Is the Compression of Morbidity a Universal Phenomenon?

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Abstract

Recent reviews of national health trends show conflicting results. It is clear today that the various health dimensions follow different trends over time. For instance an expansion of morbidity may accompany a compression of disability. What do we measure when we observe a decline in disability? Is the elderly population intrinsically healthier or are individuals more independent and less helped by children, using more technical devices in a more favorable environment? The recent OECD study, reviewing trends in ADL disability at age 65 and over in 12 OECD countries during the 1990s, demonstrates that there is clear evidence of a decline in disability among elderly people in only five of the 12 countries studied: Denmark, Finland, Italy, the Netherlands and the United States. Three countries (Belgium, Japan and Sweden) report an increasing rate and two countries (Australia and Canada) a stable rate. In France and the United Kingdom, different surveys show different trends in ADL disability (OECD, 2007). These results suggest that a decline in ADL disability may be less universal than expected. More importantly, the OECD study shows that ADL disability at age 65 and over ranges widely from a low 7.1 percent in the Netherlands (HIS) to a high of 18 percent in the United Kingdom (GHS survey). This paper reviews available evidence about the compression of morbidity and the disability decline and discusses the context in which they occur: initial level of disability, initial value of life expectancy and trend in life expectancy.

1. Health Trends: Conflicting Results

Considering the dimensions of population health proposed by Crimmins in 2004 (i.e., risk factors, diseases/conditions/impairments, functioning loss, disability and mortality), only disability and mortality clearly decreased among the elderly people in the United States during the 1990s, and self-reported good health clearly increased (Crimmins, 2004). The other health dimensions show mixed trends or no trend (Crimmins et al., 2005). Disability refers here, as in general in our paper, to activity limitations and participation restrictions according to the International Classification of Functioning, Disability and Health (ICF) of the World Health Organization (2001). When it is not the case, the specific definition of disability is provided. It is acknowledged today in Europe, as well as in the United States, that the various health dimensions may follow different trends over time (Robine, 2006; Ahacic et al., 2007; Parker and Thorslund, 2007). Recent studies on middle age people and those on the verge of retirement show that the future elderly may not be in better health than the previous cohorts (Munnell and Libby, 2007) and, even, may be in poorer health (Soldo et al., 2006). Several studies showed, however, that an increase in reported morbidity may be accompanied by a decrease in disability if the reported morbidity is less disabling than before (Robine et al., 1998; Crimmins and Saito, 2000; Freedman and Martin, 2000; Freedman et al., 2007).

2. The Compression of Morbidity

Now, if we try to assess whether the compression of morbidity, proposed by James Fries a few decades ago (Fries, 1980), has occurred in the low mortality countries, the answer is: yes, possibly, but we have been unable to prove that it actually happened! We all feel that a person aged of 70 years today is in better health in Western Europe or in the United States than a person of the same age 50 years ago. But how can we prove this, using the level of mortality of the different age groups (Cutler et al., 2007)? Certainly not. Mortality level is far from health in a daily context. Elderly people are reporting higher morbidity levels in almost all repeated cross-sectional surveys in developed countries. From year to year, they are more educated, which possibly entails a better medical awareness and literacy. They see doctors more often. They may have higher level of health expectation and lower threshold before going to see the doctor or reporting health problems. They may also have healthier life styles. On the other hand doctors diagnose diseases earlier and are more efficient in treating them, slowing down the morbidity processes, preventing complications and postponing deaths. In these conditions, it is extremely difficult to demonstrate the occurrence of a compression of

morbidity at the population level. The survivors are possibly a combination of an increasing number of healthy elderly aiming at successful aging through healthy life styles, such as moderate physical exercise and watching their diet, and an increasing number of frail elderly well cared for (Kannisto, 1991). Indeed health trends may be different between the young elderly and the oldest old (Robine and Michel, 2004).

The results of the most recent studies in the United States (Freedman et al., 2007), as well as the conclusions of the most recent reviews on international trends in health and disability among the elderly (Parker and Thorslund, 2007), confirm that an increase in reported or diagnosed chronic diseases and functional impairments may be accompanied by a simultaneous decrease in disability. In other terms, an expansion of health problems may accompany a compression of disability. As a decline in disability is observed in many low mortality countries but not in all, we now examine specifically the possible occurrence of a compression of disability.

