Association of disability with mortality in the Spanish adult non-institutionalized population

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ABSTRACT

Background. There is limited information about the association between disability and all-cause and cause-specific mortality among community-dwelling adults.

Methods. We used baseline data from 162,381 adults who participated in a countrywide disability survey in 2008. A nationally representative sample was selected and interviewed in their homes. We present data on people aged 18 or over. Disability was considered as any substantial limitation found on a list of 44 life activities that have lasted or are expected to last more than 1 year and originate from an impairment. Cause-specific mortality data were obtained from the Spanish Statistical Office. Subjects contributed follow-up time from their baseline interview until death or the censoring date of 31st December 2017. We computed standardized rate ratios, with age, sex, living with a partner, and education level distribution of the total group as the standard population.

Results. Adults with disability (11%) had an adjusted mortality rate more than twice as high as adults without disability [standardized rate ratio (SRR) (95% confidence interval): 2.37 (2.24-2.50)]. A clear higher mortality risk remained over 10-year follow-up. Mortality due to diseases of the nervous system [SRR 4.86 (3.93-6.01)], diseases of the musculoskeletal system [SRR 3.45 (2.18-5.47)], infectious diseases [SRR 3.38 (2.27-5.01)] and diabetes mellitus [SRR 3.56 (2.71-4.68)] was particularly high in those with disability.

Conclusions. All-cause mortality rates are markedly higher among adults with disability. Preventive measures and health promotion initiatives are needed to reduce mortality risk in this population. Special attention should be paid to disabled people with certain specific diseases.

Keywords: disability; mortality; cause of death

INTRODUCTION

Disability is an umbrella term, covering impairments, activity limitations, and participation restrictions. Impairments are problems in body function or structure; an activity limitation is a difficulty in executing a task or action; whereas participation restriction refers to problems in involvement in life situations.[1]

There are many types of disabilities, such as those that affect vision, hearing, movement, thinking, remembering, learning, communicating, mental health, and social relationships.[2] Disability, in either of its different types, could appear in relation to very different conditions, injuries or diseases.[2]

The prevalence of disability is largely heterogeneous because of real differences in the prevalence of its determinants but also due to different definitions and sources. It can range between 10% and 15% of the population.[3] The association between disability and health is also complex. Disability can be the consequence of disease or health conditions but also their cause, since it has been reported that 87% of people with disability have at least one secondary health condition.[4] So, different disabilities have been identified as determinants for multiple conditions that are potentially related to an increased risk of death, such as depression,[5] decubitus ulcers,[5] a reduced immune function,[5] pulmonary infections,[5] obesity,[6,7] and weight problems in general,[4] bowel and bladder problems,[4] asthma,[4] cardiovascular problems,[7] anxiety[4,7]and more propensity to injuries and falls,[4] among others. Disabilities can also cause difficulty getting out into the community[4], sleep problems[4] and muscle spasms[4] that could be related to poorer mental health including higher risk of suicide.[5] Moreover, despite advances in personalized care, health professionals are not always properly prepared to diagnose and treat the secondary conditions derived from disability,[5] which can lead to a worse prognosis. Thus, it is reasonable to expect that disability may be associated with an increased risk of death.

Many studies show associations between disability and mortality in older populations but there are few studies that primarily focus on measuring this association in representative samples of adult populations.

In 2008, the Spanish Statistical Office carried out a large nationwide survey on disability.[8] This survey formed the baseline cohort for a subsequent follow-up study on mortality.

The main objective of this research was to measure the association of disability with all-cause and cause-specific mortality in a representative sample of the adult population in Spain.

METHODS

Study population

Baseline data come from the 2008 Spanish Survey on Disabilities, Personal Autonomy and Dependency (Encuesta Sobre Discapacidades, Autonomía Personal y Situaciones de Dependencia [EDAD2008]).[8]

The study population covered by EDAD2008 consisted of a two-step, stratified, random sample of the community-dwelling population, representative of each province: first, a sample of census tracts was drawn, and a sample of family dwellings was then randomly selected within each tract. Thereafter, all households within the dwelling were group screened, and one member of each household was interviewed as the main informant. Subjects identified with a possible disability were then interviewed in depth. The interviews were conducted between November 2007 and February 2008. A total of 258,187 people living in 91,290 households were thus screened for disability. Data on mortality could be obtained for 207,529 subjects (80.4%). Of these, 162,381 people aged 18 years or over formed the study sample. Missing data on mortality was due to difficulties in identifying subjects.

The study was approved by the Institute of Health Carlos III Ethics Committee.

