BRIEF REPORT

Effect of Chronic Diseases and Multimorbidity on Survival and Functioning in Elderly Adults

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OBJECTIVES: To determine the effect of chronic disorders and their co-occurrence on survival and functioning in community-dwelling older adults.

DESIGN: Population-based cohort study.

SETTING: Kungsholmen, Stockholm, Sweden.

PARTICIPANTS: Individuals aged 78 and older examined by physicians four times over 11 years (N = 1,099).

MEASUREMENTS: Chronic diseases (grouped according to 10 organ systems according to the International Classification of Diseases, Tenth Revision, code) and multimorbidity (≥2 coexisting chronic diseases) were evaluated in terms of mortality, population attributable risk of death, median years of life lost, and median survival time with and without disability (need of assistance in ≥1 activities of daily living).

RESULTS: Approximately one in four deaths were attributable to cardiovascular and one in six to neuropsychiatric diseases. Malignancy was the condition with the shortest survival time (2.5 years). Malignancies and cardiovascular disorders each accounted for approximately 5 years of life lost. In contrast, neurosensorial and neuropsychiatric conditions had the longest median survival time (>6 years), and affected people were disabled for more than half of this time. The most-prevalent and -burdensome condition was multimorbidity, affecting 70.4% of the population, accounting for 69.3% of total deaths, and causing 7.5 years of life lost. Finally, people with multimorbidity lived 81% of their remaining years of life with disability (median 5.2 years).

CONCLUSION: Survival in older adults differs in length and quality depending on specific conditions. The greatest negative effect at the individual (shorter life, greater dependence) and societal (number of attributable deaths, years spent with disability) level was from multimorbidity, which has made multimorbidity a clinical and public health priority. **J Am Geriatr Soc 2017.**

Key words: chronic conditions; multimorbidity; disability; median survival time; population attributable risk

In recent decades, the number of people with chronic disorders has dramatically increased in several countries, mostly due to the aging of the population.[1] Cardiovascular disease, cancer, diabetes mellitus, and dementia are the most common chronic diseases in elderly persons,[2] leading to impaired physical function, dependence, high care costs, and shorter survival.[1]

Different studies have estimated the proportion of deaths attributable to specific diseases. Dementia, for example, has been estimated to account for 11% to 17% of all deaths of elderly adults, and it has been predicted to increase with increasing age.[3–5] Similar figures were found for cardiac diseases, which account for 17% to 37% of all deaths.[4,5] The percentage of deaths attributable to other diseases is lower: cancer (6–20%),[4,5] endocrine diseases (3.6–8%),[6,7] respiratory diseases (2.1–3.2%).[6] Less attention has been paid to the effect of chronic conditions on years of remaining life. Recently, researchers reported that the average decline in life expectancy after age 67 was 1.8 years for each additional chronic condition.[8] One study[9] estimated that there was a minimum reduction of 33% (4 years) in survival for people with a diagnosis of cardiovascular disease, mental health problems, or diabetes mellitus. Another study[10] found that stroke and diabetes mellitus were the leading causes of premature death, with people with those conditions losing more than 4 years of life expectancy. When disability-free life expectancy was examined, hypertension, arthritis, and diabetes mellitus were found to be the most-disabling conditions, because people lived many years after receiving the diagnosis, yet most of this time was lived with disability.[11]

Ongoing demographic changes are expected to lead to more people with multiple health problems. The most-

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DOI: 10.1111/jgs.14868

0002-8614/17/$15.00

frequent condition in advanced age is multimorbidity, the co-occurrence of two or more chronic diseases in the same individual (prevalence 55–98%).[12] Despite the increasing attention paid to multimorbidity in the scientific community, only selected aspects of this phenomenon have been investigated.[12] Multimorbidity leads to disability, poor quality of life, and high healthcare use. The co-occurrence of mental illness, especially depression, with somatic chronic diseases and socioeconomic deprivation exacerbates the negative outcomes of multimorbidity.[13–17] Multimorbidity has also been found to be associated with mortality,[9,18,19] yet little is known about its effect on survival in terms of population attributable risk of death and years of life lost. Disability increases as the number of diseases increases,[20] but data are scarce regarding number of years spent living with disability for people with multimorbidity.

