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Disability of Older Koreans

Evidence on Prevalence and the Role of Education from Five Data Sets

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Disability of Older Koreans: Evidence on Prevalence and the Role of Education from
Five Data Sets

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Abstract

Objective: To investigate how educational attainment may affect the prevalence of disability among older Koreans, a population for whom the association between health and education has been little studied. **Methods:** We performed descriptive and logistic regression analysis on five nationally representative data sets, all collected between 2004 and 2006, regarding education and disability among Koreans at least 65 years of age.

Results: We find the relationship between education and disability to be strongest between less than primary school graduates and primary school graduates. Beyond the primary school level, the educational gradient on disability is weak. **Discussion:** The effect of education among older Koreans may be limited by rapid industrialization.

Key Words: Activities of Daily Living (ADL), Disability, Educational gradient, Korea

Extensive research has investigated whether and how education affects health (Cutler & Lleras-Muney, 2008). Although the association between health and education is well established in Western nations, some research has questioned whether there is such a relationship in Asian (Jatrana & Chan 2007; Zimmer et al., 2004) and developing countries (Smith & Goldman, 2007). The policy implications of this issue are paramount. A significant association between education and health in these non-Western countries suggests that the heightened educational achievement of a population will lead to improvements in population health, a strong argument for cost-effectiveness of using education to promote health promotion. Understanding this relationship (or lack of) is especially critical for East and South Asian countries, which confront “compression of aging” (Kinsella & Phillips, 2005) and have experienced a remarkable growth in educational attainment.

The extensive literature on disability in Western nations emphasizes the importance of the measurement of disability (Freedman, Martin, & Schoeni, 2002). Although there is consensus on how to define disability, e.g., as “the impacts of health problems on people’s social functioning, that is, their ability to perform roles and activities in their society” (Verbrugge, 1997, p. 338), there is little or no consensus on how to measure it. This is particularly true for measures based on activities of daily living (ADL) limitations (Deeg, Verbrugge, & Jagger, 2003; Laditka & Jenkins, 2001). Heterogeneity of measurement has resulted in inconsistent estimates of the prevalence in ADL limitations across data sets (Jette, 1994; Walsh & Khatutsky, 2007; Wiener et al., 1990). Freedman et al. (2004) concluded that “period and definition of disability” are the main sources of inconsistency in estimates of ADL limitations. Difficulties in measuring

ADL limitations may lead to difficulties in assessing the relationship between education and disability as defined by ADL limitations.

In this paper, using five nationally representative cross-sectional data sets, we examine the association between education and old-age disability in the Republic of Korea (hereafter Korea). The data sets we examined are the 2005 Korean Census Micro (KCM) data, the 2004 Living Profile (LP) and Welfare Service Needs of Older Persons in Korea, the 2006 Social Statistics Survey (SSS), the 2005 Korean National Health and Nutrition Examination Survey (KNHANES), and the 2006 Korean Longitudinal Study of Aging (KLoSA). These data sets were collected or sponsored by the Korean government, and thus yielded higher response rates. They are also important sources for research and policy development for elderly people or health issues. The fieldwork for all occurred between 2004 and 2006. All included large numbers of old respondents.

As Firebaugh (2008, 106) suggested, “replication across data sets in a given study” can elicit sounder conclusions. If we find consistent relationships between education and disability in these data sets that differ on dimensions such as collection mode, question wordings, and response categories, then we can have greater confidence in our conclusions. Such methods minimize risk of being overly dependent upon one data set, especially for a nation where the survey industry has recently developed (emerging mainly in the 1990s) (Park, 2000).

LITERATURE REVIEWS

Life course paradigm literature links socio-economic status with old age disability through its emphasis on the lifelong process of aging under social circumstances (Elder,

Johnson, & Crosnoe, 2003). Under the life course paradigm, persons who are disadvantaged in early life are more likely to cumulate disadvantage throughout life and be disadvantaged in later years (Dannefer, 2003). Previous research has often used the lack of education as a proxy for disadvantage in early life because education is usually completed early in life, it is not likely to pose a problem of reverse causation in analysis, and it can be easily measured for nearly all persons (Crimmins & Cambois, 2003; Duncan et al., 2002; Freedman & Martin, 1999; Land & Yang, 2006). Higher levels of education can also reduce one's risk for disability, given that more educated persons are likely to avoid risks or to minimize the consequences of disease (Link & Phelan, 1995, p. 87).

While there is a consensus that higher education is associated with lower levels of disability in developed countries, particularly in the United States, whether the early-life disadvantage persists or even grows into old age is unsettled (Ferraro, 2006). Minkler, Fuller-Thomson, and Guralnik (2006) found fewer years of education are associated with fewer functional limitations in old age. Wray and Blaum (2001) found education is significantly associated with ability to perform activities of daily living (ADL) among persons 51 to 60 years of age, but not among persons at least 70 years of age. Kimbro et al. (2008) found, for persons 25 to 64 years of age, education is less associated with disability for foreign-born persons than for U.S. natives.

