Lakdawalla et al\textsuperscript{1} suggests the recent declines in chronic disability prevalence in the US elderly population will reverse as a result of the increased prevalence of obesity, asthma, and disability at ages 50 to 60 and, as a consequence, there will be significant increases in the size of the future US nursing home population older than age 65. We believe these projections do not reflect the correct direction of changes in US nursing home use in the future. We suggest that nursing home use will continue to decline, certainly as a rate past 2011, and possibly in absolute terms during the period that the small depression era and WWII birth cohorts pass age 65 (ie, up to 2011). We feel that these projections are like recent projections that the prevalence of Alzheimer's disease (~70\% of all dementia past age 65) will reach 16 million cases by 2050—both ignore significant new survey and clinical data and evidence.\textsuperscript{2,3}

The reasons for this evaluation are many. First, the projections of Lakdawalla et al\textsuperscript{1} use estimates from the MCBS of the change in chronic disability rates up to 1996. Though our 1997 and 2001 papers are cited, it appears that they did not use the more rapid rate of decline of 2.6\% per annum observed 1994 to 1999 in their sensitivity studies.\textsuperscript{4} They used the slower 1.5\% per annum decline observed 1989 to 1994.\textsuperscript{5} They also did not extrapolate the acceleration of this decline as it occurred 1989 to 1994 vs. 1994 to 1999 to provide an empirically based estimate of an upper bound to improvement in disability prevalence. The decline of the US institutional (nursing home and assisted living in nursing home beds) population 1994 to 1999 was much faster (5.9\%) by itself than the global disability decline of 2.6\% per annum.\textsuperscript{4} Comparing the MCBS projections with those using NLTCS estimates only to 1994 (~1.5\%) suggests the MCBS estimate produced a 25\% higher utilization of nursing homes. Using the 1994 to 1999 NLTCS declines, especially for institutional residence, would generate a much larger discrepancy.

A key factor in our observed NLTCS decline, and a point they did not mention, was the rapid decline in the prevalence of severe cognitive impairment—a key dynamic driving institutionalization. In the per annum rate of decline in severe cognitive impairment was 3\% per annum 1982 to 1999—the period 1994 to 1999 showed continuation of the decline noted in 5\% for 1982 to 1994.\textsuperscript{4} A decline in the prevalence of severe cognitive impairment was also found for a shorter interval by in the 1993 to 1998 AHEAD and HRS.\textsuperscript{6} It is consistent with the negative correlation between years of school completed, cognitive exercise, and the risk of severe cognitive impairment observed in earlier NLTCS and found in several epidemiological studies.\textsuperscript{7-9} In projections of chronic disability adjusted for educational differences also reduced dramatically (~50\%) the size of the future Alzheimer's disease population—especially the population with severe impairment.\textsuperscript{10} It is consistent with the negative correlation found between estrogen\textsuperscript{8} and the risk of Alzheimer's disease in US females,\textsuperscript{11} with evidence that the use of ibuprofen (or equivalent other NSAIDS) could reduce the risk of Alzheimer's disease by 80\%\textsuperscript{12,13} and recent evidence that the mechanism by which ibuprofen reduces Alzheimer's risk is, in addition to reducing

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inflammation, by affecting a basic disease mechanism—amyloid protein deposition.\textsuperscript{14} It is also consistent with evidence that antioxidants (eg, Vitamins E and C) significantly reduce Alzheimers disease risk.\textsuperscript{15,16} Thus, Alzheimers disease prevalence using existing knowledge of potential interventions may continue to decline even as educational cohort differences dissipate. Non-Alzheimers dementia may decline, for example, because of improved intervention in hypertension and stroke. A continuing decline in severe cognitive impairment is also consistent with improved management of sensory impairments—especially vision (eg, treatment of cataracts and macular degeneration).\textsuperscript{17-19}

There is increasing evidence that the most prevalent cause of chronic disability, musculoskeletal problems (especially various forms of arthritis), is declining with disease modifying agents (eg, methotrexate) being effective against rheumatoid arthritis (and new agents, like TNF \& antigens coming on line) and glucosamine and chondroitin now being recognized in RCTs as modifiers of osteoarthritis.\textsuperscript{20} These two conditions (dementia, arthritis), which are declining rapidly, are currently far more important dynamics in institutional use among the elderly than obesity and asthma.

Also not well modeled were the effects of increased education. Projections based on observed increases in the number of years of school completed in the elderly suggests that those dynamics alone could support a rate of decline of 2.2\% per annum to about 2040.\textsuperscript{21} Important is the fact that chronic disability at earlier ages is more likely associated with specific behavioral risk factors like smoking, diabetes mellitus (type II is associated with obesity), and alcohol use—all of which lead to shorter life spans. Thus, many people who have early disability because of those factors may die in their sixties and early seventies and not be future candidates for nursing home use.