Using data from the Kungsholmen project, the aim of the current study was to investigate the effect of various chronic conditions and of multimorbidity on survival and functional independence in older adults (aged ≥78). Specific aims were to estimate mortality, proportion of deaths averted if a specific condition was removed, difference in median survival time between participants with and without a specific condition, and number of years lived with and without disabilities.

METHODS

Study Population

The study was embedded in the Kungsholmen Project, a community-based longitudinal study of aging and dementia.[21] The population eligible for this project included all registered inhabitants living in the Kungsholmen district of central Stockholm aged 75 and older in October 1987. Of the 1,700 elderly adults who agreed to participate in the baseline examination (1987–89), 429 died, and 172 moved or refused to participate in the first follow-up (1991–93). The current study consisted of 1,099 people who participated at the first follow-up, at which time all participants underwent an extensive clinical examination performed by physicians.

The ethics committee of the Karolinska Institutet approved all parts of the project, and participants provided informed consent to take part in the study.

Data Collection

At baseline, all participants were examined for approximately 3 hours following a standardized protocol that included an interview, a neuropsychological battery, and a medical examination. If the participant was not able to answer the questions (e.g., cognitive impairment or dementia), an informant was interviewed. Education level was measured by considering maximum years of formal schooling, which was categorized as low (<8) or high (≥8).

Assessment of Chronic Diseases and Multimorbidity

A disease was classified as chronic if one or more of the following characteristics was present: being permanent, caused by irreversible pathological alteration, requiring rehabilitation, or requiring a long period of care.[12] The examining physician diagnosed chronic diseases in all participants according to clinical examination, medical history, laboratory data, and current use of medications at baseline and during 7 years of follow-up (1991–98). Diagnoses were also derived from the computerized Stockholm inpatient register system from 1969 to 1998. The *International Classification of Diseases* (ICD), Eighth to Tenth (10) Revisions, were used for all diagnoses, except for the following disorders: deafness was defined as being unable to hear the interviewer's voice and visual impairment as being blind or almost blind; a psychiatrist diagnosed dementia, different dementia types, and major depression according to *Diagnostic and Statistical Manual of Mental Disorders, Third Edition*, criteria; and anemia was defined as hemoglobin level less than 13 g/dL in men and less than 12 g/dL in women.[22] Physicians asked participants to show prescription forms or containers of medications used, and medications were registered according to the Anatomical Therapeutic Chemical classification system. Thirty-eight chronic conditions with a prevalence greater than 0.4% were selected. Multimorbidity was defined as the co-occurrence of any two or more of the 38 chronic conditions in the same individual, whether coincidental or not.[12] Chronic conditions were grouped using the ICD-10 classification system. Specifically, 10 groups of conditions were examined: anemia, cardiovascular, digestive, endocrine, malignancy, neuropsychiatric, musculoskeletal, neurosensorial, respiratory, and urological diseases. Each group was operationalized as having zero or one or more diseases (Table S1).

Functional Status Assessment

Functional status was measured using the Katz Index of activities of daily living (ADLs), which assesses dependence in bathing, dressing, toileting, transferring, continence, and feeding. Trained nurses assessed functional status by interviewing and observing participants at each examination. Disability was defined as need of assistance in one or more activities.

Vital Status

Information about vital status was derived from death certificates provided by Statistics Sweden. Survival status was assessed through 2002, 3 years after the last clinical examination.

Statistical Analysis

First, the population attributable risk (PAR) of death was calculated using the formula developed for survival studies[23] to estimate the proportion of deaths that would be averted in the hypothetical scenario that one could eliminate the specific condition. Baseline age-, sex-, and education-adjusted hazard ratios of mortality used for the calculation of PAR were estimated using parametric survival models, using age as the timescale. All the diseases were entered as time-varying covariates to model the effect of new events that participants experienced transitioning

from the status of being not affected to being affected by one of the disease groups.

Second, median survival time after diagnosis of disease was estimated within each group and after incidence of multimorbidity using survival functions adjusted for age, sex, and education. In addition, for the estimation of median survival time according to specific group of diseases, all the other conditions were also adjusted for. Median survival times for people with and without a specific condition were compared, and difference in median survival time was estimated. Finally, median survival time was broken down into years lived with and without disability. Interactions between sex and chronic conditions were tested for.

A complete case analysis was performed because the proportion of missing data was 0.6% for education and 1.4% for ADLs. Stata version 14.1 (Stata Corp., College Station, TX) was used for all analyses.