Study variables

In the EDAD2008 survey *disability* was considered as any important limitation to carrying out an activity, which had lasted or was expected to last more than 1 year and whose origin was an impairment. A person was considered to have a disability even if it had been overcome with the use of external technical aids, or with the help and/or supervision of another person. For screening purposes, a list of 44 questions about possible disabilities – read verbatim – was presented to the main informant of each household (see Supplementary material). The list addressed the following eight domains: vision; audition; communication; learning and application of knowledge and performance of tasks; mobility; self-care; domestic life; interaction and interpersonal relationships. People who answered affirmatively to at least one of these questions formed the disability group. To assess disability severity, we used two methods. First, a reported score based on the International Classification of Functioning Disability and Health (ICF) Checklist.[9] Twenty nine EDAD2008 items were backcoded to specific domains of the ICF Checklist and by rating the recorded difficulty performing specific tasks. A global ICF score was derived, albeit lacking data for domains d1, "Learning and applying knowledge", d8, "Major Life Areas" and d9, "Community, Social and Civic Life". Disability severity was categorized into mild, moderate, severe, and complete disability according to ICF categories. The categories of severe and complete disability were collapsed together; consequently, a 4-category variable was analyzed (no disability; mild; moderate; severe/complete). A detailed explanation of these procedures can be found elsewhere.[10] As a second step, the number of disabilities identified for each person was grouped together to produce four categories: 0; 1 to 3; 4 to 9; and 10 to 42.

Age, marital status and educational level attained were obtained by interview.

Mortality data was provided by the Spanish Statistical Office (INE). Underlying causes of death were coded using the International Statistical Classification of Diseases and Related Health Problems, 10th Revision reduced list.[11,12] These include 102 different causes of death grouped into 17 types.

Subjects contributed follow-up time from their baseline interview until death or the censoring date, 31st December 2017.

Analysis

Overall baseline proportions, means and crude rates were weighted with sampling weights. These were computed as the inverse of each participant's baseline selection probability, corrected by non-response.

To estimate the adjusted association of disability with mortality –all-cause and cause-specific– we computed standardized rate ratios (SRR) via inverse probability weighting,[13] taking the baseline distribution of age (18-39; 40-64; 65-74; ≥75 years) , sex (women or men), living with a partner (yes or no), and educational level (less than primary; primary; secondary; pre-university; university) for the total population as the standard. Weights for subjects were computed as the inverse of the conditional probability of being in their own exposure category, computed through sampling-weighted logistic regression models with disability as dependent variable, and the independent variables above as covariates. In the case of the four-category disability variables (ICF severity and number of disabilities), these probabilities were estimated through multinomial logistic regression models. Weights were then multiplied by the unconditional probability of being in their own exposure category. These stabilized weights were finally multiplied by the sampling weights. We computed weighted Poisson regression models for estimating standardized rates and rate ratios with these final weights, with disability as the independent variable and the logarithm of each observed person-year as the offset variable. To evaluate time-dependent effects, we computed 10 SRRs with increasing follow-up time, from 1 to 10 years.

Population attributable fraction for disability was calculated with the formula *f*(SMR−1)/SMR,[14] where *f* is the fraction with disability among deaths and SMR is the Standardized Mortality Ratio. SMR was computed via inverse probability weighting using the baseline distribution of the disability group as standard. In this case the weight for the *i* subject was estimated by fitting a sampling-weighted logistic regression model with disability status (*E*) as dependent variable and age, sex, living with a partner and educational level as independent variables (*Z*), and computed as:

$$w_i = \frac{P(E = 1|Z = z_i)}{P(E = e_i|Z = z_i)}$$

Thus, weights were 1 for disability subjects, and the conditional disability odds for non-disability.[15] Final weights were the product of sampling weights and standardization weights and applied in a Poisson model to obtain the SMR. Confidence intervals for the population attributable fraction were calculated with the formula proposed by Greenland.[16]

Due to the complex sampling design, we used appropriate methods to account for the effect of stratification and clustering on standard errors. Analyses were run with Stata 15[17].

RESULTS

Baseline characteristics of the study population are shown in Table 1. The prevalence (95% confidence interval [CI]) of disability was 11.0% (10.7-11.2%), and was higher in older people, women, participants not living with a partner, and those with lower educational levels.

There were 17,132 deaths in 1,541,910 person-years follow-up. The median follow-up was 10.0 years. The sampling weighted mortality rates (95%CI) per 1000 person-years, were 10.0 (10.1-10.6), for the overall population, 50.8 (49.3-52.3) for the disability group and 6.4 (6.2-6.6) for the non-disability group, for a crude rate ratio of 7.93 (7.63-8.24).

Table 2 shows the standardized mortality rates for the whole group and for subgroups of sex and age. The standardized rates per 1000 person-years were 20.03 for the disability group and 8.47 for non-disability group, for a standardized rate ratio (SRR) of 2.37. The standardized rate difference (SRD) between the mortality of the disability group and the non-disability group was 11.56 per 1000 person-years. There was little difference in the relative estimates by sex, with SRR of 2.37 for women and 2.38 for men. There was a clear gradient by age with younger people showing higher SRRs and older groups with notably higher SRDs.

The SMR (95% CI) was 1.92 (1.83-1.99) and the fraction of persons with disability among the deceased was 0.44, for a population attributable fraction (95% CI) of 0.21 (0.20-0.22).