We also question these projections based on their extrapolation of the prevalence of chronic disability among the 50- to 60-year-old US population. This, in part, is because, at least for Social Security eligibility for disability younger than age 65, there is a different definition of disability than for the elderly in the NLTCS. Disability for social security below age 65 is generally based on the ability, or lack of ability, to work in specific jobs and not on chronic impairment on ADL and IADL measures as for the older-than-65 population. The major social security reasons for disability entitlement younger than age 65 are not obesity and asthma but (in 2000) job impairments caused by chronic psychiatric problems (27.4\%), musculoskeletal problems (28.7\%), and heart disease (10.8\%).

Also, the arguments in the paper do not acknowledge the potential effects of interventions in obesity when identified as a national health problem—declines in serum cholesterol, hypertension, and smoking have been observed in NHANES because of NIH research identifying those as major health risk factors and because of public education. There is currently legislation pending before Congress to deal with obesity as a national health problem. Also, a positive sign is increased interest in nutrition and exercise in older persons. Indeed, weight loss and malabsorption syndromes are currently significant problems in the very elderly.

Another factor not recognized is the impact of federal policy on the use of institutions. Two instances of note are the modification in 1989 (a consequence of administrative changes caused by the short lived Catastrophic Care Act of 1988) of the HIM-11 regulations, which increased the use of home health and SNF services from 1989 to 1997. In response to the rapid increase in the HHA and SNF use reimbursed by Medicare, the Balanced Budget Act (BBA) of 1997 was passed to restrict growth of HHA services, reduce payments to hospitals, and constrain the use of Medicare SNFs for postacute care.\textsuperscript{22} This had a dramatic effect on Medicare expenses causing them to decline in absolute terms in 1999 and 2000.

Additionally, during this period, there was significant economic growth favorably impacting the US elderly population so that it had the resources necessary to seek alternatives to nursing home residence. One option was the use of assisted living—a new type of residential care facility that often provides care at all levels. Thus, we disagree with the characterization that assisted living is simply another form of community residence. Of more than 811,000 persons in assisted living in the 1999 NLTC, 62\% had no chronic disability. Twenty-four percent of the remainder had chronic disability and 14\% lived in the residential equivalent of a nursing home unit. Thus, 200,000 of the assisted living population live in institutional residence. The combination of the 13.2 million persons in nursing homes and 140,000 persons in nursing home units in assisted living produce a total US institutional population older than 65 of
1.46 million in the 1999 NLTCS—consistent with a pervasive decline in nursing home use rates found 1985 to 1995 NNHS23 and the 1987 to 1996 MEPS.24 The 2000 US Census also showed a slower rate of institutional residence growth. There will likely be broad resistance to return to nursing homes among elderly persons as well as the tendency for chronic disability to decline (from, in part, a reduction in Alzheimer’s disease as a result of education, HRT or ERT use in females [and, in the future, treatment of male hormonal declines], use of antioxidant and NSAIDS, and sensory improvement). If we had assigned the 140,000 persons in assisted living nursing home beds to the community population the declines 1994 to 1999 would have been larger than 5.9%.

In addition to substantive issues, we have concerns about their methodology regarding the specification of the regression functions used. One concern is the apparent lack of an explicit specification of interaction terms in their regression coefficient tables. Interactions, if significant, imply nonlinearities in the process and potentially rapid changes or shifts (bifurcations) in behavior. The assumption that effects can be “averaged out” is equivalent to assuming away interaction effects—though the authors themselves suggest that such interactions are significant. One place where this may be a special problem is that there is likely real across-state variation in nursing home use, though the coefficients for individual states may not be significant. It seems likely that there are groups of states that may significantly differ in institutional use because of state variation in Medicaid programs. The analytic problem is to identify the groups and use a state group variable in the regression. A second issue in the specification of the equations is that the selection effect of mortality is not explicitly modeled, even though the authors recognize that mortality selection could have a major impact on their projections as we discussed about alcohol use and smoking above.

The combination of substantive and methodological issues causes us to question the projection that the nursing home population may increase in the near future. We feel epidemiological, public policy, and economic factors will prevent that—probably producing a large net increase in the quality of life for the elderly. We note that the MCBS as a survey also may have methodological flaws. Two are the inability to make detailed estimates older than age 90 (despite oversampling with those older than age 85) where the highest risks of institutionalization and chronic disability occur, and in the reporting of disability, which, at least in early MCBS, apparently did not test for chronicity. It is interesting that, in addition to the MCBS disability declines cited by Waidmann and Liu,25 Corder et al20 recently noted a modest acceleration in the model-based rate of chronic disability decline comparing the 1991–1994 MCBS with the 1994–1999 MCBS. That modest acceleration occurred even though the earlier MCBS rate estimates were apparently not “age standardized” in the model so the acceleration may be relatively large, according to E. Stallard and K. Land (oral communication, 2002). This is consistent with the 1999 NLTCS finding of an acceleration in the raw rates 4 Thus, it suggests that the use of MCBS up to 1996 missed this acceleration so that their projections may not even accurately reflect the MCBS data trends. The projections made by Lakdawalla et al1 fail a test of face validity by not accurately integrating and reflecting recent national survey (MCBS data to 1999; NLTCS data to 1999), laboratory and clinical data and studies.

References
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