3. The Compression of Disability

Observations from the United States show consistent declines in disability for instrumental activities of daily living (IADLs), as well as for difficulties with basic activities of daily living (ADLs) and need of help among the population aged 70+ during the mid- and late-1990s (Freedman et al., 2004). Generally, more improvement is observed for IADLs type disability and for the younger age groups (70-74) than for the oldest-old (Crimmins, 2004; Schoeni et al., 2005). Overall, chronic disability for the elderly population may have declined at a rate of 1.5 percent per year from 1982 to 2004 (Manton et al., 2006). Such disability decline was initially confirmed by English, French and Swedish studies on health trends in the 1980s and early 1990s (Robine et al., 1998; Grundy et al., 1999; Lagergren and Batljann, 2000). But other studies have found the opposite or no significant changes. In Australia, for instance, the age-standardized prevalence rate of disability increased from 1981 to 1998 (AIHW, 2003; Giles et al., 2003). The Swedish studies, after having confirmed the U.S. trends, started to show opposite trends (Parker et al., 2005; Meinow et al., 2006). These inconsistencies in international trends in disability decline matter because, if true, the continuation in disability decline may lead to a significant decrease in long-term care (LTC) cost in the future (Manton, et al., 2007).

Therefore, to clarify the situation, the U.S. government asked the OECD to review all existing studies on trends in ADL disability in developed countries. It is the first international attempt to draw some general conclusions about the compression of disability for the elderly population. The OECD reviewed trends in ADL disability at age 65 and over in 12 OECD countries during the 1990s (Lafortune et al., 2007). The study has demonstrated that there is clear evidence of a decline in disability among elderly people in only five of the 12 countries: Denmark, Finland, Italy, the Netherlands and the United States. Three countries (Belgium, Japan and Sweden) report an increasing rate; and two countries (Australia and Canada) a stable rate. In France and the United Kingdom, different surveys show different trends in ADL disability (OECD, 2007). These results suggest that a decline in ADL disability may be less universal than expected. More importantly, the OECD study shows that the level of ADL disability at age 65 and over is diverse: its prevalence rate ranges from a low 7.1 percent in the Netherlands (HIS) to a high of 18 percent in the United Kingdom (GHS survey).

4. Disability Decline, What Do We Measure?

Beyond technical questions about the comparability of the specific disability measures used in the various surveys (Wiener et al., 1990), all surveys reviewed by OECD were dealing with activities of daily living (ADLs: bathing, dressing, eating, transferring), at age 65 and over and almost all were looking at the report of difficulties when performing or trying to perform such activities—the fundamental question is: What are we measuring when observing a decline in ADLs or IADLs disability? Are the elderly people in better health (Cutler, 2001), or are individuals more independent in their life in general, less helped by their children and using more technical devices in a more favorable environment? We have now collected evidences of significant changes over time in these health-related contextual variables.

For example, in Japan, the proportion of young mothers reporting that they expect to depend on their children for old-age security fell from 65 percent in 1950 to about 10 percent in 2000, illustrating a dramatic increase in the will of independence. In parallel the proportion of those who answer that it is a “good custom” or a “natural duty as children” to care for the old parents significantly declined, from more than 80 percent in 1963 to less than 50 percent in 2000. Japanese women are less likely to believe that it is a good custom to care for old parents and, in addition, they are no longer expecting to rely on their children for their old age security (Ogawa et al., 2005). Similar changes have been observed in the United States,

illustrating again that people are becoming more independent in their daily life (Spillman and Pezzin, 2000).

A Swedish study has shown that the decline in the proportion of elderly people receiving help has been much larger than the decline in the proportion of elderly people needing help. At the beginning of the 1980s, the proportion of Swedish elderly receiving help in their daily life was much larger than the proportion of elderly needing help. Both proportions decreased over time, but the former much more than the latter. It seems that in the past, the provision of help was much less related to the need of help than today and help was largely provided to old people in general. The gaps between the reception and the need of help as well as the differential slopes of decline may create some kind of confusion when interpreting IADL and ADL disability trends (Lagergren and Batljan, 2000). American studies, on the other hand, have indicated that instrumental activities of daily living (IADLs: shopping, managing money, doing laundry, preparing meal or using the telephone) are much easier to perform today than 10 or 20 years ago due to the significant improvements in the built and technical environments (Spillman, 2004). Moreover, American elderly use more and more technical devices and assistive technology (Freedman et al., 2006). Therefore, we clearly need to better distinguish among the numerous concepts related to disability—functional limitations at the body level, activity restriction in daily life, difficulty to do, use of technical devices, need and receipt of help—when we attempt to interpret old age disability trends.