RESULTS

Prevalence of chronic diseases and multimorbidity, mortality, PAR% for death, and difference in median survival time for each specific condition are reported in Table 1. At baseline, 10.0% (n = 104) had none of the 38 diseases, 21.1% (n = 221) had one disease, and 70.4% (n = 774) had two or more chronic conditions. Considering the specific group of diseases, cardiovascular diseases were the most prevalent and digestive disorders the least. Women had a higher prevalence of endocrine (16% vs 7%) and musculoskeletal diseases (28% vs 16%), whereas urological disorders were more prevalent in men (34% vs 2%). No sex differences were detected in the prevalence of any of the other conditions.

Approximately 70% of deaths in the population were estimated to be attributable to multimorbidity, and this was related to the high prevalence of multimorbidity in the population. The second leading cause of death was cardiovascular disease, followed by neuropsychiatric diseases. Multimorbidity, cardiovascular disease, and malignancies were each associated with the greatest (>52%) reduction in median survival time.

Finally, median survival after the diagnosis of a specific condition was evaluated (Figure 1). After the diagnosis of malignancy and urological disorders, 50% of participants lived for less than 3 years. Median survival for those with a diagnosis of respiratory, cardiovascular, musculoskeletal, or digestive diseases was approximately 4 years. Fifty percent of the people with any other condition lived at least 5 years (range 5.1–7.3 years). Estimated median survival for those with multimorbidity was approximately 6.5 years. No sex differences were found in median survival.

Irrespective of the particular condition, people lived more than 60% of their remaining years of life with disability.

DISCUSSION

This study demonstrated that the most-prevalent condition in this study population was multimorbidity, which affected 70% of the population and accounted for 69% of total deaths and 7.5 years of life lost. People with multimorbidity lived 81% of their remaining years of life with disability (median 5.2 years). When the effect of different chronic diseases was analyzed, it was found that one-third of deaths were attributable to cardiovascular disease and one-sixth to neuropsychiatric disease. People with a diagnosis of one of the studied conditions died at a younger age than people without those specific conditions. A diagnosis of cardiovascular disease or malignancy shortened the lifespan by more than 4 years (differences in median survival of 5.0 and 4.3 years, respectively). In addition to the effect of specific diseases on survival, there was also an effect on disability, with people living many years with disability after diagnosis.

Table 1. Number and Prevalence of Cases at Baseline of group of Chronic Diseases and Multimorbidity, Number of Related Deaths, Hazard of Mortality, Population Attributable Risk (PAR) of Death, and Median Years of Life Lost (YLL) at Follow-Up

	Baseline		11 Year of Follow-Up			
Organ System	Cases, n	Prevalence per 100 (95% CI)	Deaths, n	Mortality, HR (95% CI)[a]	PAR, % of Death (95% CI)	Median YLL[b]
Anemia	199	18.1 (15.9–20.5)	165	1.5 (1.3–1.7)	5.4 (3.6–7.2)	−1.6
Cardiovascular	655	59.6 (56.7–62.5)	492	2.7 (2.2–3.2)	28.0 (24.7–31.2)	−5.0
Digestive	80	7.3 (5.9–9.0)	57	1.2 (0.9–1.4)	—[c]	—[c]
Endocrine	156	14.2 (12.3–16.4)	110	1.0 (0.8–1.2)	—[c]	—[c]
Malignancy	153	13.9 (12.0–16.1)	117	1.8 (1.6–2.1)	6.7 (5.4–8.0)	−4.3
Neuropsychiatric	297	27.0 (24.5–29.7)	264	2.3 (2.0–2.7)	17.0 (15.0–19.0)	−2.0
Musculoskeletal	279	25.4 (22.9–28.0)	238	1.5 (1.3–1.7)	8.8 (6.1–11.4)	−2.5
Neurosensorial	285	25.9 (22.9–28.1)	229	1.1 (0.9–1.3)	—[c]	—[c]
Respiratory	86	7.8 (6.4–9.6)	71	1.4 (1.2–1.8)	2.5 (1.3–3.7)	−1.5
Urological	99	9.0 (7.5–10.9)	73	1.3 (1.0–1.7)	—[c]	—[c]
Multimorbidity	774	70.4 (67.7–73.1)	608	5.1 (2.6–9.6)	69.3 (50.7–80.8)	−7.5

[a]Hazard ratios (HRs) were derived from two flexible parametric models using age as time scale; the first model included all specific group of diseases, sex, education, and age at baseline. The second model included multimorbidity, sex, education, and age at baseline.