Supplementary Figures 1 and 2 show the estimates for increasing follow-up years. The SRRs were very high in the first years of follow-up but remained high and over 2 throughout the 10 years. SRDs were also declined with follow-up time.

Tables 3 and 4 show the association of disability severity with mortality, measured both by the ICF score and the number of disabilities suffered by each subject. In both cases a strong gradient was evident.

Table 5 shows the cause-specific mortality associated with disability. Disability was clearly associated with mortality in all groups. The SRR was particularly high in the following groups: diseases of the nervous system (4.86), diseases of the musculoskeletal system (3.45), infectious diseases (3.38), diseases of the genitourinary system (3.10), and endocrine diseases (3.08); and was lower for neoplasms (1.74). In terms of absolute impact, as measured by the SRD, diseases of the circulatory system and neoplasms showed higher figures, with 3.24 and 2.13 deaths per 1000 person years, respectively.

The association between disability and more specific causes of death can be found in Supplementary Table 1. Some of these estimates are unstable due to small number of cases (for a simple measure of precision for rate ratio estimates, we provide the ratio of the upper to lower confidence limits; as a somewhat arbitrary guide, estimates with ratios below 2 are deemed very precise and above 10 are very unstable). Based on reasonable stable estimates and strength of association some causes (code[12]) deserve particular attention: Septicemia (004); Alzheimer's disease (051); Other diseases of blood vessels (061); Malignant tumor of the breast (023); Cardiac arrest, unassisted death and other unknown cause of mortality (086); Intestinal vascular disease (070); Diseases of the kidney and ureter (077); Other accidents (097); Accidental drowning, submersion and suffocation (093); Diabetes mellitus (044); Suicide and self-inflicted injuries (098); Malignant tumor of the brain (033); Other diseases of the musculoskeletal system and connective tissue (076); Malignant tumor of the larynx (017); Other diseases of the nervous system and sense organs (052).

DISCUSSION

In this large follow-up study, we found mortality to be more than 100% higher in persons with disability, with a population attributable fraction of 21%. This could be translated to a figure of 87,309 annual deaths attributable to disability in the Spanish adult population (415,757 total deaths in people aged ≥18 years, estimated for 2019).[18] We also found that the risk remains high over time. Interestingly, we found a clear increase in risk for almost all of causes of death.

A limited number of works have primarily measured mortality associated with disability in representative samples. In general, the estimates presented by these studies are similar to those of the present article. Majer et al an found 65% higher mortality in the Dutch population over 55 years of age (average adjusted hazard ratio=1.65).[19] Forman-Hoffman et al report a 50% higher risk of mortality in people with disabilities, in a representative study of the American population aged 18 or over.[20] Wu et al report an adjusted hazard ratio of 2.23 in a follow-up study of a representative sample of American older people.[21] Finally, Park et al found 57% higher adjusted mortality in the disabled group in a large all-age Korean population.[22]

The study of mortality associated with disability is complex due to the nature of the determinants of disability and its consequences. These determinants are both numerous and varied and the causal paths equally intricate.[3,23] Some diseases lead to disability but are also associated with higher mortality through mechanisms that do not involve disability; they may behave as confounding factors. On the other hand, disability itself can increase the risk of certain conditions that could increase the risk of death, as mentioned in the introduction. Therefore, they could be considered mediators in the causal pathway from disability to mortality and should not be controlled for. We believe that greater part of the effect of disability health determinants on mortality is mediated by disability itself and a smaller part leads to death by paths that do not include disability.

The analysis appears to reveal some systematic patterns. With the SRR being relatively invariant across sexes and higher at ages <65 years, it would appear that disability-related causes of death in the adult population were different than the most notable causes of disability among older people, i.e., dementia, stroke and depression. The tenfold SRR increase we found for severity when the latter was measured with our ICF score might indicate a role for activity limitations as risk-of-death determinants; our ICF score was mainly based on ICF activities and did not include visual and auditory impairments. The interplay between activity limitations and medical care has yet to be mapped as a crucial part of coordinating health and social services, which is frequently mentioned as a prominent but relatively little-known field of primary care. Understanding the relevance of specific activity limitations for determining risk of death when interacting with environmental (living alone, institutionalized, homebound, etc.) or personal (literacy) factors may constitute grounds for increased surveillance of non-assisted disability persons, as has been proposed for primary care.[24] In addition, large-scale epidemiological research could identify limitations in mobility, domestic activities or self-care associated with risk of death, as well as their potential underlying pathophysiological mechanisms.

Some other considerations are worth mentioning. First, there was no information on mortality for 20% of the sample. However, we believe that the expected biasing impact on the estimates

will be small, mainly because these missing data were due to problems in the identification of subjects, and thus we can reasonably assume that they are randomly distributed. Second, we were unable to make the adjustment more comprehensive, and our estimates may consequently suffer from residual confounding. However, we do not expect this problem to be quantitatively important, when considered in comparison with the estimates found in similar studies with adjustment for health variables. In addition, we found that the mortality rate increased in the disability group for almost every cause of death. Third, individuals' disability status was self-reported, and this can be a source of both over- and under-reporting. However, it is expected that this potential misclassification would have diluted the strength of the estimations. Finally, we could not include the institutionalized population. Neglecting the institutionalized severely disabled, 1/5 of the overall group[24] may have led to an underestimation of SRD and the attributable fraction.

