ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
SCUOLA DI ECONOMIA, MANAGEMENT E STATISTICA

AICCON

Working Paper 174

Un(comfortably) numb: hearing loss, relational goods and subjective wellbeing

Leonardo Becchetti, Università di Roma Tor Vergata
Fabio Pisani, Università di Roma Tor Vergata
Berkan Acar, Università di Roma Tor Vergata

+39 0543 62327
ecofo.aiccon@unibo.it
www.aiccon.it

aiccon
cooperazione | non profit

AICCON – Italian Association for the Promotion of the Culture of Co-operation and of Nonprofit is an association formed in 1997 among the **University of Bologna, Faculty of Economics, Forlì Campus**, within the academic course on Social Economy. The aim of the Association is to encourage, support, and organise initiatives to promote the culture of solidarity with particular attention to idealities, perspectives, activities, and problems connected to Nonprofit Organizations and Co-operative Enterprises.

AICCON is part of network of people and institutions (**EMES Network**) at national and international level that, starting from its members, forms the environment in which it is located. AICCON, throughout the years, has increased its reach and succeeds to the local, national and international context in which it works.

Un(comfortably) numb:
hearing loss, relational goods and subjective wellbeing

Leonardo Becchetti, Università di Roma Tor Vergata

Fabio Pisani, Università di Roma Tor Vergata

Berkan Acar, Università di Roma Tor Vergata

Abstract

Hearing and speaking are basic ingredients of relational goods (ie. local public goods generated by interactions among individuals) that are in turn crucial for subjective wellbeing. We test our research hypothesis and show that hearing impairment reduces significantly the number of friends, social network connections and satisfaction from social networks which are the ingrediennts of relational life. We as well prove empirically that poor hearing negatively affects self-assessed subjective wellbeing under the form of subjective survival probability, life satisfaction and life sense. We also document that the negative self-assessed impact of hearing impairment on life expectancy is overestimated by respondents since hearing loss has no statistical impact on mortality (consistently with predictions from medical science).

Keywords: hearing, relational goods, subjective survival probability, subjective wellbeing.

JEL numbers

1. Introduction

You are the only coming through in waves
Your lips move but I can't hear what you're saying

(…)

I have become comfortably numb

Pink Floyd

The recent literature in economics and subjective wellbeing has acknowledged the importance of relational life identifying the concept of relational goods as crucial for life flourishing (Gui, 1987; Ulhaner, 1989; Becchetti et al. 2011; Antoci et al., 2007; Corneo, 2005; Jenkins and Osberg, 2004 and Randon et al., 2008). Relational goods are crucial also from a business point of view. One of the

most successful emerging contemporary industry is that creaging digital platforms that allow to cultivate relational goods at distance (such as Whatsapp, Twitter, Facebook or Instragram). In this paper we aim to investigate the importance of this variable from an original perspective. More specifically, we argue that hearing is a fundamental prerequisite for human interactions with the outer world and therefore for the creation of human relationships. While most (if not all) variables related to stock of and investment in relational life are inevitably affected by endogeneity (ie. extroverted or assertive character traits may cause both investment in relational goods and improvement of subjective wellbeing *per se*), hearing loss has the advantage of being originated by a shock not depending on the human character, action and/or intentions. On the other hand, the unique effect of hearing impairment is that of reducing quality of relationships with the outer world and, with it, the opportunity of enjoying relational goods. While hearing impairment cannot be used as an instrument of relational goods since it has an impact per se on subjective wellbeing, the same variable can be used as a proxy and substitute for relational goods for the reasons explained above. In this respect the strategy of our work is akin to that of studies exploiting exogenous variations of income induced by lotteries (Brickman, Coates and Janoff-Bulman 1978, Lindahl 2005, Gardner and Oswald 2007, Kuhn et al. 2011) or tax rebates (Lachowska 2017) to measure the effect of income on happiness.

To explain further our identification strategy consider that relational goods like friendship, solidarity, love relationships and various forms of social activities (club or political party membership, etc.) are the outcomes of the intrinsically motivated interactions among individuals. Relational goods are local public goods and, as such, they are non excludable and non rivalrous (actually anti rivalrous) (Gui, 1987). They are local public goods in the sense that the group of mates that intend to produce and share them may decide to exclude outsiders (as, for instance, people not invited to a party). They are as well anti-rivalrous more than non rivalrous since the presence of other human beings not only is not an obstacle to their full fruition (non rivalness), but is an essential requisite for it (i.e., it is possible in principle to enjoy alone public goods such as quality of air, but it is not possible to enjoy relational goods alone).

When considering the original characteristics of relational goods (local public goodness, excludability, anti-rivalness) we realize that hearing impairment has exactly the effect of reducing the capacity to enjoy and produce relational goods by creating partial or full excludability, even with those mates with whom the individual would like (or is allowed) to share the relational good.

We test our research hypothesis on five waves of the Survey of Health, Aging and Retirement in Europe (SHARE) database[1]. Our results find support for it. Respondents with hearing impairment have significantly less friends, meet them less and participate less to community life. We then show that, coeteris paribus, hearing impairment reduces significantly subjective survival probability, life sense (a measure of eudaimonic subjective wellbeing) and life satisfaction (a measure of cognitive subjective wellbeing). We finally find that the self-assessed impact on life expectancy overestimates the negative effect of hearing impairment since the latter does not affect significantly individual mortality.

2. The literature on Relational Goods

Relational goods are goods that are linked to relationships and interactions and can be produced and consumed only within groups. Beyond more obvious cases of friend or love relationships and club membership, examples of relational goods are a laughter when watching a comedy at the cinema or excitement for a goal in a stadium. In both casese enjoyment cannot be the same when the two events are watched alone at TV. Gui (1987) and Ulhaner (1989) describe relational goods as non-excludable anti-rival local public goods. They are so because their enjoyment by an individual consumer is not prevented by consumption of other consumers allowed to participate, unlike private goods for which there is rivalry among consumers. Since they cannot be enjoyed by isolated human beings, relational

[1] This paper uses data from SHARE Waves 1, 2, 4, 5 and 6 (DOIs: 10.6103/SHARE.w1.610, 10.6103/SHARE.w2.610, 10.6103/SHARE.w4.610, 10.6103/SHARE.w5.610, 10.6103/SHARE.w6.610), see Börsch-Supan et al. (2013) for methodological details. SHARE is a panel data on health, socio-economic status, and the social and family networks of 12 to 27 countries, in the first wave 12 then increased up to 21 in the sixth wave. In our analysis, we used 5 regular panel waves of SHARE which covers a time horizon from 2004 to 2015. The unused third wave focuses on people's life histories and does not have data on our crucial variables in our analysis. The surveys have been funded by European Commission and the Commission's Directorate-General for Employment, Social Affairs and Inclusion. Additional funding has been taken from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging and from various national funding sources (see www.share-project.org).

goods are not only nonrival but also anti-rival (participation of other human being is crucial for their fruition).

An important feature distinguishing fruition of relational goods and private goods is that, while availability of the product, individual desire and purchasing power are sufficient conditions for purchasing and enjoying private goods, this is not the case for relational goods where coordination of will among the individuals that should create the relationship is also necessary. As such, relational goods require coordinated effort and suffer from coordination failures (Antoci et al. 2007, Corneo 2005, Jenkins and Osberg 2004 and Randon et al. 2008). A common prediction in the relational good literature is that individuals and societies may end up in a low relational good trap which is especially prevalent in modern countries as a consequence of the coordination failure problem. Becchetti et. al. (2011) show that the time spent for relationships has a significant and positive impact on happiness and, using the fact of high opportunity cost of income with respect to relational goods, they argue that the individuals in the highest income quintiles may end up with poorer relational goods.

Other studies on relational goods, such as Helliwell and Putnam (2004), Aslam and Corrado (2007), Becchetti et al. (2008), Bruni and Stanca (2008), Meier and Stutzer (2008) and Powdthavee (2008), Becchetti et al. (2009), and Bartolini et al. (2008) also confirm that the consumption of relational goods has a strong positive effect on subjective well being.

The empirical analysis on the relationship between relational goods and subjective wellbeing is inevitably affected by endogeneity concerns. An observed significant and positive correlation between relational goods and wellbeing may in fact hide three different causality patterns. The first is a direct causal relationship from relational goods to subjective wellbeing, the second is an inverse causal relationship since higher life sense and satisfaction may be in turn a factor positively affecting social life. The third relates to external driving factors causing both variables under observations and producing a spurious correlation among them. An example is an extroverted character that may in turn cause a positive effect on life satisfaction and on social life.

In this paper we use an original identification strategy to test the impact of relational goods on subjective wellbeing. We focus on an exogenous health shock (hearing impairment) that the medical literature regards as unaffected by characterial traits or attitudes to social life, human action or human intentions. Hearing impairment in itself has the direct consequence of worsening the quality of contacts and communication with the rest of the world. A worsened and damaged channel of communication with the rest of the world has the straightforward consequence of reducing the quality of relational life. This is why the impact of hearing impairment on subjective wellbeing may help us to test the effect relational goods on subjective wellbeing. In what follows we examine more in depth our research hypothesis.

3. Research hypothesis

H0: Loss of Hearing is an exogenous shock affecting quantity and quality of relational life. As such it is going to negatively affect subjective wellbeing.

The medical literature tells us that hearing impairment is an exogenous shock (not driven by characterial traits). We as well know that, by definition, it reduces the quality of interactions between the individual and the rest of the word (intended as both the natural environment and the human society). If individuals were fully self-sufficient the worsened quality of contacts with the rest of the world (natural environment and human community) should not matter much. Quite to the contrary, hearing impairment should negatively and significantly affect subjective wellbeing to the extent to which relationships with the external environment are important for human life.

To clarify our research hypothesis we refer to the definition of relational goods as local public goods that are (locally) non excludable and anti-rivalrous (as explained in the previous section). They are produced through encounters where consumption, investment and production of relational goods coincide, their enjoyment depending on what Adam Smith calls “fellow feelings” (ie. the common consent among participants to the production/fruition of the relational good). Given these

characteristics hearing impairment by severely reducing the quality of interactions with other human beings) impacts negatively upon them on at least three respects: i) it limits non excludability; ii) it reduces the opportunity of fruitful encounters thereby limiting not just consumption and production but also investment in relational goods; iii) it reduces the opportunity of creating "fellow feelings" and common consent, thereby negatively affecting the quality of relational goods.

An important caveat to our hypothesis is that hearing loss can as well produce negative effects on subjective wellbeing related to the psychological effect of reduced physical efficiency per se, net of its impact on relational life. We therefore need to introduce a detailed set of health controls to control for this effect. The SHARE survey provides ample opportunities from this point of view allowing us to use as regressors various objective health measures, together with self-assessed health as a synthetic and comprehensive variable that should capture the effect of reduced physical efficiency on subjective wellbeing.