There is still less knowledge on education and old-age disability in East and South Asia (Kendig, 2004). The few studies on disability in developing, Asian countries (Chalise, Saito, & Kai, 2008; Ng et al., 2006; Ofstedal et al., 2007) have mixed findings. Zimmer et al. (2004) found no association between education and physical functioning

(difficulty crouching, climbing, lifting, walking) in Thailand and Philippines. In China, Liu et al. (2009) found that elderly Chinese with primary education are more likely to have functional disability (i.e., “the upper or lower limbs were missing, malformed or dysfunctional”) than those with at least a high school education, but there is no difference in disability between those with primary education and those with no education. At the same time, education is negatively associated with health-promoting behavior in China: individuals with at least a high-school education are more likely to have an unhealthy diet and limited physical activity, to smoke, and to use alcohol heavily (Kim, Symons, & Popkin, 2004).

In Korea, Kang (2007) found that older persons with less than an elementary-school education are more likely to have ADL limitations than those with elementary-school education, but those with an elementary-school education do not differ significantly from those with at least a middle-school education (controlling for other health conditions and health behavior). Using the 1994 LP survey, Lee and Shinkai (2003) showed that, among persons at least 60 years of age, there was no significant difference in functional disability (i.e., combination of ADL and instrumental activities of daily living (IADL) items) between persons with less than and at least seven years of education. Also, using the LP survey, Jang, Cho, and Kawachi (2010) did not find statistically significant differences among educational groups for age-adjusted prevalence ratios for ADL disability of old men and women in 2004.

METHODS

DATA

The five data sets we use are:

- The 2005 Korean Census 2% Microdata (KCM). Korea has conducted a census every five years since 1925 (Korea National Statistical Service, 2006). We drew a sample of 98,848 persons aged 65 and over from the KCM. The 2000 Census was the first to ask disability questions, which were slightly modified in 2005. The 2005 Korean Census has question wording and format similar to that for the 2000 U.S. Census (see <http://www.census.gov/dmd/www/pdf/d02p.pdf>) but has limited income information.
- The 2006 Social Statistics Survey (SSS). The SSS has been conducted annually by the Korea National Statistical Office since 1980 (Korea National Statistical Service, 2007; see, for example, Kim et al., 2007; Khang, Yun, Cho, & Jung-Choi 2009). It contains nationally representative data on social change, including household and individual-level information for a variety of annual and other rotating topics. In 2006, the survey included health, family, social participation, and labor items. Six ADL items were also included for the first time. The survey is conducted either in person or self-administered for the population at least 15 years of age. It included 33,000 households in July 2006 and had a 95-percent response rate. We analyzed a sample of 9,585 persons aged 65 and older from this survey.
- The 2004 Living Profile (LP) and Welfare Service Needs of Older Persons in Korea. This nationally representative data set was collected from June

to September of 2004 by the Korean Institute for Health and Social Affairs (KIHASA) through interviews of persons at least 65 years old. Its sample size is 3,278 with a 94 percent response rate. It aims to provide basic information about health, social relations, intergenerational transfer, and financial situations of older Koreans. It includes 12 ADL items with response categories of “completely independent, needs some help, and completely dependent.” This survey was also conducted in 1994 and 1998. The data set is interchangeably termed as “the Living Status of Korean Elderly” (Kim & Rhee, 1997; Lee & Shinkai, 2003) or “the National Survey of Elder’s Life and Welfare Desires” (Jang, Cho, & Kawachi 2010).

- The 2005 Korean National Health and Nutrition Examination Survey, or KNHANES (<http://knhanes.cdc.go.kr/>). KNHANES, closely modeled on the U.S. National Health and Nutrition Examination Survey (<http://www.cdc.gov/nchs/nhanes.htm>) is a cross-sectional nationally representative survey previously conducted in 1998 and 2001 (see, for example, Chun, Khang, Kim, & Cho, 2008). The target population for KNHANES is community-residing individuals at least one year old. KNHANES uses a multistage probability sampling design and consists of a health interview, a physical examination, and a nutrition examination. Three different organizations conducted the KNHANES: the KIHASA, which collected health interview data, the Korea Centers for Disease Control and Prevention (KCDC), and the Korea Health Industry

Development Institute (KHIDI). The response rate for health interviews was 98.9 percent. We assessed a sample of 3,730 older adults at least 65 years old from this survey.

- The 2006 Korean Longitudinal Study of Aging (KLoSA). The KLoSA is a large-scale, longitudinal survey of the community-residing population at least 45 years of age. The baseline survey instrument was modeled after the Health and Retirement Survey, and included questions on demographics, family and social networks, health, employment and retirement, income and assets (Lee, 2007). Baseline data were collected from August 1 to December 22, 2006. The study sample was drawn from the 2005 Census. To account for design effects created by stratified multi-stage area probability sampling, we used weights and strata in estimation. The survey had an 89.2 percent response rate, with a total of 10,255 respondents completing the interview. For this analysis, we used the sample of 4,155 respondents at least 65 years of age.

Appendix A provides descriptive statistics for the older population in all five data sets.

VARIABLES

As noted, these surveys ask a range of ADL questions. These vary in specific topics and response categories. We summarize these questions below and present detailed descriptions in Appendix B.