Conclusion

Risk of death is clearly higher in people with disability, with some causes of death showing an especially high risk, like neurological diseases and diabetes mellitus. In absolute terms, the number of deaths attributable to disability might well be very high. The population with disability must receive adequate preventive measures and health promotion initiatives to both improve survival and offer better quality of life.

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Data availability statement. Unavailable due to legal restrictions.

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Table 1. Baseline characteristics of study population aged 18 or over [a]

	All	Disability	No disability
Total, n (%)	162,381 (100)	18,600 (11)	143,781 (89)
Age y, mean (SD)	48 (18)	66 (18)	45 (17)
Age group, y (%)			
18-39	39	9	42
40-64	41	31	42
65-74	11	20	10
≥75	10	40	6
Sex, women (%)	51	60	50
Lives with partner (%)	65	54	66
Educational level attained (%)			
Illiterate and less than primary	16	44	13
Primary (6 to 12 years old)	25	30	25
Secondary (12 to 16 years old)	14	10	15
Pre-university (16 to 18)	22	09	23
University (18 and more years old)	23	07	25

[a] Unweighted counts and weighted percentages (sampling weights)

Table 2. Mortality rates (per 1000 person-years), rate differences and rate ratios standardized to the baseline total population distribution of age, sex, living with a partner and education

	SR disability	SR no disability	SRD	SRR
Total	20.03 (18.99-21.07)	8.47 (8.22-8.72)	11.56 (10.52-12.60)	2.37 (2.24-2.50)
Women	17.04 (15.89-18.19)	7.19 (6.88-7.51)	9.85 (8.68-11.02)	2.37 (2.19-2.56)
Men	23.27 (21.6-24.95)	9.78 (9.45-10.12)	13.49 (11.8-15.18)	2.38 (2.20-2.57)
Age 18-39 y	3.00 (1.91-4.09)	0.45 (0.38-0.51)	2.55 (1.46-3.65)	6.72 (4.55-9.93)
Age 40-64 y	13.23 (11.89-14.57)	3.90 (3.71-4.1)	9.33 (7.97-10.68)	3.39 (3.02-3.80)
Age 65-74 y	40.44 (37.48-43.39)	17.51 (16.67-18.36)	22.92 (19.85-25.99)	2.31 (2.12-2.52)
Age ≥75 y	120.86 (117.16-124.56)	57.78 (55.83-59.73)	63.08 (58.87-67.28)	2.09 (2.00-2.19)

SR, Standardized Rate; SRD, Standardized Rate Difference; SRR, Standardized Rate Ratio.

Table 3. Association of ICF disability severity with mortality

Severity	SR [a]	SRD [b]	SRR [c]
No disability	8.49 (8.24-8.74)	0 (ref.)	1 (ref.)
Mild disability	15.26 (14.3-16.23)	6.77 (5.81-7.74)	1.80 (1.68-1.92)
Moderate disability	36.84 (32.8-40.88)	28.35 (24.31-32.38)	4.34 (3.88-4.85)
Severe/complete disability	88.85 (68.81-108.9)	80.36 (60.31-100.40)	10.46 (8.33-13.14)

[a] Standardized rate per 1000 person-years, with the baseline total population distribution of age, sex, living with a partner and education as standard.

[b] Standardized rate difference.

[c] Standardized rate ratio.

Table 4. Association of number of disabilities with mortality

No of disabilities	SR [a]	SRD [b]	SRR [c]
0	8.49 (8.24-8.74)	0 (ref.)	1 (ref.)
1-3	13.53 (12.43-14.63)	5.04 (3.94-6.14)	1.59 (1.47-1.73)
4-9	19.20 (17.48-20.92)	10.71 (8.98-12.43)	2.26 (2.06-2.48)
10-42	42.54 (38.37-46.72)	34.06 (29.88-38.23)	5.01 (4.53-5.54)

[a] Standardized rate per 1000 person-years, with the baseline total population distribution of age, sex, living with a partner and education as standard.

[b] Standardized rate difference.

[c] Standardized rate ratio.

