**Trends in US Women's Physical Functioning by Education Level, 1997-2014.**

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**SHORT ABSTRACT**

Functional limitations and disability declined among American women during the 1990s, but whether those trends continued into the 21st century is largely unknown. Whether socioeconomic inequalities in disability increased or decreased is also poorly understood. Given the cost of health care for the disabled, the trends are of major importance to US social and health policies. This project examines recent trends in functional limitations and disability among women aged 45-84. We document and explain both aggregate and education-specific trends. Using the 1997-2014 National Health Interview Surveys (N~150,000), we employ semiparametric models to examine disability trends by education and appropriate regression models to statistically test changes over time. Preliminary findings reveal surprising increases in functional limitations and disability in non-elderly women, particularly among the less-educated. The increasing educational inequalities in disability seem to mirror those observed in recent decades among US women for mortality, suggesting common underlying causes.

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Trends in US Women's Physical Functioning by Education Level, 1997-2014

Extended abstract.

Improvements in health and longevity of American women have lagged behind their peers in other developed countries in recent decades; the improvements have also lagged behind their male peers in the United States. In this study we focus on important indicators of health status –functional limitations and disability-- and examine the extent to which recent trends in these outcomes among women differ across socioeconomic subgroups, and the reasons for the differences.

Research on mortality trends has found that the disconcerting trends for U.S. women are primarily driven by the high mortality of low-educated women, with marked increases in mortality inequalities by education. The large literature on health trends has largely focused on the aggregate findings while the question of how the trends are patterned by education has been somewhat neglected. This presents a critical gap in knowledge. Because of the high costs of functional limitations and disability to individuals, families, communities, and nationwide (Freedman, Martin and Schoeni 2002, Fried et al. 2001), understanding their trends across different social groups is critical for health care and policy planning targeted optimally at the most vulnerable groups in the population.


The increasing average educational attainment in the population is a key contributor to the health improvements of the late 20th century (Crimmins and Saito 2001, Martin, Schoeni and Andreski 2010). Surprisingly, little research has tried to determine trends across different levels of education (Freedman, Martin and Schoeni 2002, Schoeni et al. 2005). The few exceptions noted persistent or increasing disparities in various health outcomes (Crimmins and Saito 2001, Martin et al. 2007, Schoeni et al. 2005). This gap in the literature is all the more startling because research on trends in mortality has focused heavily on educational disparities and determined that the worsening aggregate trends (Crimmins and Beltrán-Sánchez 2011) are driven primarily by the increasing death rates of low-educated women. We urgently need to determine trends in different dimensions of health for women across educational-attainment levels in order to understand what groups are driving the aggregate trends and how the increasing disparities in mortality may be unfolding much earlier in the disablement process (Schoeni, Freedman and Wallace 2001, Verbrugge and Jette 1994).
We also examine two explanations for the education-specific trends in women’s morbidity and disability: obesity and smoking, and socioeconomic well-being. Evidence for the role of obesity is mixed (Iezzoni, Kurtz and Rao 2014, Martin et al. 2010, Martin and Schoeni 2014) and the role of smoking is largely unknown (Martin, Schoeni and Andreski 2010). We draw on our earlier work (Montez and Zajacova 2013) on the diverging trends in women’s mortality across education levels, which found that economic circumstances and health behaviors were key explanations.

DATA AND METHODS

Data
We use the National Health Interview Surveys (NHIS) data 1997-2014 (preliminary results are based on 1997-2013 data). The NHIS is an annual cross-sectional, nationally-representative survey of the non-institutionalized US population. It is the best source of data for our project because it includes a long 17-year series, most recent data, the entire adult lifecourse, a large sample size, a rich set of health outcomes, and all necessary controls.

Sample is defined as “sample adult” women age 45 to 84. The “sample adult” is a random subsample of adults who were administered all of the health measures proposed here. The upper age boundary is 84 because the NHIS top-codes at age 85. Our range includes middle-aged to elderly women from birth cohorts 1913-1969.

Variables
Key predictors are 1) the year of interview (trend) and 2) and educational attainment. Attainment is coded as less than high school, high school, some college, and bachelor’s degree or higher.

Basic control variables included in all models are age and race/ethnicity. Explanatory factors to be included later comprise health behaviors, especially obesity, and socioeconomic status measures.

Outcomes are listed in detail in Appendix A. They include functional limitations (mobility, sensory, emotional and cognitive), accommodations (needing special equipment), and disability: impaired social participation, work limitations, and needing help with activities of daily living (ADLs) and instrumental activities of daily living (IADLs).

Approach
All analyses are estimated on pooled 1997-2014 NHIS data. Most models stratify the sample of women to younger and older groups (45-64 and 65-84) because of indications that the trends may differ by age group.