5. The Epidemiological Background

The OECD review, unexpectedly, revealed a wide range of values from a low 7.1 percent of people 65+ reporting limitation in at least one ADL (major difficulty or needing assistance) in the Netherlands to a high 18 percent in the United Kingdom (reporting difficulty or requiring assistance), though everywhere ADL limitations comprise the same list of basic activities, such as eating, washing, dressing and moving from bed to chair. Therefore, when analyzing disability trends, we need to first consider the initial level of disability, as the likelihood of disability decline should be much larger if the initial level of disability is relatively high, as in southern Europe (Minicuci et al., 2004; Aijanseppa et al., 2005; Sagardui-Villamor et al., 2005), than if it is initially relatively low as in the Netherlands (Deeg, 2004).

Trends in the life expectancy at age 65 also need to be considered (Robine, 2006). Gaps in life expectancy at age 65 are quite large among low mortality countries. The gap between Japan and the United States, for instance, reached 3.4 years for women and 1.2 years for men in 2004. Life expectancy at age 65 has been increasing by about 2 months per year in some countries such as Japan, France, Spain or Switzerland while it has been very slowly increasing in some other countries such as the United States, Denmark or the Netherlands. A decline in ADL disability hardly has the same meaning for Spain, where the increase in life expectancy at age 65 has been substantial during the last decade, and the United States, where the increase in life expectancy has been much slower, although the two countries initially had quite high levels of ADL disability. Interestingly, countries that witnessed a rapid increase in the number of centenarians may have accumulated frail oldest-old (Robine and Michel, 2004), whereas in Denmark, where the increase in the number of centenarians has been very slow, centenarians performed significantly better in 2005 than 10 years ago (Engberg et al., 2007).

6. Active Life Expectancy

To assess whether the decline in ADL disability is large enough to compensate for the lengthening of life and increase in life expectancy at age 65, it is necessary to simultaneously take into account survival and disability. This is done through the calculation of the life expectancy without ADL disability or active life expectancy (Nusselder and Peeters, 2006). But only few studies follow active life expectancy over long periods of time. The longest published study, based on the U.S. National Long Term Care Survey (NLTCS), covers the period from 1935 to 1999, with a forecast to 2080 (Manton et al., 2006b). This series shows a strong improvement in life and active life expectancies and suggests a significant compression of disability in the long run, with the proportion of life expectancy free of ADL disability increasing from 74 percent in 1935 to above 85 percent in 2080 for both proposed scenarios for the future. Nevertheless, it should be noted that actual values, coming from a really comparable survey, cover the shorter period 1982-1999 and that no improvement is suggested over the previous period 1935-1982. A study focusing on the last decade, 1992-2003, confirms the compression of disability currently observed in the United States (Cai and Lubitz, 2007).

New results from the European Union show that European citizens can expect at age 50, on average, 18 remaining years free of activity limitation for men and 19 years for women. There is a huge diversity between the 27 European Member States, from less than 10 remaining years to about 24 remaining years free of activity limitation according to the country (Robine et al., 2008).

7. Conclusion

Several studies in the United States as well as in Europe showed that an increase in reported or diagnosed morbidity is not incompatible with a decrease in ADLs, IADLs and other daily activity limitations and with a compression of disability. Whereas the disability decline has been confirmed in the United States, the disability decline may be less universal in the other low mortality countries than previously expected. Chronic diseases and functional impairments are the health components which require most of the care resources. Thus, even if the disability decline is strong enough to offset the impact of the lengthening of life, it may hardly offset the rising demand for formal long-term care that will result from several factors such as oldest-old population growth and changes in independence vis-à-vis his/her children (Robine et al., 2007), and the demand for medical care and other health services.

Among the few countries having time series, Sweden presents an interesting case showing a steady decline in disability, at age 65-84 during the 1980s and the 1990s for 16 consecutive years and through eight successive cross-sectional surveys from 1980 to 1996. But since 1996, the successive surveys have shown an increasing disability from 1996 to 2004 (OECD, 2007). However, the U.S. decline in old-age disability contributes to an increased quality of life and a decline in the proportion of elderly reporting poor/fair health among the older population to mirror the decline in disability (Martin et al., 2007). In total, improvements in longevity, in self reported health and in daily functioning during the last decades have been accompanied in the United States by an increase in reported and diagnosed morbidity, health care services use and health spending. To what extent the rising obesity epidemic will change the picture for the new elderly cohorts is a burning question in the United States (Cutler et al., 2007; Kramarow et al., 2007), while why old age disability is stagnating or even increasing is still the most important question for several OECD countries. For the United States and the other countries where old age disability is declining, it is also important to know whether this disability decline will continue or upturn.

Acknowledgment

This study of the compression of morbidity is part of a wider project called the M-project, led by the four authors, which aims to explore the demographic factors leading to an increase in the adult longevity, investigate the phenomenon called the compression of mortality and develop a new methodological approach to longevity analysis with focus on the modal age at death (M).