4. Model specification and empirical findings

In order to evaluate the impact of hearing impairment on subjective wellbeing we argue that wellbeing perception is more important than any presumed objective measure of "actual" wellbeing since subjective wellbeing is driven by the former more than by the latter. This is why we focus on a subjective measure of physical wellbeing such as the self-assessed probability of being alive in the target year fixed by the interviewer and estimate the following model

$$(1)\quad SSP_{i,t} = \alpha_0 + \sum_j \beta_j \, DHearing_{i,t} + \sum_k \gamma_k \, DEducation\ status_{i,t} + \sum_l \delta_l \, DAge\ class_{i,t}$$

$$+\alpha_2 Forecast\ horizon_{i,t} + +\alpha_1 Male_{i,t} + \alpha_3 Household\ size_{i,t} + \alpha_4 Log(1 + Income)_{i,t}$$

$$+ \alpha_5 Number\ of\ Children_{i,t}\left(+ \sum_n \theta_n\ DSelf\ health_{i,t} \right)$$

$$+ \sum_m \beta_m\ DSport\ activity_{i,t} + \sum_o \lambda_o\ DMarital\ Status_{i,t} + \sum_p \mu_p\ DAdla_{i,t}$$

$$+ \sum_q \nu_q\ DIadla_{i,t} + \alpha_6 UnderWeight_{i,t} + \alpha_7 Obese_{i,t} + \alpha_8 Maxgrip_{i,t}$$

$$+ \alpha_9 Number\ of\ chronic\ _{i,t} + \alpha_{10} Diabetes_{i,t} + \alpha_{11} Heart\ attack_{i,t}$$

$$+ \alpha_{12} Highpressure_{i,t} + +\alpha_{13} Stroke_{i,t} + \alpha_{14} Lung_{i,t} + \alpha_{15} Parkinson_{i,t}$$

$$+ \sum_r \xi_r\ DJobStatus_{i,t} + \sum_s \rho_s\ Country_i + \sum_u \tau_u\ Wave_t + \varepsilon_{i,t}$$

where the dependent variable (subjective survival probability or SSP) is the percentage probability that the i-th respondent interviewed in wave "t" attributes to her/his survival up to the life expectancy target age given by the interviewer. The life expectancy target age in the SHARE question varies according to the age of the respondent: it is equal to 75 for those aged less than 65, to 80 for those aged 65–69, to 85 for those aged 70–74, to 90 for those aged 75–79, to 95 for those aged 80–84, to 100 for those aged 85–94, to 105 for those aged 95–99, to 110 for those aged 100–104 and to 120 for those aged above 104. According to this rule, the respondent's forecast horizon (the difference between the target and current age) to assess his/her subjective survival probability should not be less than five and greater than 25 for any ages. Morover, it should not be greater than 15 for ages higher than 64. Given variable construction we eliminate distances between age and target age deviating from this rule since they are most probably due to an ex-post correction which certainly might have affected the responses.[2] As the forecast horizon is changing across individuals and is crucial for estimating subjective survival probability, we use it as a control variable (Forecast horizon).

[2] In rare cases (e.g. if age was ex post corrected due to an interviewer remark) the gap between age and target age may deviate from this rule. See http://www.share-project.org/fileadmin/pdf_documentation/SHARE_release_guide_6-1-0.pdf: accessed on 24/03/2019. The target ages are assigned to missing values for 476 observations as they are considerably deviating from the rule.

Our main regressor of interest is hearing quality assessed by the respondent. We introduce a dummy (*DHearing*) for each answer modality ("very good", "good", "fair", "poor") with "excellent" being the omitted benchmark.

Among controls we include male gender, household size, the number of the respondent's children and the log of yearly household net (after tax) income[3]. The expected non linearity of the age effect is captured with five-year age classes starting from 55 (the 50-54 age class being the omitted benchmark). Education status dummies follow the ISCED classification.[4] Job status dummies include the employed/self-employed, unemployed, permanently sick or disabled, and homemaker status, with the retired status being the omitted benchmark. We use two (underweight and obese) weight dummies following the standard international classification where individuals with a body mass index below 18.5 are classified as underweight, while those above 30 as obese. Marital status dummies include registered partnership, married living separate from spouse, never married, divorced and widowed, with married living together with the partner being the omitted benchmark. In order to control for life styles we include dummies measuring the frequency of sport practices or activities that are vigorous (once a week, one to three times a month, hardly ever or never), with more than once a week being the omitted benchmark.

Our specification includes as well several health controls, that are essential to avoid that the hearing impairment effect be spurious and driven by other concurring health conditions. We introduce dummies for each of the following diseases for which the respondents received a doctor diagnosis (diabetes, heart attack, high pressure, stroke, lung disease, cancer, Parkinson). We use dummies for

[3] In the first wave, the income variables were originally collected before taxes and social insurance contributions. However they have also been harmonized as net income using the procedure available in SHARE Working Paper 25-2016 by Bertoni et al. (2016). For the missing variables of the income variables, the averages of five different imputation methods have been used to take into account the uncertainty of the imputed data (De Luca et al., 2015).

[4] More specifically, we have a separate dummy for each of the following six ISCED (International Standard Classification of Education) levels. First level (primary education or first stage basic education), second level (lower secondary or second stage of basic education), third level (upper secondary education), fourth level (post-secondary non tertiary education), fifth level (first stage of tertiary education), sixth level (second stage of tertiary education). The omitted benchmark is the zero level of education meaning no education or unfinished first level of education.

each level of ADLA[5] (Activities of Daily Living) and IADLA[6] (Instrumental Activities of Daily Living) indicators. As a further control for respondent functionality we introduce maximum grip strength measured (in kg) of both hands or of one hand. In order to capture health components not measured by objective indicators we include self-assessed health dummies (very good, good, fair, poor), with "excellent" being the omitted benchmark. The inclusion of these (objective and subjective) health controls is particularly important because it may be argued that part of the effect of hearing impairment on subjective wellbeing is due to the psychological disappointement for the loss of physical efficiency beyond the effect on relational life. These factors are adequately captured by our measures of functionalities and self-assessed health.

We finally include dummies for all countries of origin (Germany, Sweden, Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium, Israel, Czech Republic, Poland, Ireland, Hungary, Portugal, Slovenia and Estonia, with Austria being the omitted benchmark) and wave dummies (the first wave being the omitted benchmark). The model is estimated with heteroscedasticity robust standard errors or, where explicitly mentioned, with country-year clustered standard errors.

Descriptive findings of the regressors used in our econometric estimates are provided in Table 2. The sample is almost gender balanced with males accounting for 45 percent of respondents. Average education status is close to lower secondary or second stage of basic education level. Around 15 percent of respondents are widowed. 20 percent sample respondents result to be obese, while only around 1 percent are underweight. The share of individuals suffering from high blood pressure or hypertension is quite high (around 38 percent). 11 percent of the sample declare poor self-assessed health, whereas 38 percent declare that they have less than good health conditions. The lowest

5 The ADLA (Activities of Daily Living) index measures how the respondent evaluates her/his capacity in performing the following tasks: dressing, bathing or showering, eating and cutting up food, walking across a room and getting in or out of bed. The index takes values ranging from 0 to 5 with highest values when difficulties in performing these tasks are higher due to respondents' limited functionalities.

6 The Instrumental Activities of Daily Living (IADLA) index, differently from the ADLA index, measures activities not merely related to physical functionalities but combining them with cognitive abilities. It sums self-evaluated responses on skills in performing the following tasks: telephone calls, taking medications and managing money. The index ranges from 0 to 3 and takes higher values when difficulties in performing these tasks are higher.

modality (poor) of our main variable of interest (self-assessed hearing quality) is reported by around 4 percent of the sample, while the next-to-lowest (fair) by 16 percent.

Still from a descriptive point of view we find confirmation that hearing impairment negatively affects relational life. As it can be seen from Figure 1, respondents declaring the lowest level of hearing quality (poor) have on average .32 friends and 2.12 members in their social network including relatives, while those with the highest hearing quality (excellent) .57 and 2.64 repectively (with non overlapping 95 percent confidence intervals). The significant difference is confirmed when we look at the level of social connectedness[7] and social network satisfaction levels where respondents with excellent hearing quality declare on average a 2.06 value of social connectedness (maximum value 4) and a 9.11 value of network satisfaction (maximum value 10) against 1.85 and 8.64 of those with poor hearing quality respectively. In all these measures of relational life there is a monotonic decrease as far as hearing impairment gets more severe. The differences are statistically significant since 95 percent confidence intervals do not overlap, except for a negligibly small overlap of the social connections of the "good" and "fair" hearing respondents .

Econometric findings from the estimated specification in (1) are presented in Table 3, column 1 and show that hearing impairment is negatively and significantly correlated with subjective survival probability. More specifically, the lowest level of hearing ("poor") reduces by around 7.2 points the self-assessed probability of being alive at the target age with respect to the "excellent" level omitted benchmark. The effect is smaller as expected for lower levels of hearing impairment (ie. a "fair" level reduces the probability by just 6.2 points). It is desirable that our specifications include several health variables in order to avoid that hearing loss captures spurious correlation between omitted health drivers and our dependent variable. For this reason in our second specification (Table 3, column 2) we include self-assessed health status that should capture all (or most of the) objective unmeasurable

[7] Social connectedness is a generated variable that gives a summary scale of the social network (Litwin and Stoeckel, 2016). It is computed by using the answers of the respondents to the various questions such as relationship with social network members, their genders, residential proximities to the respondent, frequency of contacts and levels of emotional closeness with the respondent.

health factors. The introduction of self-assessed health does not change our main findings, even though it reduces their magnitude. “Poor” hearing reduces now by around 4 points the probability of being alive at the target age with respect to the “excellent” modality.

Among other controls male gender reduces by 3-4 points the probability of being alive at the target age, consistently with the well-known gender effect on observed survival rates. As expected, subjective survival probability decreases with increasing age and this reduction is above 16 points for respondents older than 70. Difficulties in daily activities (ADLA and IADLA indexes) also have 2-11 point negative effects on the life expectancy of the respondents. Self-assessed health has, as expected, a very strong impact. Those considering their health as “poor” expect to be alive at the target age with 24 points lower probability than those considering their health as “excellent”. As for marital status, respondents who have never married, live separately from their spouse or are widowed report a 1-2 point lower probability of being alive at the target age. Cancer and heart attack are the two diagnosed chronic diseases that affect more negatively the dependent variable. More recent waves enter with positive sign and higher magnitudes on the dependent variable capturing the effect of medical progress in increasing subjective survival probability.