Analyses to date (through 09/25/15) focus on visualizing education-specific trends in the health outcomes. The figures shown below are generated from semiparametric partial-linear models (Lokshin 2006). We have also estimated nonparametric unadjusted models and calculated age-standardized year-specific prevalence values – results not shown for parsimony because the
findings were comparable to those shown here. We also estimated appropriate regression models of select outcomes as a function of year (trend) interacted with education, to test whether the disability trends are converging, diverging, or parallel.

At a later point, health behaviors and economic circumstances will be added to explain observed education-specific health trends. We will include these as covariates in appropriate regression models. The changes in the coefficient of trend across unadjusted versus adjusted models will be calculated to capture the proportion of trends due to the mediators. For easy visualization, we will then plot predicted morbidity and disability trends for women at different education levels at comparable mediators levels (that is, setting the values of the mediator variables to specific levels in all prediction calculations). This set of plots will yield an intuitive image of the ‘direct’ or residual effect of education on trends other than via the considered mediators.

**PRELIMINARY RESULTS**

The proportions of women with limitations and disability varies by age group and disability measure. This motivates our age-stratified analyses and broad focus on all available outcomes.

<table>
<thead>
<tr>
<th>Disability measures</th>
<th>All ages</th>
<th>45-64</th>
<th>65-84</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Raw</td>
<td>Weighted</td>
<td>Raw</td>
</tr>
<tr>
<td>Any disability</td>
<td>8.7%</td>
<td>8.4%</td>
<td>5.7%</td>
</tr>
<tr>
<td>Needs help with ADLs</td>
<td>3.3%</td>
<td>3.1%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Needs help with IADLs</td>
<td>8.3%</td>
<td>8.0%</td>
<td>5.4%</td>
</tr>
<tr>
<td>Work limitation</td>
<td>21.5%</td>
<td>20.6%</td>
<td>18.4%</td>
</tr>
<tr>
<td>Social limitation</td>
<td>16.4%</td>
<td>15.9%</td>
<td>13.3%</td>
</tr>
</tbody>
</table>

Among older women age 65-84, most outcomes had relatively stable trends, with some educational groups increasing slightly and some decreasing. Also, for most outcomes there was no statistically significant divergence or convergence of trends by educational attainment (table not shown for parsimony). A good illustration is the figure for any ADL/IADL disabilities.

An exception among older women were mobility limitations, which had a statistically significant upward trend for most of the 2000s. As for other outcomes, however, there were no statistically significant differences in the trends by education. That is, older women are not experiencing increasing relative inequalities in limitations and disability.
Among younger women age 45-64, the results are rather different. For many outcomes, we observe statistically significant increases in limitations and disability, either for all education groups as in the figure below for mobility limitations, or for less-educated group as in the figure below for any ADL/IADL disability.

This finding indicates that the trends in functional limitations and disability for middle-aged women are increasing for some or all sections of the educational spectrum.
The trend described above for women aged 45-64 was observed for most outcomes, including those that are less closely related to mobility, such as social limitations. In fact, the only outcome where trends were decreasing was sensory limitations, perhaps reflecting the improved technology in vision and hearing corrective devices and medical interventions (i.e., cataract surgery).
REFERENCES


APPENDIX A. OUTCOME VARIABLES

Functional limitations

- **Physical limitations**: degree of difficulty, without special equipment, with any of the following 9 activities: carrying 10lbs, walking up 10 steps, pushing large objects around, grasping small objects, reaching over one’s head, standing 2 hours, sitting 2 hours, stooping or bending, or walking ¼ mile,
- **Cognitive limitations**: activities limited by difficulty remembering.
- **Sensory limitations**: has lot of trouble hearing/deaf; trouble seeing even with glasses/contact lenses or unable to see/blind.
- **Emotional limitations**: elevated Kessler6 (K6) score, which asks how frequently the respondent felt sad, nervous, restless, hopeless, worthless, or like everything was an effort, in the past 30 days.

Accommodation

- **Special equipment**: having a health problem or functional limitation that requires the use of special equipment such as a cane, a wheelchair, a special bed, or a special telephone.

Disability

- **IADLs**: needs help of other persons in handling routine needs, such as everyday household chores, doing necessary business, shopping, or getting around for other purposes.
- **ADLs**: needs help with any of 6 basic personal care such as bathing/showering, dressing, eating, using the toilet, getting around at home, and getting in/out of bed or chairs.
- **Social participation**: degree of difficulty, without special equipment, with any of the following three activities: going out, relaxing at home, and participating in social activities such as visiting friends.
- **Work limitations**: degree of difficulty, without special equipment, with any of the following three activities: going out, relaxing at home, and participating in social activities such as visiting friends.