Table 5. Association of disability with mortality by group of causes

Group of causes	SRD (95%CI) [a]	SRR (95%CI) [b]
Certain infectious and parasitic diseases	0.28 (0.14-0.42)	3.38 (2.27-5.01)
Neoplasms	2.13 (1.65-2.61)	1.74 (1.57-1.92)
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	0.02 (−0.00-0.05)	1.75 (0.94-3.26)
Endocrine, nutritional and metabolic diseases	0.45 (0.33-0.57)	3.08 (2.43-3.90)
Mental and behavioral disorders	0.40 (0.28-0.53)	2.43 (1.91-3.07)
Diseases of the nervous system	1.46 (1.13-1.79)	4.86 (3.93-6.01)
Diseases of the circulatory system	3.24 (2.78-3.71)	2.32 (2.12-2.55)
Diseases of the respiratory system	1.42 (1.17-1.66)	2.69 (2.35-3.07)
Diseases of the digestive system	0.56 (0.38-0.73)	2.25 (1.84-2.75)
Diseases of the skin and subcutaneous tissue	0.03 (0.00-0.05)	2.38 (1.22-4.64)
Diseases of the musculoskeletal system and connective tissue	0.20 (0.09-0.31)	3.45 (2.18-5.47)
Diseases of the genitourinary system	0.51 (0.37-0.65)	3.10 (2.44-3.94)
Congenital malformations, deformations and chromosomal abnormalities	0.05 (0.01-0.10)	28.23 (5.86-135.96)
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	0.32 (0.19-0.46)	2.73 (2.01-3.71)
External causes	0.47 (0.26-0.69)	2.68 (1.98-3.65)

[a] Standardized rate differences, per 1000 person-years, with the baseline total population distribution of age, sex, living with a partner and education as the standard.

[b] Standardized rate ratios.