References

Aijanseppa S, Notkola IL, Tijhuis M, van Staveren W, Kromhout D, Nissinen A (2005) Physical functioning in elderly Europeans: 10-year changes in the north and south: the HALE project. *J Epidemiol Commun Health* 59:413-9.

Ahacic, K., Kareholt, I., Thorslund, M., and Parker, M.G. 2007. "Relationships between Symptoms, Physical Capacity and Activity Limitations in 1992 and 2002." Aging Clinical and Experimental Research 19(3): 187-193.

Australian Institute of Health and Welfare (AIHW). 2003. *Disability Prevalence and Trends*. Australian Institute of Health and Welfare, Canberra, AIHW cat. No. DIS 34.

Cai, L., and Lubitz, J. 2007. "Was there Compression of Disability for Older American from 1992 to 2003?" Demography 44(3): 479-495.

Crimmins, E.M. 2004. "Trends in the Health of the Elderly." Annu Rev Public Health 25: 79-98.

Crimmins, E.M., Alley, D., Reynolds, S.L., Johnston, M., Karlamangla, A., Seemanm T. 2005. "Changes in Biological Markers of Health: Older Americans in the 1990s." J Gerontol A Biol Sci Med Sci 60: 1409-13.

Crimmins, E.M., and Saito, Y. 2000. "Changes in the Prevalence of Diseases among Older Americans: 1984-1994." Demographic Research 3: 9.

Cutler, D.M. 2001. "The Reduction in Disability among the Elderly." Proc Natl Acad Sci U S A. 98: 6546–6547.

Cutler, D.M., Glaeser, E.L., and Rosen, A. 2007. "Is the U.S. Population Behaving Healthier?" NBER Working Paper No. 13013.

Deeg, D.J.H. 2004. "Robine and Michel's 'Looking Forward to a General Theory on Population Aging': Population Aging: The Benefit of Global versus Local Theory." J Gerontol A Biol Sci Med Sci 59:600.

Engberg, H., Christensen, K., Andersen-Ranberg, K., and Jeune, B. 2007. Improvements in ADL Danish Female Centenarians—A Comparative Study of Two Danish Birth Cohorts Born in 1895 and 1905. Poster presented at VI European Congress of the International Association of Gerontology and Geriatrics (IAGG), St. Petersburg, Russia.

Freedman, V.A., Crimmins, E.M., Schoeni, R.F., et al. 2004. "Resolving Inconsistencies in Trends in Old-Age Disability: Report from a Technical Working Group." Demography 41: 417-41.

Freedman, V.A., Agree, E.M., Martin, L.G., and Cornman, J.C. 2006. "Trends in the Use of Assistive Technology and Personal Care for Late-Life Disability, 1992–2001." Gerontologist 46: 124-7.

Freedman, V.A., Martin, L.G. 2000. "Contribution of Chronic Conditions to Aggregate Changes in Old-Age Functioning." Am J Public Health 90: 1755–1760.

Freedman, V.A., Schoeni, R.F., Martin, L.G., and Cornman, J.C. 2007. Chronic Conditions and the Decline in Late-Life Disability." Demography 44(3): 459-477.

Fries, J.F. 1980 "Aging, Natural Death, and the Compression of Morbidity." The New England Journal of Medicine 303(3): 130-135.

Giles, L.C., Cameron, I.D., and Crotty, M. 2003. “Disability in Older Australians: Projections for 2006-2031.” MJA 179: 130-133.

Grundy, E., Ahlburg, D., Ali, M., et al. 1999. *Disability in Great Britain*. London: HMSO, Department of Social Security, (Research Report 94).

Kannisto, V. 1991 “Frailty and Survival.” Genus 47(3-4): 101-118.

Kramarow, E., Lubitz, J., Lentzner, H., and Gorina, Y. 2007. “Trends in the Health of Older Americans, 1970–2005.” Health Affairs 26: 1417-1425.

Lafortune, G., Balestat, G., and the Disability Study Expert Group Members. 2007. “Trends in Severe Disability among Elderly People: Assessing the Evidence in 12 OECD Countries and Future Implications.” OECD Health Working Papers No. 26. OECD.

Lagergren, M., and Batljan, I. 2000. “Will There Be a Helping Hand? Macroeconomic Scenarios of Future Needs and Costs of Health and Social Care for the Elderly in Sweden, 2000-30.” The Long-Term Survey 1999/2000, Stockholm, Annex 8

Manton, K.G., Gu, X., and Lamb, V.L. 2006. “Changes in Chronic Disability from 1982 to 2004/2005 as Measured by Long-Term Changes in Function and Health in the U.S. Elderly Population.” PNAS 103(48): 18374-18379.