A problem with the SHARE database is attrition among waves. We have two different types of attrition: death and non-response unrelated to deceases. If survival in the sample is positively correlated with the dependent variable and positively correlated with poor hearing, the elimination from the sample of individuals with high subjective survival probability and poor hearing quality may produce an upward bias in our estimates. In order to avoid this problem we follow the usual approach of estimating the sample survival probability of our respondents across waves (Table 3, column 7) through a probit regression using the covariates in specification (1) except the forecast horizon variable[8]. We then weight our observations with the inverse of the predicted survival probability in order to account for attrition. Our findings (for specifications including/not including

[8] Forecast horizon is used by respondents to assess SSP, hence it is unrelated to the sample attrition of the respondents.

self-assessed health) are shown in columns 3 and 4 of Table 3. Our main result is unchanged in significance and slightly lower in magnitude (7 and 3.8 percentage points in the two specifications without/with self-assessed health status respectively).

In order to control for time invariant idiosyncratic traits of respondents that could be correlated with both hearing quality and the dependent variable, we re-estimate our specifications with fixed effects (Table 3, columns 5-6). Our main finding remains unchanged indicating that the within effect of hearing impairment on subjective survival probability is also significant. The magnitude gets slightly lower with a 1.2 point effect in the specification controlling for self-assessed health.

We perform several robustness checks on our findings. First, we estimate the model separately for each wave (Table 4). We find that the impact of hearing impairment is always negative and significant and quite stable across waves in terms of magnitude. The magnitude is as well remarkably stable ranging between 6.6 and 8.7 percent points for the poor hearing level. Second, we estimate our specification conditional to each of the five different self-assessed health levels in order to test whether hearing impairment has a significant effect on the dependent variable, conditionally to a given level of self-assessed health with/without attrition control (Table 5). Again, our main finding remains robust and significant. We further split our sample by gender and high/low education status (Tables 6 and 7). The effect of hearing impairment does not vary much and is significant and negative in all subsamples, except for the male subsample where it is weaker. In all our models we use country clustered standard errors which are larger with respect to robust standard errors.

We finally consider the problem of focal-point responses since elicitation of subjective expectations about probabilities typically produces distributions concentrated around the focal answers of the respondents. In general the expected focal answers considered in the literature are 0, 50 and 100 (e.g., Hurd and McGarry, 1995; Hurd et al., 1998; Hurd et al., 2005). Whileit is clearly more difficult to choose probabilities that are detailed at second digit (ie. discerning whether self-assessed probability of being alive at the target age is 53 or 54 percent), we may consider focal

responses as sign of lower accuracy and reliability in responses (Lillard and Willis, 2001; Kézdi and Willis, 2003; Hill et al., 2004) or, alternatively, of uncertainty and lack of knowledge about the dependent variable (e.g., de Bruin et al., 2000; Manski and Molinari, 2010; Delavande and Rohwedder, 2011). This is why research working on this type of variables proposes robustness checks on the point. The method we follow is to exclude focal points in our analysis as a robustness check. Differing from the general tendency in the literature, the focal answers in our data are more likely to be 50, 80 and 100 since their frequencies are extremely high[9] with respect to other responses (Figure 2). We eliminate these possible focal responses and run the same models we used before (Table 8). Again we find robust and significant negative effects of hearing with increasing impairment levels in all models.

5. The effect of hearing impairment on mortality, life sense and life satisfaction

If expectations of SHARE respondents are correct we should expect a significant and positive effect of hearing impairment on mortality. Contrary to those expectations, we know that there is no scientific evidence about it in the medical literature. Hearing loss is a serious pathology that however does not affect significantly life expectancy. Our mortality estimates (Table 9) produce findings that are consistent with evidence from the medical literature and in contrast with those on subjective survival probability reported above. Among the six different estimations of the effect of all hearing categories, the only significant effect seems to be at the 5% level with a very low -0.004 probability for "fair" hearing level in the second model. However, that effect becomes insignificant when we control for the attrition that is relevant since the "fair" hearing level positively and significantly correlates with sample survival. We therefore conclude that, based on our evidence, hearing impairment has no statistically significant impact on mortality. On the other hand, being male,

[9] In fact 0, 50 and 100 responses are the most frequent responses in Hurd et al.(1998) and they are assumed to be focal responses for this reason. Likewise, Delavande and Rohwedder (2011) also do not admit 0 and 50 answers as outliers as they are not extremely more frequent than the other responses in that study.

underweight or widow, having diabetes, heart attack, high pressure, stroke, lung and cancer diseases significantly affect mortality (see Appendix for detailed Table 9 results with all the covariates of mortality).

In order to have a broader idea of the effect of hearing impairment on subjective wellbeing we estimate the effect of the former on life sense and life satisfaction using the same covariates included specification (1) except forecast horizon. As a measure of life sense, the frequency (never, rarely, sometimes and often) that the respondent gives to the question on the meaning to life, is used. For life satisfaction, the life satisfaction scores (from 0 to 10) that the respondents gave when answering how much they are satisfied with life, are used. In all our pooled OLS and fixed effect estimates for life sense and life satisfaction, the effect of hearing impairment is also negative, significant and increasing as far as the impairment becomes more severe (Tables 10-11). For quantifying the effects better, we also run ordered logit regressions using the same covariates in specification (1) except forecast horizon and as the dependent variable life sense and life satisfaction. According to our results, the probability that the respondent answers that life has for her/him often sense (the highest item in the question) decreases by 3 to 8 percent from the lowest to highest impairment with respect to "excellent" hearing (Table 12), Likewise, the probability of full life satisfaction decreases by 2 to 4 percent with the increasing hearing impairment.

6. Further Robustness Check with Propensity Score Matching

Finally, we perform a quasi-experimental framework on our data using the propensity score matching approach proposed by Rosenbaum and Rubin (1983) and Heckman et al. (1997). We first group low hearing levels ("poor" or "fair") as the treated group and the other levels as the control. The propensity scores are calculated through a probit regression using as dependent variable a dummy that takes value one if the respondent has a low hearing level and the independent variables are all the other regressors used in our base model. Then, using these scores and considering also wave and

country fixed effects, we match the charateristics of the groups according to five nearest neigbours[10] with replacement and 0.04 percent caliper distance for the subjective survival probability outcome in order to prevent biased and poor matches. In the end, we reach a highly balanced treatment and control group consisting of 28,167 and 67,700 observations respectively, such that none of the characterisics are significantly different between two groups as it can be seen in Table 13.

The average treatment effect on the treated (low hearing levels) is found as the difference between the mean of the matched groups. The reported value is -2.16, meaning that poor or fair hearing respondents declare significantly 2.16 lower probability of being alive at the target age with respect to better hearing respondents, which is consistent with our previous results. We as well perform nearest neighbour matching for the full life satisfaction (life satisfaction score 10) and often life sense dummy variables and again we obtain negative and significant effect for the low hearing levels from highly balanced samples (See Table 15 and 16 in Appendix for the balanced characteristics).

In order to compare better with our previous results with the results of the matched samples, we reestimate our base model with self-health controls for the three dependent variables (subjective survival probability, ”highest” life satisfaction level and “often” life sense) for the matched samples (Table 14). The impacts of the hearing levels are again all significant with increasing impairment and have almost the same effects as the previous results (the second column of Table 3 and Table 12) which confirms that our findings are robust and consistent.

[10] Our final findings are also robust with respect to different matching algorithms like 1-to-1 matching, and radius matching. Nearest neighbour method is preferred because it allows us to estimate the model with more observations and with possibly less biased results.

7. Conclusions

Happy life years are a subjective wellbeing indicator putting together two crucial wellbeing factors (life expectancy and life satisfaction), with life expectancy being weighted for the satisfaction for life enjoyed by the respondent. In our empirical analysis we find that hearing impairment impacts negatively on both since it reduces self-assessed probability that respondents attach to being alive at a target age, on the one side, and current reported life satisfaction and life sense, on the other side.

We focus on hearing impairment as we consider this variable an exogenous shock (not driven by socio-demographic factors, character traits, human actions or intentions) that has, by definition, the effect of reducing the relationship of the individual with the external environment (intended in the sense of natural environment and human community). For these reasons hearing impairment is the best variable to analyse the effect of relational life on subjective wellbeing.

Our research hypothesis hinges on the fact that the impact of hearing impairment is negative as it reduces the quantity and quality of human interactions thereby reducing relational goods that are typically consumed, produced and (invested in) via interactions. The negative effect arises because hearing impairment produces partial excludability, thereby limiting fruition of relational goods that are local public goods enjoyed through relationships.

Our findings are extremely strong and robust showing that the self-assessed negative effect is important but also overestimated by respondents. More specifically, hearing impairment reduces significantly life satisfaction, life sense and subjective survival probability, even though it does not affect mortality in our sample. This finding implies that the perceived effect on subjective wellbeing (for the portion explained by life expectancy) is even larger than the actual effect.

An obvious policy suggestion arising from our findings is that measures aimed to reduce isolation of those suffering from hearing impairment have a remarkable effect on subjective wellbeing.

References

Antoci, Angelo, Pier Luigi Sacco, and Paolo Vanin. "Social capital accumulation and the evolution of social participation." The Journal of Socio-Economics 36.1 (2007): 128-143.

Aslam, Aquib, and Luisa Corrado. "No man is an island: the inter-personal determinants of regional well-being in Europe." (2007).

Bartolini, Stefano, Ennio Bilancini, and Maurizio Pugno. "Did the decline in social capital decrease American happiness." A relational explanation of the happiness paradox. University of Siena Department of Economics Working Paper 513 (2008).

Becchetti, Leonardo, Alessandra Pelloni, and Fiammetta Rossetti. "Relational goods, sociability, and happiness." Kyklos 61.3 (2008): 343-363.

Becchetti, Leonardo, Elena Giachin Ricca, and Alessandra Pelloni. "On the causal impact of relational goods on happiness." CEIS Research Paper Series (2009).

Becchetti, Leonardo, Giovanni Trovato, and David Andres Londono Bedoya. "Income, relational goods and happiness." Applied Economics 43.3 (2011): 273-290.

Bertoni, M., A. Bonfatti, C. Dal Bianco, G. Weber and F. Zantomio. “Harmonized net income measures in SHARE Wave 1.” SHARE Working Paper Series (2016):25-2016

Börsch-Supan, Axel, et al. "Data resource profile: the Survey of Health, Ageing and Retirement in Europe (SHARE)." International journal of epidemiology 42.4 (2013): 992-1001.

Bruni, Luigino, and Luca Stanca. "Watching alone: relational goods, television and happiness." Journal of Economic Behavior & Organization 65.3 (2008): 506-528.

