0.081***	-0.154***
	(0.018)	(0.037)	(0.009)	(0.076)	(0.023)	(0.017)
Retired	-0.157***	-0.078	0.007	0.354	0.047	-0.005
	(0.026)	(0.094)	(0.020)	(0.313)	(0.061)	(0.043)
Unemployed	0.120**	0.076	-0.044**	-1.032***	-0.115	-0.005
	(0.054)	(0.089)	(0.018)	(0.222)	(0.072)	(0.051)
Disabled	0.561***	0.553**	0.379***	-0.472	0.849***	0.733***
	(0.080)	(0.216)	(0.044)	(0.855)	(0.190)	(0.128)
Employed	-0.258***	0.054	0.049**	-0.167	-0.227***	-0.149**
	(0.038)	(0.134)	(0.024)	(0.398)	(0.077)	(0.058)
Married	-0.239***	0.212*	0.059**	0.716*	0.110	0.013
	(0.057)	(0.127)	(0.026)	(0.404)	(0.079)	(0.055)
Divorced	-0.055	0.125	0.018	-0.048	0.001	-0.045*
	(0.037)	(0.087)	(0.014)	(0.162)	(0.060)	(0.026)
Widowed	0.077**	0.043	0.012	0.307**	0.015	-0.075***
	(0.035)	(0.081)	(0.024)	(0.139)	(0.056)	(0.023)
Number of children	-0.022***	0.052***	0.006*	0.202***	0.010	0.005
	(0.006)	(0.015)	(0.003)	(0.045)	(0.014)	(0.008)
Live alone	0.256***	-0.438***	-0.098***	-0.697*	-0.100	-0.124**
	(0.041)	(0.103)	(0.028)	(0.398)	(0.092)	(0.054)
Education parents (tertiary)	0.012	0.044**	0.006	-0.720***	-0.002	-0.074***
	(0.022)	(0.021)	(0.008)	(0.103)	(0.034)	(0.020)
Relationship parents (adverse)	0.143***	0.063	-0.034***	-0.190	0.045	0.069**
	(0.020)	(0.061)	(0.013)	(0.206)	(0.047)	(0.031)
Absent parent	0.031	0.118***	-0.012	0.173	0.114***	0.037**
	(0.021)	(0.035)	(0.014)	(0.119)	(0.029)	(0.019)
HH net wealth	-0.036***	-0.036***	-0.003	-0.062	-0.045***	-0.041***
	(0.005)	(0.013)	(0.004)	(0.059)	(0.010)	(0.009)
HH expenditure	0.013***	0.006	0.002	-0.025	0.002	-0.003
	(0.002)	(0.007)	(0.002)	(0.027)	(0.005)	(0.003)
Country (of residence) FE	Yes	Yes	Yes	Yes	Yes	Yes
Year (round) FE	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	85.72	—	—	—	—	—
1st stage p-value	0.0000	—	—	—	—	—
N. Observations	53011	53011	53011	53011	53011	53011

Notes: *The table reports the coefficients of two stage linear estimations. Robust standard errors are clustered at the country of residence and parental country of origin level. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table C.9: The effect of loneliness on health outcomes. SG immigrants (either one or both parents born abroad), individualism vs. collectivism.

Variable	1ST **Loneliness**	2ND **Eurod**	2ND **Adl**	2ND **Bmi**	2ND **Chronic**	2ND **SAH**
Individualism	-0.001					
	(0.002)					
Loneliness (R-UCLA)		3.536	1.352	12.886	1.416	1.370
		(4.007)	(1.771)	(22.258)	(2.094)	(2.269)
Full set of v. Table 2	Yes	Yes	Yes	Yes	Yes	Yes
Country (of residence) FE	Yes	Yes	Yes	Yes	Yes	Yes
Year (round) FE	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	0.47	—	—	—	—	—
1st stage p-value	0.5013	—	—	—	—	—
N. Observations	4286	4286	4286	4286	4286	4286

Notes: *The method of estimation is ivreg2. Robust standard errors are clustered at the country of residence and parental country of origin level. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table C.10: The effect of loneliness on health outcomes. SG immigrants (either one or both parents born abroad), uncertainty avoidance.

Variable	1ST **Loneliness**	2ND **Eurod**	2ND **Adl**	2ND **Bmi**	2ND **Chronic**	2ND **SAH**
Uncertainty Avoidance	0.002					
	(0.002)					
Loneliness (R-UCLA)		0.955	0.147	1.963	-0.509	-0.446
		(0.782)	(0.224)	(6.073)	(1.040)	(0.813)
Full set of v. Table 2	Yes	Yes	Yes	Yes	Yes	Yes
Country (of residence) FE	Yes	Yes	Yes	Yes	Yes	Yes
Year (round) FE	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	0.72	—	—	—	—	—
1st stage p-value	0.4090	—	—	—	—	—
N. Observations	4286	4286	4286	4286	4286	4286

Notes: *The method of estimation is ivreg2. Robust standard errors are clustered at the country of residence and parental country of origin level. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table C.11: The effect of loneliness on health outcomes. SG immigrants (either one or both parents born abroad), power distance.

Variable	1ST **Loneliness**	2ND **Eurod**	2ND **Adl**	2ND **Bmi**	2ND **Chronic**	2ND **SAH**
Power Distance	0.001					
	(0.002)					
Loneliness (R-UCLA)		1.579**	0.588	5.299	1.292	0.467
		(0.801)	(0.392)	(9.670)	(1.171)	(0.712)
Full set of v. Table 2	Yes	Yes	Yes	Yes	Yes	Yes
Country (of residence) FE	Yes	Yes	Yes	Yes	Yes	Yes
Year (round) FE	Yes	Yes	Yes	Yes	Yes	Yes
1st stage F	0.64	—	—	—	—	—
1st stage p-value	0.4368	—	—	—	—	—
N. Observations	4286	4286	4286	4286	4286	4286

Notes: *The method of estimation is ivreg2. Robust standard errors are clustered at the country of residence and parental country of origin level. Significance levels:* * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

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