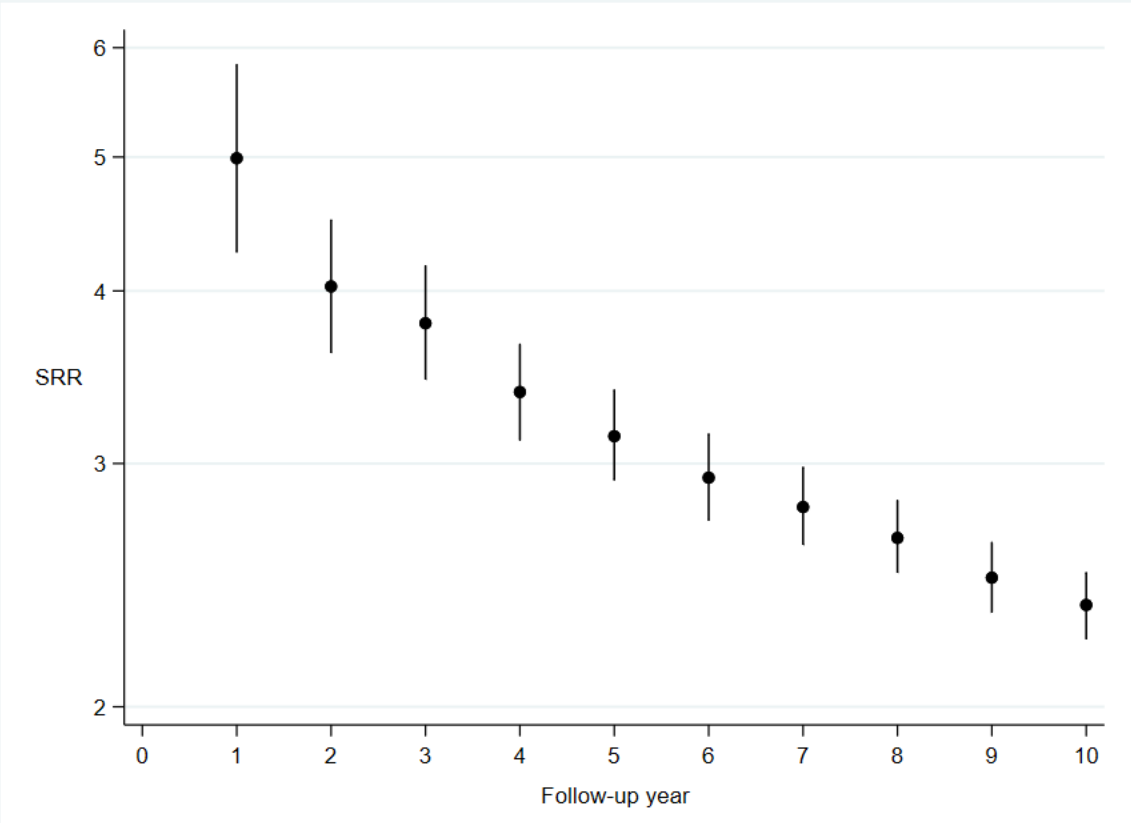
SUPPLEMENTARY MATERIAL

Forty-four activities used to screen on possible disability

1. Vision
    1.1. Perceiving any image.
    1.2. Visual detail tasks.
    1.3. Overall visual tasks.
    1.4. Other vision problems.
2. Hearing
    2.1. Receive any sound.
    2.2. Hearing loud sounds.
    2.3. Listen to the speech.
3. Communication
    3.1. Produce spoken messages.
    3.2. Receive spoken messages.
    3.3. Communication of written messages.
    3.4. Communication of gesture messages, signals or symbols.
    3.5. Have a conversation (only problems of a cognitive nature or intellectual).
    3.6. Communication through communication devices and techniques.
4. Learning and application of knowledge and development of tasks (only problems of a cognitive or intellectual nature)
    4.1. Intentional use of the senses (looking, listening ...).
    4.2. Basic learning (reading, writing, counting ...).
    4.3. Carry out simple tasks.
    4.4. Perform complex tasks.
5. Mobility
    5.1. Change basic body postures.
    5.2. Maintain body position.
    5.3. Moving around the home.
    5.4. Moving outside the home.
    5.5. Getting around using means of transport as a passenger.
    5.6. Driving vehicles.
    5.7. Lifting and carrying objects.
    5.8. Move objects with the upper limbs.
    5.9. Fine use of the hand.
6. Self-care
    6.1. Toilet hygiene.
    6.2. Care of body parts.
    6.3. Personal hygiene related to urination.
    6.4. Personal hygiene related to defecation.
    6.5. Personal hygiene related to menstruation.
    6.6. Dressing and undressing.
    6.7. Eating and drinking.
    6.8. Taking care of one's own health: complying with medical prescriptions.
    6.9. Taking care of one's own health: avoiding dangerous situations.
7. Domestic life
    7.1. Acquisition of goods and services.
    7.2. Prepare meals.
    7.3. Carry out household chores.

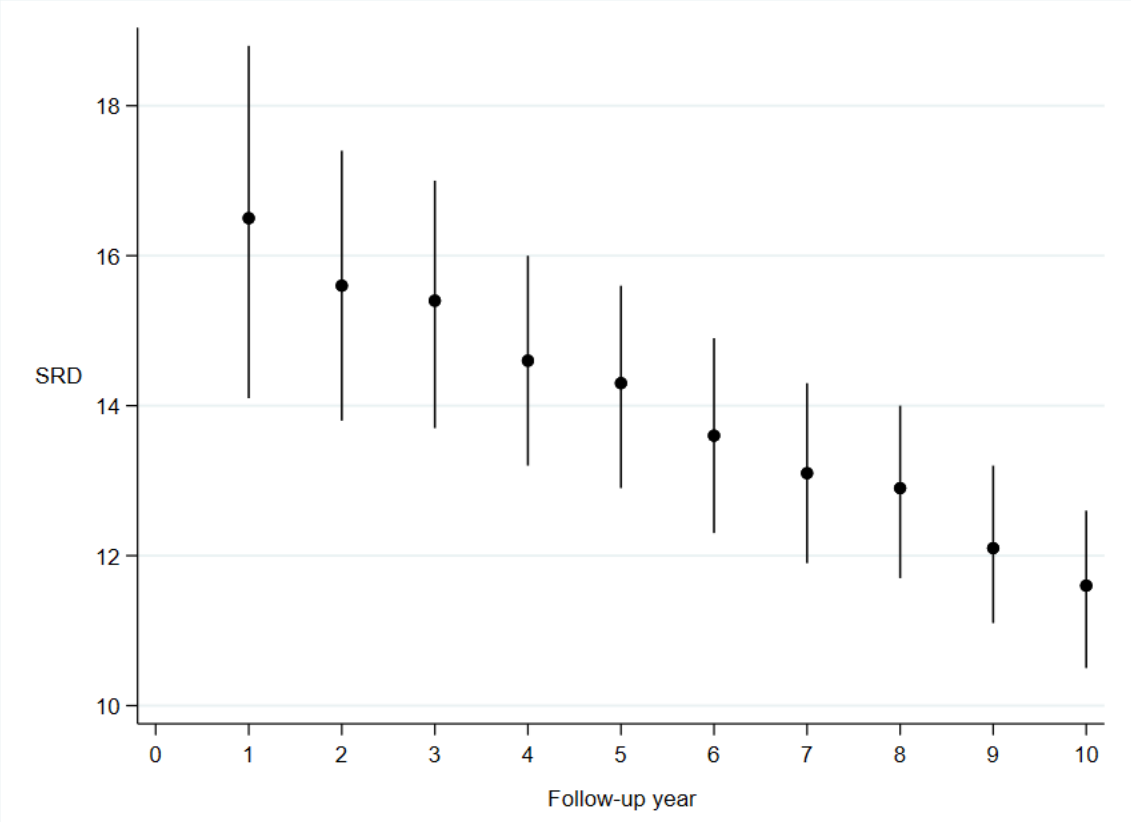
8. Interactions and personal relationships
    8.1. Basic interpersonal interactions.
    8.2. Relate to strangers.
    8.3. Formal relationships.
    8.4. Informal social relations.
    8.5. Family relationships.
    8.6. Sentimental relationships.

Supplementary Figure 1. Standardized Rate Ratios and 95% CI for increasing years of follow-up.



Time-dependent Standardized Rate Ratios (SRR) and 95% confidence intervals for the association of disability and death with the baseline age, sex, living with a partner and education distribution of the total group as the standard. SRRs in logarithmic scale.