Corneo, Giacomo. "Work and television." European Journal of Political Economy 21.1 (2005): 99-113.

De Bruin, Wändi B., Baruch Fischhoff, Susan G. Millstein and Bonnie L. Halpern-Felsher. "Verbal and numerical expressions of probability:“It's a fifty–fifty chance”." Organizational behavior and human decision processes 81.1 (2000): 115-131.

De Luca, G., Celidoni, M., & Trevisan, E. (2015). Item non response and imputation strategies in SHARE Wave 5. SHARE Wave, 5, 85-100.

Delavande, Adeline, and Susann Rohwedder. "Differential survival in Europe and the United States: Estimates based on subjective probabilities of survival." Demography 48.4 (2011): 1377-1400.

Gardner, Jonathan, and Andrew J. Oswald. "Money and mental wellbeing: A longitudinal study of medium-sized lottery wins." Journal of health economics 26.1 (2007): 49-60.

Gui, Benedetto. "Eléments pour une définition d’économie communautaire." Notes et documents 19.20 (1987): 32-42.

Heckman, J. J., Ichimura, H., & Todd, P. E. (1997). Matching as an econometric evaluation estimator: Evidence from evaluating a job training programme. The review of economic studies, 64(4), 605-654.

Helliwell, John F., and Robert D. Putnam. "The social context of well-being." Philosophical Transactions of the Royal Society B: Biological Sciences 359.1449 (2004): 1435.

Hill, Daniel, Michael Perry, and Robert J. Willis. "Estimating Knightian uncertainty from survival probability questions on the HRS." Labor and social interaction in economics, A conference in honor of Yoram Weiss’ sixty-fifth birthday. 2004.

Hurd, Michael D., Daniel L. McFadden, and Li Gan. "Subjective survival curves and life cycle behavior." Inquiries in the Economics of Aging. University of Chicago Press, 1998. 259-309.

Hurd, Michael D., and Kathleen McGarry. "Evaluation of the subjective probabilities of survival in the health and retirement study." Journal of Human resources (1995): S268-S292..

Hurd, Michael D., Susann Rohwedder, and Joachim Winter. "Subjective probabilities of survival: An international comparison." RAND manuscript (2005).

Jenkins, Stephen P., and Lars Osberg. "Nobody to Play with?." The economics of time use. Emerald Group Publishing Limited, 2004. 113-145.

Kézdi, Gábor, and Robert J. Willis. "Who becomes a stockholder? Expectations, subjective uncertainty, and asset allocation." (2003).

Kuhn, Peter, et al. "The effects of lottery prizes on winners and their neighbors: Evidence from the Dutch postcode lottery." American Economic Review 101.5 (2011): 2226-47.

Lachowska, Marta. "The Effect of Income on Subjective Well-Being Evidence from the 2008 Economic Stimulus Tax Rebates." Journal of Human Resources 52.2 (2017): 374-417.

Lillard, Lee A., and Robert J. Willis. "Cognition and wealth: The importance of probabilistic thinking." Michigan Retirement Research Center Research Paper No. WP 7 (2001).

Lindahl, M. (2005). Estimating the effect of income on health and mortality using lottery prizes as an exogenous source of variation in income. Journal of Human resources, 40(1), 144-168.

Litwin, H., & Stoeckel, K. J. (2016). Social network, activity participation, and cognition: A complex relationship. Research on aging, 38(1), 76-97.

Meier, Stephan, and Alois Stutzer. "Is volunteering rewarding in itself?." Economica 75.297 (2008): 39-59.

Manski, Charles F., and Francesca Molinari. "Rounding probabilistic expectations in surveys." Journal of Business & Economic Statistics 28.2 (2010): 219-231.

Powdthavee, N. (2008). Putting a price tag on friends, relatives, and neighbours: Using surveys of life satisfaction to value social relationships. The Journal of Socio-Economics, 37(4), 1459-1480.

Randon, Emanuela, Luigino Bruni, and Ahmad Naimzada. "Dynamics of relational goods." International review of economics 55.1-2 (2008): 113-125.

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. Biometrika, 70(1), 41-55.

Uhlaner, Carole Jean. "“Relational goods” and participation: Incorporating sociability into a theory of rational action." Public choice 62.3 (1989): 253-285

Table 1. Variable Legend

Variable	Description
	Dependent variables
Subjective survival probability (SSP)	Self-assessed probability of being alive at the life expectancy target age given to the respondent (0-100 percent).
Life satisfaction	Self-assessed life satisfaction scores (0-10)
Life sense	Frequency of times in which the respondent gives a meaning to her/his life (never, rarely, sometimes or often).
Mortality	Dummy variable=1 if the respondent dies in the next waves and and 0 otherwise.
	Health related variables
Number of chronic diseases	Number of the following chronic diseases: heart attack, high blood pressure or hypertension, high blood cholesterol, a stroke or cerebral vascular disease, diabetes or high blood sugar, chronic lung disease,cancer or malignant tumor, stomach or duodenal ulcer, peptic ulcer, Parkinson disease, cataracts, hip fracture or femoral fractur.
Diabetes	Dummy variable=1 if the doctor told the respondent had: Diabetes or high blood sugar. 0 otherwise
Heart attack	Dummy variable=1 if the doctor told the respondent had: heart attack. 0 otherwise
High pressure	Dummy variable=1 if the doctor told the respondent had: high blood pressure or hypertension. 0 otherwise
Stroke	Dummy variable=1 if the doctor told the respondent had: stroke. 0 otherwise
Lung	Dummy variable=1 if the doctor told the respondent had: chronic lung disease. 0 otherwise
Cancer	Dummy variable=1 if the doctor told the respondent had: cancer. 0 otherwise
Parkinson	Dummy variable=1 if the doctor told the respondent had: Parkinson. 0 otherwise
Self Health	Self-perceived health status: 1=Excellent, 2=Very good, 3=Good,4=Fair, 5=Poor
Maxgrip	Maximum of grip strength measure which increases with increasing grip strength.
	Socio-demographic and other variables
Age class	0/1dummies for the following age groups: Age 50-54; Age 55-59; Age 60-64; Age 65-69; Age 70-74; Age 75-79, Age 80-84; Age 85-89; Age 90-94; Age 95+
Education status	ISCED (International Standard Classification of Education) levels: Zero level of education meaning no education or unfinished first level of education. First level (primary education or first stage basic education), second level (lower secondary or second stage of basic education), third level (upper secondary education), fourth level (post-secondary non tertiary education), fifth level (first stage of tertiary education), sixth level (second stage of tertiary education).
Male	Dummy variable = 1 if the respondent's gender is male and 0 otherwise.
Income	Yearly household income after taxes and social insurance contributions.
Job status	Categorical job status variable indicating Retired, Employed or self-employed, Unemployed, Permanently sick or disabled, Homemaker or Other
Sport activity	Frequency of sport activities done by the respondent.: 1. More than once a week, 2. Once a week, 3. One to 3 times a month 4. Hardly ever or never
Marital status	Marital status categorical variable: 1=Married, 2= Registered Partner; 3= Divorced 4= Separated; 5= Widowed
Number of children	Number of the respondent's children
Underweight	Dummy variable=1 if the respondent is underweight (BMI<18.49), 0 otherwise
Obese	Dummy variable=1 if the respondent is obese (BMI>34.9) , 0 otherwise
Adla	Activities of Daily Living Index ranging from 0 to 5 with increasing values indicating higher difficulties of the respondent. It covers five main tasks: dressing, bathing or showering, eating, cutting up food, walking across a room and getting in or out of bed.
Iadla	Instrumental Activities of Daily Living Index ranging from 0 to 3 with increasing values indicating higher difficulties of the respondent. It covers the following activities: telephone calls, taking medications and managing money
Friend network size	Number of friends in the social network.
Social network size	Number of people in the social network.
Social connection level	Scale of social connectedness which is computed using the relationship with social network members, their gender, residential proximities to the respondent, frequency of contacts and levels of emotional closeness with the respondent. The scale increases with higher connection.
Social connection satisfaction	Scale of social network satisfaction which increases with higher satisfaction.
Forecast horizon	The difference between the life expectancy target age given to the respondent and the respondent's age.
Wave	2004 wave, 2006 wave, 2010 wave, 2013 wave and 2015 wave.
Country	The countries where the surveys were realized: Austria,Germany, Sweden, Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium, Israel, Czech Republic, Poland, Ireland, Hungary, Portugal, Slovenia and Estonia.

Tab 2 Descriptive findings of the sample

Continuous variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Subjective survival probability	213.042	62.228	29.735	0	100
Friend Network Size	114,303	0.467	0.874	0	7
Social Network Size	58,184	2.473	1.598	0	7
Social Connection Level	58,092	1.978	0.869	0	4
Social Connection Satisfaction	117,066	8.879	1.400	0	10
Household size	344.039	2.451	1.283	0	15
ln(1+Income)	256.833	9.077	1.451	0	15
Number of children	258.884	2.191	1.410	0	19
Maxgrip	236.234	33.717	11.924	1	99
Number of chronic	259.166	1.167	1.237	0	10
Forecast horizon	229.128	3.99	14.513	5	25

Categorical DummyVariables

Variable	Obs	Density	Variable	Obs	Density
Life satisfaction	221.515		Life sense	220.601	
0		0.006	Never		0.025
1		0.003	Rarely		0.068
2		0.006	Sometimes		0.234
3		0.014	Often		0.674
4		0.018			
5		0.100	Mortality	173,955	0.039
6		0.075	Self health	259,263	
7		0.166	Excellent		0.079
8		0.309	Very good		0.179
9		0.153	Good		0.361
10		0.150	Fair		0.270
			Poor		0.110
Male	354.652	0.449			
Age class	254.313		Hearing	259.153	
50-55		0.100	Excellent		0.164
55-59		0.167	Very good		0.257
60-64		0.179	Good		0.384
65-69		0.168	Fair		0.156
70-74		0.140	Poor		0.039
75-79		0.111	Education status	354.652	
80-84		0.078	No or unfinished		0.311
85-89		0.041	Primary		0.148
90-94		0.015	Lower Secondary		0.129
95+		0.002	Upper Secondary		0.231
Marital status	257.341		Post-Secondary, non Tertiary		0.031
Married		0.689	First level Tertiary		0.146
Registered Partner		0.015	Second level Tertiary		0.005

	Separated		0.012
	Never Married		0.054
	Divorced		0.080
	Widowed		0.150
Adla		259.269	
	0		0.886
	1		0.058
	2		0.025
	3		0.013
	4		0.009
	5		0.010
Country		354.409	
	Austria		0.058
	Germany		0.064
	Sweden		0.057
	Netherlands		0.046
	Spain		0.085
	Italy		0.077
	France		0.075
	Denmark		0.052
	Greece		0.040
	Switzerland		0.046
	Belgium		0.091
	Israel		0.037
	Czech Republic		0.071
	Poland		0.027
	Ireland		0.003
	Luxembourg		0.015
	Hungary		0.012
	Portugal		0.017
	Slovenia		0.047
	Estonia		0.069
	Croatia		0.011
Obese		251.487	0.207
Underweight		354.652	0.009
Diabetes		259.076	0.124
Heart attack		259.076	0.123
High pressure		259.076	0.383
Stroke		259.076	0.040
Lung		259.076	0.060
Cancer		259.076	0.050
Parkinson		259.076	0.008
Iadla		259.269	
	0		0.943
	1		0.033
	2		0.011
	3		0.013
Job status		256,931	
	Retired		0.547
	Employed or self-employed		0.273
	Unemployed		0.030
	Permanently sick or disabled		0.035
	Homemaker		0.101
	Other		0.014
Sport Activity		258.512	
	More than once a week		0.339
	Once a week		0.137
	One to 3 times a month		0.090
	Hardly ever or never		0.433
Wave		354.652	
	1		0.087
	2		0.133
	4		0.235
	5		0.264
	6		0.281

Note: Density measures the average value of the (0/1) dummy variable picking up the given modality of the categorical variable.