[b]Median YLL was estimated comparing median survival with and without the specific chronic condition, that were derived from survival functions.

[c]Estimates only for conditions with a clear effect on mortality.

CI = confidence interval.

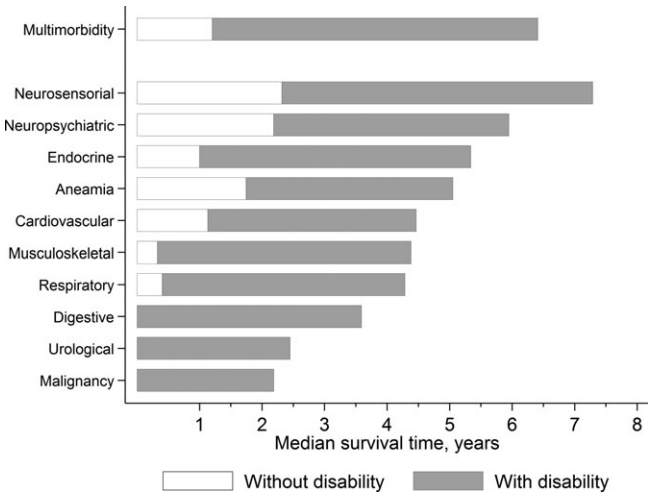

Figure 1. Median survival time without (white bar) and with (grey bar) disabilities, according to incident chronic condition. Median survival after diagnosis of incident group of diseases and multimorbidity were derived from survival functions. For the specific group of diseases, models were adjusted for age at baseline, sex, education, and all other conditions. For multimorbidity, the model was adjusted for age at baseline, sex, and education. Disability was defined as need of assistance in one or more activities of daily living.

Previous studies that have estimated the percentage of death attributable to a single disease have found similar results.[3–7] Dementia has been found to be associated with 11% to 17% of deaths of people aged 65 and older,[3,5,6] increasing to 42% of those aged 95 and older.[4] Proportions of death attributable to cardiovascular disease were 38% in people aged 75 and older and 17% in those aged 95 and older.[4,5] Previous studies have shown that diabetes mellitus accounts for at least 3.6%[7] of deaths and cancer for 6% to 20%.[4,5] Comparisons with previous studies of multimorbidity are difficult because of scarce information.

The literature offers limited insight into the burden of chronic disease on life expectancy; previous studies have focused on a single disease or on a specific index disease and its comorbidities. The current results are in agreement with a report from the United Kingdom that found that, in a population aged 65 and older, life expectancy was significantly lower for all the conditions considered, except for sensorial diseases.[10] Similar effects were found for cardiovascular and musculoskeletal diseases on survival, in a population aged 85 to 94,[24] with approximately 3 years of life lost.

In this study, the effect of multimorbidity on survival is striking, although previous research into multimorbidity and mortality has reported inconsistent results, with increasing number of diseases found to increase the risk of death in some studies[9,18,19] but not in others.[13,25] Nevertheless, a proper comparison with previous studies cannot be made because of differences in length of follow-up, the set of diseases chosen, and age range. The majority of the research into multimorbidity has been conducted on populations aged 65 and older. Looking at subgroups of older adults separately could be interesting, because people aged 80 and older are the fastest growing segment of the population, and in the next few decades, the majority of older adults will be aged 75 and older. Moreover, older adults are the most affected by the highest number of co-occurring chronic diseases. Multimorbidity has been measured using different approaches, yet a standardized measurement has not prevailed. The definition of chronic disease used in this study is in accordance with most other definitions that have been used, including time, treatment, care, quality of life, and function-related aspects. The 38 diseases identified to operationalize multimorbidity in this study are also included in the list of conditions recommended by in a previous study[27] as core chronic diseases and are included in the most-cited definition of multimorbidity.[17]

The current study results regarding duration of time spent in disabled status confirm previous findings.[11] Moreover, other studies have shown that a greater number of diseases was consistently associated with greater risk of functional dependency.[12] The association between diseases and disability is complex and still not fully understood. Development of diseases could represent the initial change from functional independence to disability.[28] Diseases might also be seen as intermediate factors between pathophysiological processes (e.g., inflammation, oxidative stress) and disability.[29] According to the most-recent Global Burden of Diseases in Sweden (http://www.healthdata.org/sweden), ischemic heart disease, low back pain, and cerebrovascular disease were the top three causes of disability-adjusted life years (DALYs), which quantify premature death and disability. Alzheimer's disease, other dementias, and diabetes mellitus have also been ranked in the top 10 leading causes of DALYs.