Supplementary Figure 2. Standardized Rate Differences per 1000 person-years and 95% CI for increasing years of follow-up.



Time-dependent Standardized Rate Differences (SRD) per 1000 person-years and 95% confidence intervals for the association of disability and death with the baseline age, sex, living with a partner and education distribution of the total group as the standard.

Supplementary table 1. Cause-specific mortality associated with disability [a]

Causes	No of deaths	SR [b]	SRR [c] (95% CI)	UI/LI [d]
001. Intestinal infectious diseases	38	1.63	1.97 (0.90-4.28)	4.8
002.Tuberculosis and its late effects	8	0.38	5.32 (1.03-27.46)	26.7
004. Septicemia	143	6.57	2.67 (1.76-4.05)	2.3
005. Viral hepatitis	21	0.82	5.30 (1.80-15.65)	8.7
006. AIDS	18	1.35	5.54 (1.21-25.34)	20.9
008. Rest of infectious and parasitic diseases and their late effects	23	1.04	4.98 (1.58-15.65)	9.9
009. Malignant tumor of the lip, oral cavity and pharynx	116	6.98	1.66 (0.89-3.1)	3.5
010. Malignant tumor of the esophagus	92	5.28	1.77 (0.80-3.90)	4.9
011. Malignant neoplasm of stomach	296	17.60	1.27 (0.78-2.08)	2.7
012. Malignant tumor of the colon	554	30.27	1.56 (1.19-2.06)	1.7
013. Malignant neoplasm of rectum, rectosigmoid portion and anus	157	10.41	1.15 (0.66-2.00)	3.0
014. Malignant tumor of the liver and intrahepatic bile ducts	221	14.94	1.25 (0.78-1.99)	2.6
015. Malignant tumor of the pancreas	271	16.87	0.99 (0.58-1.69)	2.9
016. Other digestive malignancies	132	7.16	1.84 (1.03-3.29)	3.2
017. Malignant tumor of the larynx	73	2.86	7.39 (3.66-14.92)	4.1
018. Malignant tumor of the trachea, bronchi and lung	963	58.06	1.53 (1.22-1.91)	1.6
019. Other malignant respiratory and intrathoracic tumors	21	1.25	1.62 (0.47-5.62)	12.0
020. Malignant tumors of the bone and articular cartilage	4	0.10	7.08 (0.79-63.59)	80.5
021. Malignant melanoma of the skin	41	2.24	0.41 (0.16-1.09)	6.8
022. Other malignant tumors of the skin and soft tissues	62	4.07	1.73 (0.57-5.23)	9.2
023. Malignant tumor of the breast	278	13.17	2.77 (1.96-3.93)	2.0
024. Malignant tumor of the cervix	27	1.68	1.58 (0.53-4.77)	9.0
025. Malignant tumor of other parts of the uterus	87	4.67	1.9 (1.07-3.39)	3.2
026. Malignant tumor of the ovary	77	4.05	1.09 (0.59-2.02)	3.4
027. Malignant tumors, other female genital organs	15	0.41	6.76 (1.91-23.86)	12.5
028. Malignant tumor of the prostate	292	14.78	2.01 (1.4-2.89)	2.1
029. Malignant tumors of other male genital organs	7	0.54	6.62 (0.78-56.52)	72.5
030. Malignant tumor of the kidney, except renal pelvis	99	5.85	1.30 (0.70-2.40)	3.4
031. Malignant tumor of the bladder	195	11.54	1.78 (1.17-2.71)	2.3