Figure 1 Mean Friend Network Size, Social Network Size, Social Connection and Social Connection Satisfaction by Hearing impairment levels with 95% Confidence Intervals

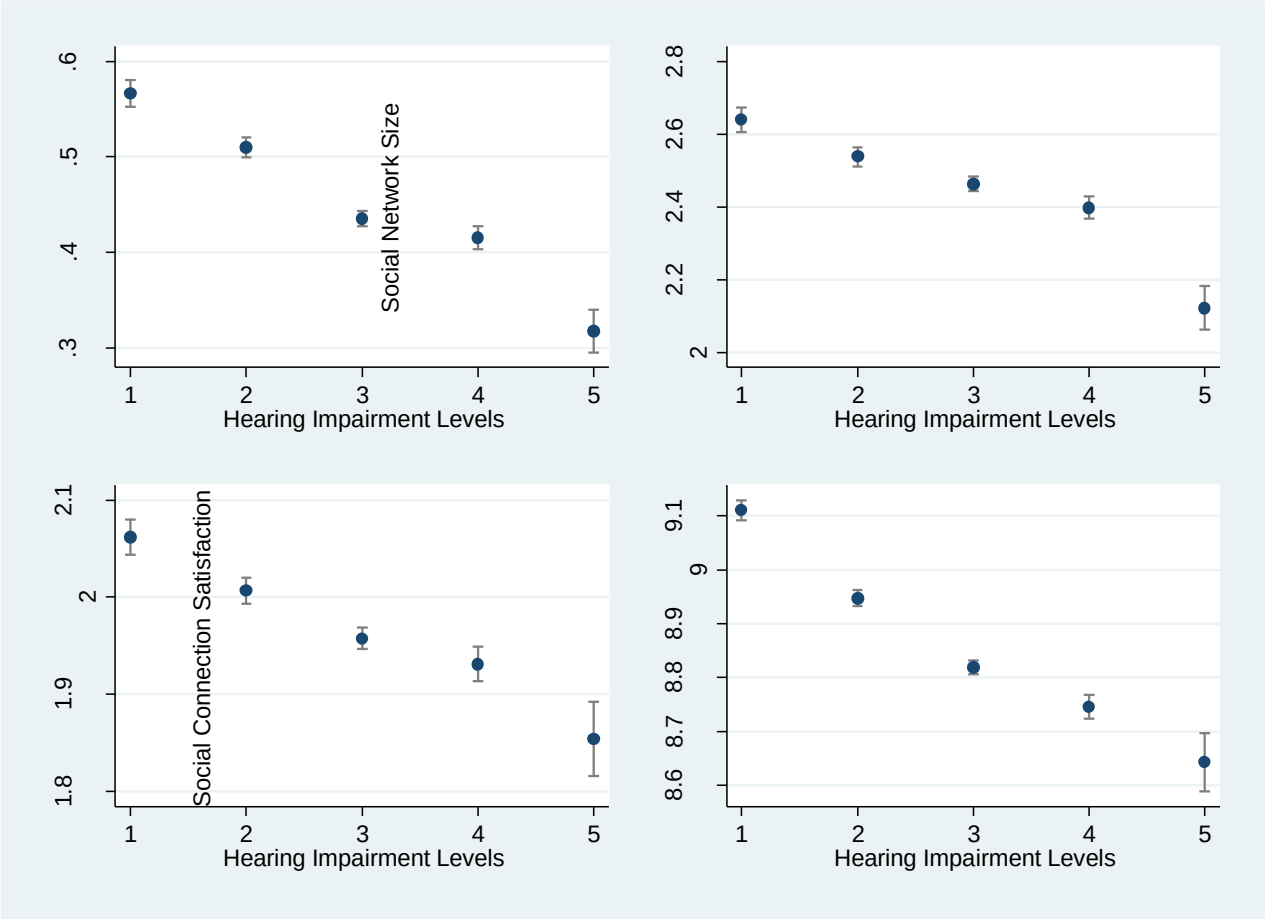

Table 3 Pooled OLS, Fixed Effect and sample survival Probability estimates

VARIABLES	(1) Base	(2) Base+SH	(3) Base+Attr	(4) Base+Attr+SH	(5) FE	(6) FE+SH	(7) Sample Survival
Hearing							
Very good	-1.991***	-1.354***	-1.994***	-1.388***	-0.853***	-0.680**	0.010
	(0.213)	(0.229)	(0.241)	(0.252)	(0.263)	(0.271)	(0.007)
Good	-4.466***	-2.738***	-4.461***	-2.779***	-2.029***	-1.504***	0.010**
	(0.303)	(0.302)	(0.326)	(0.321)	(0.424)	(0.393)	(0.005)
Fair	-6.160***	-3.737***	-6.055***	-3.720***	-3.126***	-2.317***	0.016**
	(0.375)	(0.354)	(0.403)	(0.373)	(0.512)	(0.503)	(0.007)
Poor	-7.240***	-4.002***	-7.025***	-3.836***	-3.375***	-2.296***	0.010
	(0.632)	(0.600)	(0.686)	(0.674)	(0.827)	(0.797)	(0.010)
Education status							
Primary	-0.618	-0.949	-0.792	-1.152	17.883***	18.501***	0.031***
	(0.966)	(0.986)	(1.056)	(1.046)	(4.763)	(4.831)	(0.011)
Lower Secondary	-0.206	-0.918	-0.211	-0.998	13.035**	13.724**	0.032***
	(0.756)	(0.770)	(0.800)	(0.794)	(6.159)	(6.226)	(0.012)
Upper Secondary	0.957	-0.221	0.826	-0.396	6.811	7.329	0.045***
	(0.728)	(0.731)	(0.831)	(0.809)	(6.191)	(6.176)	(0.012)
Post-Secondary, non Tertiary	1.432*	-0.017	1.061	-0.372	8.557	8.501	0.045***
	(0.720)	(0.733)	(0.850)	(0.830)	(9.344)	(9.141)	(0.015)

First level Tertiary	1.777**	-0.135	1.423	-0.464	9.812	10.023	0.060***
	(0.785)	(0.822)	(0.917)	(0.915)	(7.097)	(7.225)	(0.012)
Second level Tertiary	0.660	-1.575	0.642	-1.572	16.383	17.435	0.044**
	(1.312)	(1.413)	(1.364)	(1.438)	(9.931)	(10.113)	(0.019)
Male	-4.316***	-3.397***	-4.250***	-3.356***	-0.644	-0.644	-0.011***
	(0.553)	(0.480)	(0.535)	(0.481)	(7.478)	(7.071)	(0.004)
Age class							
55-59	-3.815***	-3.766***	-4.154***	-4.112***	-0.806**	-0.863**	-0.034***
	(0.327)	(0.338)	(0.318)	(0.323)	(0.313)	(0.306)	(0.007)
60-64	-7.526***	-7.759***	-7.941***	-8.178***	-1.231*	-1.403**	-0.041***
	(0.497)	(0.564)	(0.450)	(0.507)	(0.637)	(0.609)	(0.008)
65-69	-11.824***	-12.193***	-12.398***	-12.772***	-1.097	-1.323	-0.045***
	(0.642)	(0.700)	(0.649)	(0.690)	(0.820)	(0.783)	(0.011)
70-74	-16.367***	-16.719***	-16.800***	-17.139***	0.454	0.259	-0.056***
	(0.819)	(0.890)	(0.749)	(0.804)	(0.994)	(0.950)	(0.011)
75-79	-23.440***	-23.726***	-24.019***	-24.283***	-0.939	-1.042	-0.058***
	(1.088)	(1.183)	(1.029)	(1.105)	(1.145)	(1.080)	(0.012)
80-84	-29.612***	-29.987***	-30.154***	-30.462***	-2.094	-2.077	-0.083***
	(1.444)	(1.554)	(1.304)	(1.407)	(1.436)	(1.368)	(0.012)
85-89	-33.929***	-34.603***	-34.300***	-35.050***	-1.681	-1.468	-0.098***
	(1.718)	(1.822)	(1.593)	(1.705)	(1.826)	(1.748)	(0.012)
90-94	-34.901***	-36.323***	-35.013***	-36.427***	1.633	2.041	-0.114***
	(2.174)	(2.230)	(1.997)	(2.059)	(2.584)	(2.613)	(0.014)
95+	-45.923***	-48.274***	-45.811***	-48.857***	-6.670	-5.781	-0.191***
	(4.149)	(3.819)	(4.406)	(4.150)	(5.901)	(6.109)	(0.027)
Forecast horizon	-1.308***	-1.293***	-1.350***	-1.333***	-1.655***	-1.647***	
	(0.059)	(0.058)	(0.061)	(0.059)	(0.085)	(0.084)	
Household size	0.209*	0.209**	0.264**	0.261**	0.244	0.257	0.002
	(0.101)	(0.095)	(0.106)	(0.104)	(0.237)	(0.233)	(0.002)
ln(1+Income)	0.503***	0.429***	0.497***	0.424***	-0.004	-0.010	0.006**
	(0.097)	(0.093)	(0.100)	(0.095)	(0.107)	(0.106)	(0.002)
Number of children	0.296**	0.282**	0.293**	0.261**	0.117	0.142	0.002
	(0.104)	(0.111)	(0.106)	(0.115)	(0.164)	(0.170)	(0.001)
Sport activity							
Once a week	-1.489***	-1.070***	-1.672***	-1.259***	-0.675**	-0.557**	0.002
	(0.345)	(0.333)	(0.363)	(0.354)	(0.274)	(0.261)	(0.003)
One to 3 times a month	-2.227***	-1.808***	-2.345***	-1.925***	-0.742	-0.606	-0.004
	(0.395)	(0.401)	(0.401)	(0.407)	(0.483)	(0.470)	(0.005)
Hardly ever or never	-3.874***	-2.185***	-3.872***	-2.187***	-1.518***	-1.099**	-0.008*
	(0.450)	(0.438)	(0.453)	(0.439)	(0.480)	(0.475)	(0.004)
Self-assessed health							
very good		-4.385***		-4.324***		-1.534***	-0.007*
		(0.242)		(0.306)		(0.218)	(0.004)
good		-8.460***		-8.372***		-3.449***	-0.017***
		(0.469)		(0.528)		(0.292)	(0.004)
fair		-14.616***		-14.434***		-6.705***	-0.022**
		(0.554)		(0.605)		(0.273)	(0.009)
poor		-23.982***		-23.775***		-11.202***	-0.024**
		(0.585)		(0.634)		(0.466)	(0.010)
Marital status							
Registered Partner	0.295	0.373	0.382	0.404	2.134*	1.918	-0.012
	(0.738)	(0.742)	(0.622)	(0.629)	(1.165)	(1.137)	(0.009)
Separated	-1.682***	-1.437***	-1.940***	-1.757***	-1.089	-1.392	-0.002