Strengths of the present study are the study design, the use of a large community-based cohort including people living at home and in institutions, and the long follow-up over an 11-year period, with high participation rates (>90%), which resulted in large sample numbers for the study outcome, but because of the urban setting and the high education and social status of the participants, findings from this population may not be generalizable to older adults living in rural areas or deprived areas. Another strength is the assessment of diseases from multiple sources of information, including examination by study physicians. Severity of the diseases, which could be expected to be a better predictor of mortality, was not taken into account. Nevertheless, although disease severity information was not available, in general, the diagnoses considered had a potential severity that could affect mortality. The dropout rate at baseline was 35% (601/1,700), mainly due to death (25%) and refusal or moving from the area (10%). People who dropped out of the study differed from participants in that they died at younger. It is likely that this then led to overestimation of median survival.

In summary, survival of elderly adults differs in duration and quality depending on specific conditions, but the highest negative effect at the individual (shorter life, greater dependence) and societal (number of attributable deaths, years spent with disability) levels is due to multimorbidity. This study has demonstrated a strong burden associated with multimorbidity, which clearly supports the clinical and public health relevance of multimorbidity in elderly adults. Individuals with multimorbidity have complex health needs, but because of the current disease-oriented approach to health care, they face a highly

fragmented care system that leads to ineffective and potentially harmful interventions. Currently, evidence of the efficacy of care pathways for multimorbidity is conflicting, and there are no widely accepted care models for multimorbidity.[30] Therefore, there is a compelling need to develop and implement systems that work for multimorbidity to deliver high-quality care to the many individuals with multiple chronic conditions.

ACKNOWLEDGMENTS

The authors would like to express their gratitude to the study participants and data collection staff for their invaluable contributions to the Kungsholmen Project.

Conflict of Interest: The authors have no financial or other conflicts with this paper.

Financial Disclosure: The project was supported by Karolinska Institutet faculty funding for postgraduate students, Swedish Council for Working Life and Social Research, Swedish Research Council for Medicine, Gun and Bertil Stohnes Stiftelse, Swedish Brain Power, Stiftelsen Ragnhild och Einar Lundströms Minne, Gun and Bertil Stohne Foundation, Gamla Tjänarinnor, and Loo and Hans Osterman Foundation.

Author Contributions: Rizzuto had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Rizzuto and Marengoni: Study concept and design. Rizzuto: Statistical analysis, drafting of manuscript, funding. All authors: Critical revision of manuscript for important intellectual content and approval of final version.

Sponsor's Role: The sponsors were not involved in the design, methods, subject recruitment, data collection, analysis, or preparation of the paper.