032. Other malignant tumors of the urinary tract	42	2.27	1.75 (0.71-4.28)	6.0
033. Malignant tumor of the brain	140	7.79	3.23 (1.70-6.14)	3.6
034. Other malignant neurological and endocrine tumors	27	1.69	0.86 (0.23-3.22)	14.0
035. Malignant tumor of ill-defined, secondary, and unspecified sites	251	13.14	2.25 (1.48-3.42)	2.3
036. Malignant tumors of the lymphatic tissue, hematopoietic organs and related tissues (except leukemia)	190	11.20	1.96 (1.19-3.24)	2.7
037. Leukemia	145	7.84	1.64 (0.86-3.13)	3.6
039. Benign tumors	23	1.53	2.81 (0.93-8.44)	9.1
040. Myelodysplastic syndrome	52	2.53	1.46 (0.65-3.32)	5.1
041. Other tumors of uncertain or unknown behavior	103	5.73	1.76 (1.00-3.09)	3.1
042. Diseases of the blood and hematopoietic organs	57	2.88	1.60 (0.85-3.04)	3.6
043. Certain disorders affecting the mechanism of immunity	8	0.39	2.82 (0.46-17.14)	37.3
044. Diabetes mellitus	388	14.51	3.56 (2.71-4.68)	1.7
045. Other endocrine, nutritional and metabolic diseases	131	7.07	2.09 (1.29-3.38)	2.6
046. Organic, senile and presenile mental disorders	628	27.29	2.29 (1.83-2.86)	1.6
049. Other mental and behavioral disorders	6	0.38	13.45 (1.18-153.43)	130.0
051. Alzheimer's disease	577	24.20	2.76 (2.20-3.45)	1.6
052. Other diseases of the nervous system and sense organs	407	13.70	8.52 (6.20-11.7)	1.9
053. Chronic rheumatic heart diseases	80	3.41	4.01 (1.55-10.33)	6.7
054. Hypertensive diseases	418	20.89	2.25 (1.54-3.27)	2.1
055. Acute myocardial infarction	772	39.03	1.96 (1.60-2.40)	1.5
056. Other ischemic heart diseases	706	34.73	2.45 (1.94-3.08)	1.6
057. Heart failure	741	34.09	2.29 (1.88-2.78)	1.5
058. Other heart diseases	934	46.97	2.04 (1.70-2.45)	1.4
059. Cerebrovascular diseases	1217	54.97	2.57 (2.15-3.08)	1.4
060. Atherosclerosis	62	2.05	3.04 (1.60-5.77)	3.6
061. Other diseases of blood vessels	175	9.12	2.86 (1.61-5.08)	3.2
062. Influenza (flu) includes avian flu and influenza A	12	0.90	2.89 (0.55-15.33)	27.9
063. Pneumonia	344	16.42	2.86 (2.06-3.97)	1.9
064. Chronic diseases of the lower respiratory tract	648	29.62	2.56 (2.05-3.2)	1.6
065. Asthma	52	2.38	3.67 (1.61-8.36)	5.2
066. Respiratory failure4	78	3.92	2.45 (1.36-4.39)	3.2
067. Other diseases of the respiratory system	734	30.74	2.66 (2.19-3.24)	1.5

068. Ulcer of stomach, duodenum and jejunum	29	1.69	2.12 (0.74-6.11)	8.3
069. Non-infectious enteritis and colitis	15	0.72	2.30 (0.71-7.48)	10.5
070. Intestinal vascular disease	146	6.18	2.97 (1.88-4.71)	2.5
071. Cirrhosis and other chronic liver diseases	190	9.71	2.53 (1.62-3.94)	2.4
072. Other diseases of the digestive system	503	26.18	1.98 (1.52-2.59)	1.7
073. Skin and subcutaneous tissue diseases	52	2.00	2.38 (1.22-4.64)	3.8
074. Rheumatoid arthritis and osteoarthritis	25	0.52	9.69 (2.84-33.06)	11.6
075. Osteoporosis and pathological fracture	104	5.62	2.13 (1.27-3.59)	2.8
076. Other diseases of the musculoskeletal system and connective tissue	52	2.05	5.48 (2.26-13.27)	5.9
077. Diseases of the kidney and ureter	340	13.88	3.32 (2.49-4.44)	1.8
078. Diseases of the male genital organs	10	0.41	1.79 (0.4-8.11)	20.3
080. Other diseases of the genitourinary system	199	9.92	2.91 (1.93-4.38)	2.3
084. Congenital malformations of the circulatory system	5	0.16	1.87 (0.25-13.96)	55.8
085. Other congenital malformations, deformities and chromosomal abnormalities	9	0.03	155.43 (29.14-828.9)	28.4
086. Cardiac arrest, unassisted death and other unknown cause of mortality	171	10.10	2.96 (1.86-4.69)	2.5
087. Senility	87	3.08	2.34 (1.36-4.02)	3.0
089. Rest of symptoms, signs and findings ... not classified elsewhere	121	5.54	2.54 (1.60-4.03)	2.5
090. Motor vehicle traffic accidents	80	5.00	0.80 (0.37-1.73)	4.7
091. Other transport accidents	6	0.27	14.87 (1.66-133.21)	80.2
092. Accidental falls	108	6.29	1.23 (0.67-2.26)	3.4
093. Accidental drowning, submersion and suffocation	89	4.41	3.68 (1.82-7.44)	4.1
094. Accidents due to fire, smoke and hot substances	8	0.58	2.50 (0.38-16.6)	43.7
095. Accidental poisoning by psychotropic drugs and drugs of abuse	16	0.54	3.19 (0.9-11.24)	12.5
096. Other accidental poisonings	6	0.17	19.04 (3.59-100.9)	28.1
097. Other accidents	77	3.12	4.09 (1.98-8.43)	4.3
098. Suicide and self-inflicted injuries	126	6.75	2.80 (1.33-5.87)	4.4
099. Assaults (homicide)	8	0.44	0.68 (0.08-5.67)	70.9
101. Complications of medical and surgical care	14	0.52	3.97 (1.2-13.14)	11.0

[a] Some causes not included due to insufficient number of cases.

[b] Standardized mortality rate per 100,000 person-years, for the reference group (non-disability) with the baseline total population distribution of age, sex, living with a partner, and education as the standard.

[c] Standardized mortality ratios, with the baseline total population distribution of age, sex, living with a partner and education as the standard.

[d] Statistical precision; the ratio of the upper to lower 95% confidence limits.