	(0.475)	(0.480)	(0.575)	(0.606)	(2.152)	(2.063)	(0.007)
Never Married	-1.415***	-1.177**	-1.356***	-1.156**	1.481	1.382	-0.011*
	(0.444)	(0.431)	(0.417)	(0.408)	(2.167)	(2.279)	(0.006)
Divorced	0.204	0.443	0.343	0.585	0.967	0.946	0.002
	(0.480)	(0.462)	(0.501)	(0.492)	(0.920)	(0.943)	(0.006)
Widowed	-2.169***	-2.150***	-2.071***	-2.093***	-1.626***	-1.742***	-0.013***
	(0.494)	(0.462)	(0.498)	(0.466)	(0.501)	(0.515)	(0.005)
Adla level 1	-5.134***	-2.495***	-5.170***	-2.525***	-2.235***	-1.676***	0.012***
	(0.355)	(0.388)	(0.402)	(0.429)	(0.375)	(0.376)	(0.004)
adla level 2	-5.550***	-1.673**	-5.705***	-1.855**	-3.386***	-2.424**	0.003
	(0.772)	(0.681)	(0.792)	(0.700)	(1.103)	(1.025)	(0.006)
Adla level 3	-8.658***	-4.038***	-8.377***	-3.859***	-4.486***	-3.267***	-0.006
	(0.754)	(0.696)	(0.741)	(0.707)	(1.031)	(0.982)	(0.011)
Adla level 4	-11.188***	-6.035***	-10.540***	-5.531***	-5.383***	-3.991***	-0.019*
	(1.336)	(1.281)	(1.346)	(1.259)	(1.393)	(1.399)	(0.011)
Adla level 5	-7.630***	-3.908*	-8.250***	-4.783**	-6.884***	-5.833**	0.058**
	(2.052)	(2.103)	(2.133)	(2.092)	(2.242)	(2.136)	(0.024)
Iadla level 1	-3.491***	-2.279***	-3.161***	-1.938*	-1.360	-1.069	-0.024***
	(0.742)	(0.724)	(0.974)	(0.991)	(0.840)	(0.864)	(0.006)
Iadla level 2	-2.787**	-2.244*	-1.527	-1.002	-2.519**	-2.307**	-0.064***
	(1.208)	(1.120)	(1.589)	(1.532)	(1.093)	(1.021)	(0.022)
Iadla level 3	3.044	2.329	4.695**	4.067**	0.674	0.473	-0.121***
	(1.882)	(1.894)	(1.817)	(1.727)	(2.150)	(2.118)	(0.020)
Underweight	-4.501***	-3.561***	-4.657***	-3.756***	0.712	1.031	-0.013**
	(0.804)	(0.738)	(0.907)	(0.830)	(0.776)	(0.768)	(0.007)
Obese	-0.257	0.552**	-0.183	0.633**	-0.020	0.119	0.008***
	(0.300)	(0.254)	(0.321)	(0.280)	(0.297)	(0.291)	(0.003)
Maxgrip	0.181***	0.108***	0.179***	0.106***	0.093***	0.068***	0.001***
	(0.010)	(0.011)	(0.012)	(0.013)	(0.024)	(0.023)	(0.000)
Number of chronic diseases	-1.491***	-0.767***	-1.469***	-0.767***	-0.242	-0.069	0.013***
	(0.122)	(0.118)	(0.116)	(0.116)	(0.195)	(0.186)	(0.001)
Diabetes	-0.880**	-0.060	-0.826**	0.026	-0.772	-0.541	-0.011***
	(0.317)	(0.273)	(0.358)	(0.325)	(0.557)	(0.556)	(0.002)
Heart attack	-4.194***	-2.692***	-4.178***	-2.679***	-2.170***	-1.759***	0.000
	(0.378)	(0.349)	(0.360)	(0.343)	(0.436)	(0.427)	(0.003)
High presssure	-0.804***	-0.561**	-0.855***	-0.590**	-0.229	-0.155	-0.010***
	(0.214)	(0.200)	(0.289)	(0.264)	(0.189)	(0.190)	(0.003)
Stroke	-0.801	0.163	-1.214	-0.260	-1.287*	-0.912	-0.003
	(0.552)	(0.496)	(0.726)	(0.704)	(0.676)	(0.643)	(0.005)
Lung	-3.454***	-1.694***	-3.443***	-1.690***	-0.953	-0.696	0.000
	(0.493)	(0.396)	(0.495)	(0.397)	(0.616)	(0.621)	(0.005)
Cancer	-5.161***	-3.486***	-5.094***	-3.437***	-3.134***	-2.480***	0.004
	(0.591)	(0.534)	(0.552)	(0.506)	(0.500)	(0.501)	(0.004)
Parkinson	-2.184**	0.185	-2.632**	-0.201	0.782	1.395	-0.017**
	(1.034)	(0.838)	(1.123)	(0.931)	(2.121)	(2.049)	(0.008)
Job status							
Employed or self-employed	2.166***	1.444***	2.237***	1.539***	-0.850**	-0.853**	-0.001
	(0.529)	(0.471)	(0.510)	(0.471)	(0.349)	(0.349)	(0.004)
Unemployed	-0.809	-0.337	-0.597	-0.056	-1.264**	-1.026*	0.001
	(0.660)	(0.674)	(0.607)	(0.609)	(0.551)	(0.570)	(0.007)
Permanently sick or disabled	-4.501***	-0.935	-4.222***	-0.586	-2.102**	-1.469*	-0.005

	(0.637)	(0.664)	(0.706)	(0.747)	(0.810)	(0.778)	(0.006)
Homemaker	-2.152***	-2.114***	-2.315***	-2.271***	-1.076**	-1.042*	-0.008
	(0.489)	(0.459)	(0.442)	(0.427)	(0.498)	(0.517)	(0.009)
Other	0.495	0.652	0.091	0.121	-1.691*	-1.626*	0.001
	(0.886)	(0.824)	(0.829)	(0.788)	(0.935)	(0.924)	(0.007)
Country							
Germany	-5.239***	-3.867***	-5.359***	-3.973***			-0.112***
	(0.226)	(0.226)	(0.228)	(0.232)			(0.011)
Sweden	-3.724***	-4.898***	-3.938***	-5.040***			-0.091***
	(0.365)	(0.364)	(0.385)	(0.398)			(0.010)
Netherlands	-0.220	-0.595**	-0.407*	-0.681***			-0.368***
	(0.285)	(0.269)	(0.225)	(0.209)			(0.011)
Spain	2.974***	2.723***	2.817***	2.615***			-0.110***
	(0.330)	(0.330)	(0.349)	(0.347)			(0.009)
Italy	2.488***	2.770***	2.150***	2.459***			-0.080***
	(0.302)	(0.291)	(0.300)	(0.289)			(0.009)
France	-3.531***	-3.265***	-3.770***	-3.442***			-0.093***
	(0.160)	(0.153)	(0.173)	(0.165)			(0.005)
Denmark	3.933***	2.490***	3.829***	2.428***			-0.085***
	(0.285)	(0.255)	(0.292)	(0.273)			(0.009)
Greece	-3.295***	-3.702***	-3.211***	-3.617***			-0.129***
	(0.382)	(0.366)	(0.408)	(0.384)			(0.030)
Switzerland	-0.423**	-1.292***	-0.217	-1.082***			-0.008**
	(0.189)	(0.199)	(0.183)	(0.192)			(0.003)
Belgium	-4.750***	-5.532***	-4.661***	-5.400***			-0.066***
	(0.160)	(0.148)	(0.148)	(0.138)			(0.005)
Israel	-1.146***	-1.519***	-1.510***	-1.718***			-0.276***
	(0.327)	(0.308)	(0.371)	(0.357)			(0.016)
Czech Republic	-15.400***	-14.031***	-15.843***	-14.403***			-0.121***
	(0.179)	(0.165)	(0.172)	(0.170)			(0.004)
Poland	-11.078***	-8.323***	-11.281***	-8.421***			-0.222***
	(0.375)	(0.345)	(0.413)	(0.396)			(0.017)
Ireland	3.633***	1.187**					
	(0.613)	(0.564)					
Luxembourg	-0.195	-0.592**	-0.194	-0.544*			-0.100***
	(0.268)	(0.271)	(0.295)	(0.307)			(0.024)
Hungary	-12.126***	-9.313***					
	(0.602)	(0.657)					
Portugal	0.506	2.346***	0.062	1.916***			0.066***
	(0.408)	(0.449)	(0.385)	(0.426)			(0.007)
Slovenia	-3.199***	-1.830***	-3.249***	-1.842***			0.010**
	(0.198)	(0.202)	(0.191)	(0.198)			(0.005)
Estonia	-6.688***	-2.873***	-7.020***	-3.249***			0.055***
	(0.233)	(0.270)	(0.225)	(0.274)			(0.003)
Croatia	-12.772***	-10.927***	-12.982***	-11.102***			0.014
	(0.454)	(0.473)	(0.477)	(0.495)			(0.026)
2nd wave	0.913	1.459***	0.927	1.512***	-2.592***	-2.215***	-0.195***
	(0.557)	(0.506)	(0.545)	(0.498)	(0.464)	(0.417)	(0.029)
4th wave	1.292	1.508	1.310	1.611*	-8.699***	-8.238***	-0.485***
	(1.035)	(1.016)	(0.915)	(0.900)	(0.968)	(0.911)	(0.050)
5th wave	4.311***	4.582***	4.205***	4.499***	-8.374***	-7.817***	-0.236***
	(0.765)	(0.770)	(0.734)	(0.739)	(0.654)	(0.600)	(0.048)