Manton, K.G., Gu, X., and Lamb, V.L. 2006b. “Long-Term Trends in Life Expectancy and Active Life Expectancy in the United States.” Popul Dev Rev 32: 81-105.

Manton, K.G., Lamb, V.L., and Gu, X. 2007. “Medicare Cost Effects of Recent U.S. Disability Trends in the Elderly.” J of Aging and Health 19(3): 359-381.

Martin, L.G., Schoeni, R.F., Freedman, V.A., Andreski, P. 2007. “Feeling Better? Trends in General Health Status.” J of Gerontology: SOCIAL SCIENCES 62B (1): S11-S21.

Meinow, B., Parker, M.G., Karecholt, I., and Thorslund, M. 2006. “Complex Health Problems in the Oldest Old in Sweden, 1992-2002.” Eur J Ageing 2006(3): 98-106.

Minicuci, N., Noale, M., Pluijm, S.M.F., et al. 2004. “Disability-Free Life Expectancy: A Cross-National Comparison of Six Longitudinal Studies on Aging. The CLESA Project.” Eur J Ageing 1: 37-44.

Munnell, A.H.,, Libby, J. 2007. “Will People Be Healthy Enough to Work Longer?” Center for Retirement Research, Boston College.

Nusselder, W.J., and Peeters, A. “Successful Aging: Measuring the Years Lived with Functional Loss.” J Epidemiol Commun Health 2006(60): 448-55.

Ogawa, N., Kondo, M., and Matsukura, R. 2005. “Japan’s Transition from Demographic Bonus to Demographic Onus.” Asian Population Studies 1(2): 207-226.

Parker, M.G., Ahacic, K., and Thorslund, M. 2005. “Health Changes among Swedish Oldest Old: Prevalence Rates from 1992 and 2002 Show Increasing Health Problems.” J Gerontol A Biol Sci Med Sci 60: 1351-5.

Parker, M.G., and Thorslund, M. 2007. “Health Trends in the Elderly Population: Getting Better and Getting Worse.” The Gerontologist 47(2): 150-158.

Robine, J.M. 2006. “Trends in Population Health.” Aging Clinical and Experimental Research 18(5): 349-351.

Robine, J.M., Michel, J.P., Herrmann, F.R. 2007. “Who Will Care for the Oldest People in our Ageing Society?” Br Med J 334(7593): 570-571.

Robine, J.M., Jagger, C., Van Oyen, H., and Cambois, E. 2008. “Increasing Healthy Life Expectancy and Reducing Longevity Gaps between European Countries.” In: European Health Report 2008, EUROGLOREH, forthcoming.

Robine, J.M., and Michel, J.P. 2004. “Looking Forward for a General Theory on Population Aging.” J Gerontol A Biol Sci Med Sci 59: 590-7.

Robine, J.M., Mormiche, P., Sermet, C. 1998. “Examination of the Causes and Mechanisms of the Increase in Disability-Free Life Expectancy.” J Aging Health 10(2, special issue): 171-191.

Sagardui-Villamor, J., Guallar-Castillon, P., Garcia-Ferruelo, M., Banegas, J.R., Rodriguez-Artalejo, F. 2005. “Trends in Disability and Disability-Free Life Expectancy among Elderly People in Spain: 1986-1999.” J Gerontol A Biol Sci Med Sci 60: 1028-34.

Schoeni, R.F., Martin, L.G., Andreski, P.M., and Freedman, V.A. 2005. “Persistent and Growing Socioeconomic Disparities in Disability among the Elderly: 1982-2002.” Am J of Public Health 95(11): 2065-2070.

Soldo, B.J., Mitchell, O.S., Tfaily, R., and McCabe, J. 2006. “Cross-Cohort Differences in Health on the Verge of Retirement.” NBER Working Paper No. 12762.

Spillman, B.C. 2004 “Changes in Elderly Disability Rates and Implications for Health Care Utilization and Cost.” The Milbank Quarterly 82(1): 157-194.

Spillman, B.C., and Pezin, L.E. 2000. “Potential and Active Family Caregivers: Changing Networks and ’Sandwich generation.”’ The Milbank Quarterly 78(3): 347-374.

Wiener, J.M., Hanley, R.J., Clark, R., and Van Nostrand, J.F. 1990. “Measuring the Activities of Daily Living: Comparisons across National Surveys.” J Gerontol Soc Sci 45: S229–S237.

World Health Organization. 2001. International Classification of Functioning, Disability and Health (ICF). World Health Organization, Geneva.