REFERENCES

1. Prince MJ, Wu F, Guo Y et al. The burden of disease in older people and implications for health policy and practice. Lancet 2015;385:549–562.
2. Marengoni A, Winblad B, Karp A et al. Prevalence of chronic diseases and multimorbidity among the elderly population in Sweden. Am J Public Health 2008;98:1198–1200.
3. Villarejo A, Benito-Leon J, Trincado R et al. Dementia-associated mortality at thirteen years in the NEDICES Cohort Study. J Alzheimers Dis 2011;26:543–551.
4. Borjesson-Hanson A, Gustafson D, Skoog I. Five-year mortality in relation to dementia and cognitive function in 95-year-olds. Neurology 2007;69:2069–2075.
5. Rizzuto D, Bellocco R, Kivipelto M et al. Dementia after age 75: Survival in different severity stages and years of life lost. Curr Alzheimer Res 2012;9:795–800.
6. Tschanz JT, Corcoran C, Skoog I et al. Dementia: The leading predictor of death in a defined elderly population: The Cache County Study. Neurology 2004;62:1156–1162.
7. Saydah SH, Eberhardt MS, Loria CM et al. Age and the burden of death attributable to diabetes in the United States. Am J Epidemiol 2002;156:714–719.
8. DuGoff EH, Canudas-Romo V, Buttorff C et al. Multiple chronic conditions and life expectancy: A life table analysis. Med Care 2014;52:688–694.
9. Caughey GE, Ramsay EN, Vitry AI et al. Comorbid chronic diseases, discordant impact on mortality in older people: A 14-year longitudinal population study. J Epidemiol Community Health 2010;64:1036–1042.
10. Jagger C, Matthews R, Matthews F et al. The burden of diseases on disability-free life expectancy in later life. J Gerontol A Biol Sci Med Sci 2007;62A:408–414.
11. Kingston A, Davies K, Collerton J et al. The contribution of diseases to the male-female disability-survival paradox in the very old: Results from the Newcastle 85+ study. PLoS ONE 2014;9:e88016.
12. Marengoni A, Angleman S, Melis R et al. Aging with multimorbidity: A systematic review of the literature. Ageing Res Rev 2011;10:430–439.
13. Marengoni A, Von Strauss E, Rizzuto D et al. The impact of chronic multimorbidity and disability on functional decline and survival in elderly persons. A community-based, longitudinal study. J Intern Med 2009;265:288–295.
14. Fortin M, Dubois MF, Hudon C et al. Multimorbidity and quality of life: A closer look. Health Qual Life Outcomes 2007;5:52. doi:10.1186/1477-7525-5-52
15. Moussavi S, Chatterji S, Verdes E et al. Depression, chronic diseases, and decrements in health: Results from the World Health Surveys. Lancet 2007;370:851–858.
16. Payne RA, Abel GA, Guthrie B et al. The effect of physical multimorbidity, mental health conditions and socioeconomic deprivation on unplanned admissions to hospital: A retrospective cohort study. Can Med Assoc J 2013;185:E221–E228.
17. Barnett K, Mercer SW, Norbury M et al. Epidemiology of multimorbidity and implications for health care, research, and medical education: A cross-sectional study. Lancet 2012;380:37–43.
18. Menotti A, Mulder I, Nissinen A et al. Prevalence of morbidity and multimorbidity in elderly male populations and their impact on 10-year all-cause mortality: The FINE study (Finland, Italy, Netherlands, Elderly). J Clin Epidemiol 2001;54:680–686.
19. Byles JE, D'Este C, Parkinson L et al. Single index of multimorbidity did not predict multiple outcomes. J Clin Epidemiol 2005;58:997–1005.
20. Marengoni A, Angleman S, Fratiglioni L. Prevalence of disability according to multimorbidity and disease clustering: A population-based study. J Comorb 2011;1:11–18.
21. Fratiglioni L, Viitanen M, Backman L et al. Occurrence of dementia in advanced age: The study design of the Kungsholmen Project. Neuroepidemiology 1992;11(Suppl 1):29–36.
22. Atti AR, Palmer K, Volpato S et al. Anaemia increases the risk of dementia in cognitively intact elderly. Neurobiol Aging 2006;27:278–284.
23. Newson RB. Attributable and unattributable risks and fractions and other scenario comparisons. Stata J 2013;13:672–698.
24. Trombetti A, Herrmann F, Hoffmeyer P et al. Survival and potential years of life lost after hip fracture in men and age-matched women. Osteoporos Int 2002;13:731–737.
25. Landi F, Liperoti R, Russo A et al. Disability, more than multimorbidity, was predictive of mortality among older persons aged 80 years and older. J Clin Epidemiol 2010;63:752–759.
26. Calderon-Larranaga A, Vetrano DL, Onder G et al. Assessing and measuring chronic multimorbidity in the older population: A proposal for its operationalization. J Gerontol A Biol Sci Med Sci 2016; pii: glw233. doi: 10.1093/gerona/glw233. [Epub ahead of print]
27. Diederichs C, Berger K, Bartels DB. The measurement of multiple chronic diseases—A systematic review on existing multimorbidity indices. J Gerontol A Biol Sci Med Sci 2011;66A:301–311.
28. Crimmins EM. Trends in the health of the elderly. Annu Rev Public Health 2004;25:79–98.
29. Yancik R, Ershler W, Satariano W et al. Report of the national institute on aging task force on comorbidity. J Gerontol A Biol Sci Med Sci 2007;62A:275–280.
30. Smith SM, Soubhi H, Fortin M et al. Managing patients with multimorbidity: Systematic review of interventions in primary care and community settings. BMJ 2012;345:e5205.

SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Table S1. Most Common Chronic Diseases Used in Study Grouped According to *International Classification of Diseases, Tenth Revision* (ICD-10), Code or Other Diagnostic Criteria.

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