6th wave	6.523***	6.843***	6.548***	6.870***	-8.524***	-7.870***	-0.014
	(0.754)	(0.754)	(0.727)	(0.727)	(0.862)	(0.798)	(0.021)
Constant	92.872***	102.060***	94.110***	103.231***	84.774***	87.902***	
	(1.531)	(2.034)	(1.689)	(2.038)	(5.543)	(5.421)	
Mean SSP	63.167	63.171	63.326	63.326	63.167	63.171	
Observations	186,141	186,105	182,758	182,758	186,141	186,105	215,261
R-squared	0.223	0.248	0.227	0.252	0.041	0.048	
Number of id					101,641	101,630	

Base model (column 1) is the initial OLS estimate. Base+SH model adds self-assessed health variables, Base+Attr adds attrition correction and Base+Attr+SH adds both attrition correction and self-health levels to the base model. FE and FE+SH are the fixed effect regressions in which only the latter has self-health variables. Finally sample survival indicates the marginal effects of the covariates on the survival across waves. The omitted benchmark is an individual married, retired, living in Austria in the first wave, aged between 50-54, with no education level, making sport more than once a week, with excellent self decleared health, reporting zero difficulty in the Adla and Iadla indexes, with self-reported excellent hearing. Clustered (for country) standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4 Pooled OLS for all cross-section single waves

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Wave 1	Wave 2	Wave 4	Wave 5	Wave 6
Hearing					
Very good	-1.978***	-1.712***	-2.120**	-1.870***	-2.155***
	(0.432)	(0.320)	(0.727)	(0.393)	(0.326)
Good	-4.392***	-4.579***	-4.587***	-4.411***	-4.438***
	(0.368)	(0.679)	(0.919)	(0.503)	(0.406)
Fair	-5.897***	-5.970***	-6.599***	-6.411***	-6.042***
	(0.655)	(0.678)	(1.030)	(0.510)	(0.600)
Poor	-6.611***	-6.185***	-7.236***	-6.626***	-8.712***
	(1.459)	(1.090)	(1.699)	(0.725)	(0.886)
Mean SSP	62.201	61.569	59.233	64.609	65.094
Observations	22,596	27,700	29,114	51,636	55,095
R-squared	0.189	0.233	0.223	0.215	0.238

Excellent hearing is the omitted benchmark. Clustered (for country) standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Table 5 Pooled OLS for each self-assessed health level without and with attrition correction

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	SH1	SH2	SH3	SH4	SH5	SH1+Attr	SH2+Attr	SH3+Attr	SH4+Attr	SH5+Attr
Hearing										
Very good	-1.368**	-1.253***	-1.519***	-1.173**	-1.983*	-1.536**	-1.238***	-1.567***	-1.276**	-1.601
	(0.516)	(0.189)	(0.405)	(0.469)	(0.995)	(0.623)	(0.245)	(0.477)	(0.475)	(1.235)
Good	-1.714***	-2.150***	-2.780***	-3.234***	-5.002***	-1.860***	-2.126***	-2.769***	-3.359***	-5.131***
	(0.439)	(0.435)	(0.410)	(0.384)	(0.765)	(0.505)	(0.478)	(0.472)	(0.423)	(0.732)
Fair	-3.723***	-3.039***	-3.419***	-4.447***	-5.360***	-3.343***	-3.066***	-3.492***	-4.330***	-5.584***
	(0.518)	(0.606)	(0.437)	(0.575)	(0.716)	(0.526)	(0.643)	(0.517)	(0.580)	(0.730)
Poor	-4.673**	-0.837	-5.691***	-4.475***	-4.870***	-4.317**	-1.165	-5.210***	-4.328***	-5.127***
	(1.899)	(2.011)	(0.934)	(0.699)	(1.268)	(2.043)	(2.146)	(1.070)	(0.860)	(1.455)
Mean SSP	79.229	73.088	65.439	54.915	39.957	79.223	73.171	65.492	55.015	40.308
Observations	16,072	35,508	69,748	49,159	15,618	15,809	35,014	68,835	48,089	15,011
R-squared	0.122	0.138	0.154	0.153	0.134	0.123	0.141	0.161	0.160	0.132

SH1: self-health level 1 (excellent health); SH2: self-health level 2 (very good health); SH3: self-health level 3 (good health); SH4: self-health level 4 (fair health); SH5: self-health level 5 (poor health). Attr: Estimates corrected for attrition. Excellent hearing is the omitted benchmark. Clustered (for country) standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6 Pooled OLS and Fixed Effect estimations for females and males

VARIABLES	(1) OLS Female	(2) OLS Male	(3) FE Female	(4) FE Male
Hearing				
Very good	-1.374***	-1.188***	-0.895**	-0.424
	(0.316)	(0.302)	(0.380)	(0.261)
Good	-2.765***	-2.566***	-1.638***	-1.331**
	(0.303)	(0.475)	(0.502)	(0.477)
Fair	-3.924***	-3.490***	-3.097***	-1.590***
	(0.550)	(0.517)	(0.799)	(0.532)
Poor	-3.778***	-4.186***	-2.906***	-1.713
	(0.687)	(0.862)	(0.925)	(1.029)
Mean SSP	63.376	62.927	63.376	62.927
Observations	100,925	85,180	100,925	85,180
R-squared	0.265	0.233	0.046	0.052
Number of id			55,069	46,579

OLS: Ordinary Least Square regression. FE: Fixed effect regression. Excellent hearing is the omitted benchmark. Clustered (for country) standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7 Pooled OLS and Fixed Effect estimations for high and low education levels

VARIABLES	(1) OLS HighEduc	(2) OLS LowEduc	(3) FE HighEduc	(4) FE LowEduc
Hearing				
Very good	-1.260***	-1.748***	-0.794**	-0.176
	(0.216)	(0.586)	(0.306)	(0.526)
Good	-2.541***	-3.580***	-1.355***	-1.993***
	(0.293)	(0.664)	(0.381)	(0.696)
Fair	-3.553***	-4.521***	-2.306***	-2.451***
	(0.353)	(0.697)	(0.574)	(0.653)
Poor	-4.007***	-4.648***	-2.345**	-2.483*
	(0.597)	(1.154)	(1.003)	(1.217)
Mean SSP	64.826	57.404	64.826	57.404
Observations	144,606	41,499	144,606	41,499
R-squared	0.250	0.218	0.049	0.049
Number of id			78,059	23,640

OLS: Ordinary Least Square regression. FE: Fixed effect regression. HighEduc sample represents the sample with only education levels equal or greater than lower secondary or second stage of basic education since the mean education level is slightly lower than this level. LowEduc contains the primary, no or unfinished primary education levels. Excellent hearing is the omitted benchmark. Clustered (for country) standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Figure 2 Probability density function of the subjective survival probability variable

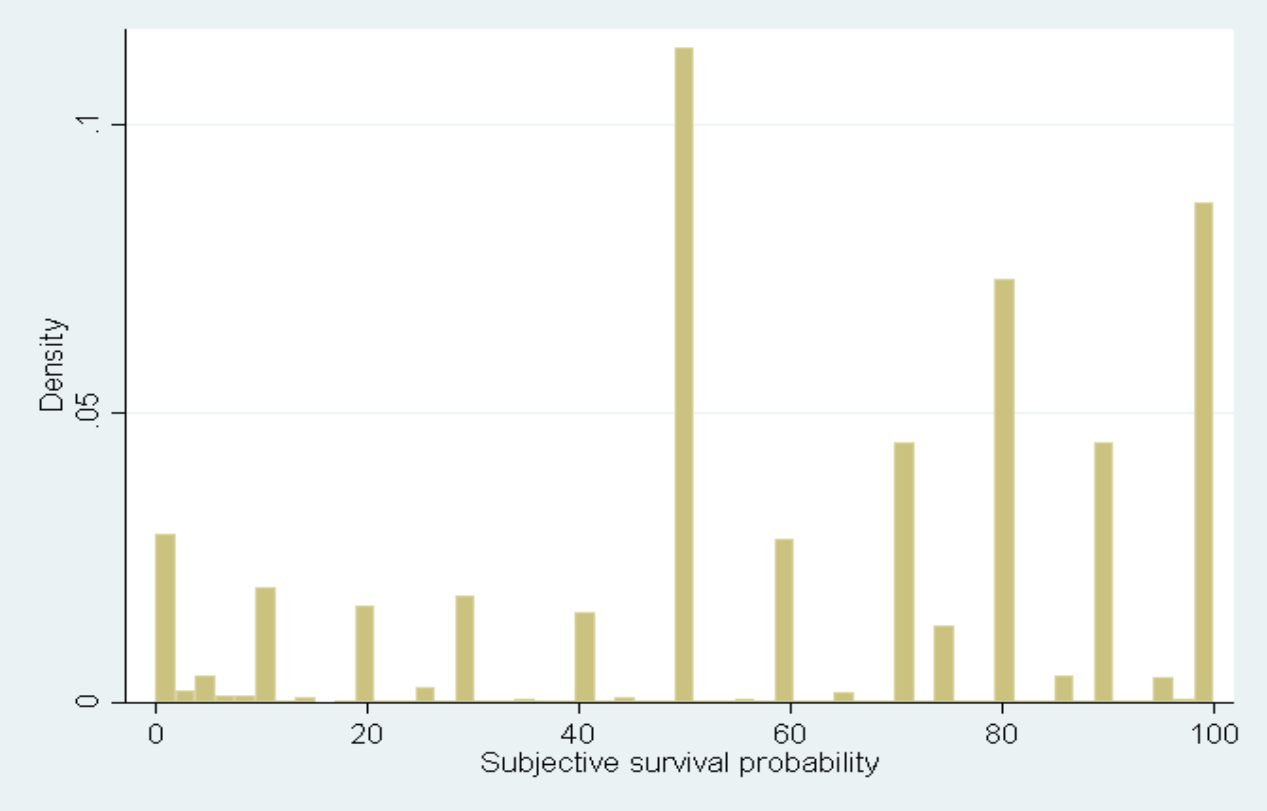

Table 8 Robustness check by excluding possible focal points of Subjective Survival Probability

VARIABLES	(1) Base	(2) Base+SH	(3) Base+Attr	(4) Base+Atrr+SH	(5) FE	(6) FE+SH
Hearing						
Very good	-0.364	-0.338	0.052	0.089	-0.791*	-0.648
	(0.303)	(0.357)	(0.307)	(0.357)	(0.425)	(0.425)
Good	-2.873***	-2.893***	-1.150***	-1.182**	-1.517**	-1.012
	(0.399)	(0.433)	(0.398)	(0.434)	(0.638)	(0.650)
Fair	-5.548***	-5.313***	-2.942***	-2.769***	-3.027***	-2.199**
	(0.412)	(0.511)	(0.408)	(0.515)	(0.758)	(0.820)
Poor	-6.357***	-6.326***	-2.953***	-2.887***	-3.492***	-2.338***
	(0.634)	(0.652)	(0.581)	(0.615)	(0.812)	(0.708)
Mean SSP	51.888	52.139	51.895	52.139	51.888	51.895
Observations	90,296	88,654	90,271	88,654	90,296	90,271
R-squared	0.293	0.294	0.322	0.324	0.049	0.058
Number of id					64,959	64,942

SH: Self-health levels also taken into account. Attr: Estimates corrected for attrition. FE: Fixed effect regression. Excellent hearing is the omitted benchmark. Clustered (for country) standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 9 The marginal and within group effects of hearing impairment on Mortality

VARIABLES	(1) Base	(2) Base+SH	(3) Base+Attr	(4) Base+Atrr+SH	(5) FE	(6) FE+SH	(7) Sample Survival
Hearing							
Very good	-0.000	-0.000	0.000	-0.000	-0.001	-0.001	0.002
	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.004)
Good	0.002	-0.000	0.002	0.000	0.001	0.000	0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.004)
Fair	-0.001	-0.004**	-0.001	-0.003	-0.003	-0.004	0.013**
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)
Poor	0.002	-0.002	0.002	-0.002	0.008*	0.005	0.015**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.004)	(0.007)
Observations	121,047	121,017	118,691	118,691	121,047	121,017	128,343
R-squared					0.063	0.065	
Number of id					71,643	71,629	

The first four panels report the effects as the marginal probability on mortality, obtained after the logit regressions that use the same covariates as the OLS regressions. SH: Self-health levels also taken into account. Attr: Estimates corrected for attrition.FE: Fixed effect regression. Excellent hearing is the omitted benchmark. Clustered (for country) standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 10 The effect of hearing impairment on Life Sense

VARIABLES	(1) Base	(2) Base+SH	(3) Base+Attr	(4) Base+Attr+SH	(5) FE	(6) FE+SH	(7) Sample Survival
Hearing							
Very good	-0.032***	-0.027***	-0.028***	-0.024***	-0.018*	-0.017	0.002
	(0.009)	(0.008)	(0.009)	(0.008)	(0.010)	(0.010)	(0.002)
Good	-0.074***	-0.055***	-0.070***	-0.051***	-0.048***	-0.041***	0.005*
	(0.014)	(0.013)	(0.013)	(0.012)	(0.014)	(0.014)	(0.002)
Fair	-0.123***	-0.090***	-0.117***	-0.085***	-0.078***	-0.065***	0.006*
	(0.019)	(0.017)	(0.019)	(0.016)	(0.022)	(0.020)	(0.004)
Poor	-0.184***	-0.128***	-0.175***	-0.120***	-0.103***	-0.082***	0.008
	(0.021)	(0.019)	(0.023)	(0.021)	(0.024)	(0.023)	(0.005)
Mean Life Sense	2.586	2.586	2.586	2.586	2.586	2.586	
Observations	192,812	192,760	189,269	189,269	192,812	192,760	191,085
R-squared	0.122	0.138	0.123	0.140	0.011	0.015	
Number of id					99,724	99,713	

SH: Self-health levels also taken into account. Attr: Estimates corrected for attrition.FE: Fixed effect regression. Excellent hearing is the omitted benchmark. Sample survival indicates the marginal effects of the covariates on the survival across waves. Clustered (for country) standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 11 The effect of hearing impairment on Life Satisfaction

VARIABLES	(1) Base	(2) Base+SH	(3) Base+Attr	(4) Base+Attr+SH	(5) FE	(6) FE+SH	(7) Sample Survival
Hearing							
Very good	-0.146***	-0.103***	-0.139***	-0.098***	-0.056***	-0.043***	0.001
	(0.020)	(0.020)	(0.021)	(0.020)	(0.016)	(0.014)	(0.002)
Good	-0.321***	-0.193***	-0.314***	-0.189***	-0.144***	-0.105***	0.005*
	(0.031)	(0.027)	(0.031)	(0.027)	(0.026)	(0.022)	(0.003)
Fair	-0.461***	-0.277***	-0.445***	-0.269***	-0.214***	-0.152***	0.008**
	(0.038)	(0.031)	(0.042)	(0.031)	(0.033)	(0.026)	(0.004)
Poor	-0.537***	-0.281***	-0.515***	-0.262***	-0.221***	-0.132**	0.008*
	(0.047)	(0.042)	(0.047)	(0.042)	(0.062)	(0.056)	(0.004)
Mean Life Sense	7.635	7.635	7.646	7.646	7.635	7.635	
Observations	193,622	193,568	190,079	190,079	193,622	193,568	191,085
R-squared	0.188	0.233	0.180	0.228	0.021	0.034	
Number of id					99,886	99,875	

SH: Self-health levels also taken into account. Attr: Estimates corrected for attrition.FE: Fixed effect regression. Excellent hearing is the omitted benchmark. Sample survival indicates the marginal effects of the covariates on the survival across waves. Clustered (for country) standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 12 Marginal Effect of Hearing in Ordered Logit Regressions for Life Sense and Full Life Satisfaction

VARIABLES	(1) Often Life Sense	(2) Full Life Satisfaction
Hearing		
Very good	-0.027***	-0.020***
	(0.007)	(0.003)
Good	-0.045***	-0.033***
	(0.009)	(0.004)
Fair	-0.064***	-0.043***
	(0.010)	(0.005)
Poor	-0.077***	-0.041***
	(0.010)	(0.006)
Observations	192,760	193,568

Excellent hearing is the omitted benchmark. Clustered (for country) standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 13 Propensity Score Matching and Matched Balanced Characteristics for Subjective Survival Probability

VARIABLES	Low Hearing Levels (Mean)	High Hearing Levels (Mean)	T-Statistics	P-value
Average Treatment Effect on the Treated				
Subjective survival probability	57.12	59.28	-9.28	0.00
Balanced Characteristics				
Male	0.52	0.52	-0.16	0.88
Education status				
Primary	0.21	0.21	1.00	0.32
Lower Secondary	0.19	0.20	-0.77	0.44

Upper Secondary	0.32	0.32	-0.01	0.99
Post-Secondary, non Tertiary	0.04	0.04	0.96	0.34
First level Tertiary	0.18	0.18	-0.42	0.68
Second level Tertiary	0.01	0.01	0.27	0.79
Age class				
55-59	0.13	0.13	0.81	0.42
60-64	0.16	0.16	-0.65	0.52
65-69	0.18	0.18	-0.45	0.66
70-74	0.17	0.17	0.09	0.93
75-79	0.15	0.15	-0.48	0.63
80-84	0.09	0.09	1.36	0.17
85-89	0.04	0.04	0.32	0.75
90-94	0.01	0.01	-0.65	0.52
95+	0.00	0.00	-0.22	0.83
Household size	2.11	2.11	0.52	0.60
ln(1+Income)	9.07	9.09	-1.44	0.15
Number of children	2.18	2.18	0.29	0.77
Sport Activity				
Once a week	0.13	0.13	0.38	0.70
One to 3 times a month	0.09	0.09	0.48	0.63
Hardly ever or never	0.45	0.45	0.48	0.63
Marital status				
Registered Partner	0.01	0.01	0.83	0.41
Separated	0.01	0.01	-0.51	0.61
Never Married	0.05	0.05	-0.92	0.36
Divorced	0.08	0.08	0.26	0.79
Widowed	0.16	0.16	-1.20	0.23
Self health				
Very good	0.11	0.11	0.59	0.56
Good	0.35	0.35	0.91	0.36
Fair	0.37	0.37	0.01	0.99
Poor	0.12	0.12	-1.28	0.20
Forecast horizon	13.83	13.84	-0.34	0.73
1.adla	0.07	0.07	1.41	0.16
2.adla	0.02	0.02	-0.04	0.96
3.adla	0.01	0.01	0.13	0.89
4.adla	0.00	0.01	-1.21	0.23
5.adla	0.00	0.00	0.52	0.61
1.iadla	0.03	0.03	0.64	0.53
2.iadla	0.01	0.00	0.82	0.41
3.iadla	0.00	0.00	0.38	0.70
Underweight	0.01	0.01	-1.03	0.31
Obese	0.23	0.23	-0.31	0.75
Maxgrip	33.97	33.97	0.03	0.98
Number of chronic	1.37	1.36	0.77	0.44
Diabetes	0.14	0.14	0.96	0.34
Heart attack	0.15	0.15	0.71	0.48

High pressure	0.44	0.44	-0.30	0.76
Stroke	0.05	0.04	0.58	0.56
Lung	0.07	0.07	0.66	0.51
Cancer	0.06	0.06	0.02	0.99
Parkinson	0.01	0.01	0.21	0.84
Job status				
Retired	0.65	0.65	0.40	0.69
Employed or self-employed	0.20	0.20	0.49	0.62
Unemployed	0.03	0.03	0.40	0.69
Permanently sick or disabled	0.04	0.04	-0.94	0.35
Homemaker	0.07	0.08	-0.75	0.46
Observations	28,167	67,700		

Table 14 Estimations for SSP, Often Life Sense and Full Life Satisfaction for the matched samples

VARIABLES	(1) Subjective survival probability	(2) Often Life Sense	(3) Full Life Satisfaction
Hearing			
Very good	-1.012***	-0.028***	-0.020***
	(0.344)	(0.006)	(0.003)
Good	-2.700***	-0.047***	-0.033***
	(0.426)	(0.009)	(0.004)
Fair	-3.768***	-0.069***	-0.042***
	(0.443)	(0.010)	(0.005)
Poor	-4.074***	-0.081***	-0.037***
	(0.740)	(0.010)	(0.006)
Mean Dependent Variable	62.100		
Observations	95,691	102,861	103,539
R-squared	0.212		

Excellent hearing is the omitted benchmark. The first panel gives the results for the OLS regression using specification (1) including self-health controls, the second and third panels give the impact (calculated in marginal probabilities) of hearing levels in determining the "Often" Life Sense and "Full" (10) Life Satisfaction outcomes after ordered logit regressions using the same covariates as the first panel except the forecast horizon variable. Clustered (for country) standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1