The Korean Census asks respondents whether they “have any difficulty in doing” ADLs such as, “clothing, bathing, eating, and getting around inside the home.” Response categories are binary, Yes (1) and No (0).

The SSS asks respondents if they “are able to do” six ADLs: “sitting and standing, dressing, using the toilet, eating, walking inside the home, and bathing”. Response categories are “I can do it by myself,” “I can do it with some help,” and “I cannot do it by myself.”

The LP survey asks whether respondents “need assistance” when they do 12 ADLs, including 1) dressing and undressing; 2) washing face; 3) brushing teeth; 4) bathing; 5) eating; 6) repositioning or changing one’s posture; 7) getting up and sitting; 8) moving to a different position or seat and sitting down; 9) getting out of the room; 10) toilet use; 11) bowel continence; 12) bladder continence. It has three response categories: (1) completely independent, (2) need some help, (3) completely dependent.

The KNHANES also asks whether respondents “need assistance” to perform seven ADLs: dressing, washing face, bathing, eating, getting out of bed, using the toilet, and controlling urination and defecation. It has a three-point scale that includes rather long response categories and provides free-standing special instructions for clarifying the conditions for response categories. In terms of the format and question wording, the KNHANES has the most complex data of the surveys we review.

The KLOSA has seven ADL items that are similar to those in KHNANES. These have three response categories: “No, I don't need any help,” “Yes, I need help to some extent,” and “Yes, I need help in every respect.”

For our analysis of the prevalence of disabilities among older persons in these data sets, we created a dichotomous variable on whether old persons have a disability (yes=1). For surveys with ADLs (that is, all the surveys but the Census), we combined answers indicating partial or complete dependency in performance into a single category (coded 1) that we compared with responses of no dependency (coded 0). We defined disability as having dependency in at least one ADL.

For our independent variable, we derived an education variable with four categories: less than primary-school graduates, primary-school graduates, middle-school graduates, and high-school graduates (or higher). For the LP survey, which does not provide information on whether the respondent completed school, we used the last level of school the respondent attended as a proxy for educational attainment.

We use five control variables present in all five data sets: age (the reference category of 65-69, plus categories of 70-74, 75-79, 80-84, 85+), marital status (reference category of married, plus widowed and divorced/separated), and dummy variables for home ownership (1=yes) and urban residence (1=yes).

Data Analysis

Although these data have been used in previous studies about disability, as far as we know this is the first study comparing them. Therefore, we first show the percent of persons with at least one of the limitations and with specific limitations in each of these data sets (Table 1). We later present disability prevalence by gender and education. Finally, using logistic regression analysis, we estimate the association between education

and odds of disability controlling for age group, marital status, home ownership, and urban residence.

<Table 1 about here: % of ADL >

RESULTS

Prevalence of Disability

Table 1 presents the prevalence of any disability as well as for specific ADLs in each data set. As noted, the data differ in measurements of disability, including on number of items, duration imposed, level of difficulty, and question wordings (difficulty vs. assistance). The KCM asked one combined item about “Dressing, bathing, eating, or getting around inside the home.” It shows the lowest level of prevalence of disability, 5.4 percent. For comparison, we note the U.S. Census found disability (excluding eating) among older persons to be 9.5 percent (Waldrop & Stern, 2003). The prevalence of ADL disability was 7.5 percent for the SSS and 8.2 percent for the LP survey. The similar prevalence of ADL disability reported by the SSS and the LP survey is noteworthy because the LP survey asks about twice as many ADLs. The KLOSA and KNHANES asked about seven ADL items with similar content but with different formats and response categories. The KLOSA showed a prevalence of 10.0 percent, close to that of the LP, but well below the 17.7 percent prevalence in the KNHANES. Much of the higher prevalence of disability in the KNHANES appears to be from its high estimate of older persons needing assistance in bathing or showering, particularly in the proportion of persons needing “some” help with this activity. Bathing is typically the ADL with which

older persons need the most assistance (Chen et al., 1995; Thomas, Rockwood, & McDowell, 1998; Tang et al., 1999).

<Table 2 about here >

Education and Disability

Table 2 presents the education gradients by sex in disability for each of the five data sets. In each data set, disability appears to be higher for women, although the differences between men and women are relatively small except in the KNHANES. Disability rates for the least educated group appear to be about 2.5 times that for the most educated in all but the LP survey. The biggest difference, particularly among men, appears to be between those who did not complete primary education and those who completed that or a higher level.

<Table 3 about here >

Table 3 presents results of a multivariate logistic regression analysis conducted separately for males and females. Controlling for home ownership, age, marital status, and urban residence, our multivariate results show no clearly consistent education gradient for disability among older Koreans. Men who did not complete primary school are 1.2 to 2.2 times more likely to be disabled than primary school graduates in all five data sets. The difference between primary school graduates and persons of higher

educational attainment, however, is not statistically significant. For women, the difference between those who graduated primary school and those who did not is statistically significant in only two data sets. The difference between elementary school graduates and women of higher educational attainment is also not statistically significant in most of the data sets.

Old age is positively associated with disability for both women and men across the five data sets. Marital status and urban residence do not show consistent patterns. Home ownership has a significantly negative effect on disability for men in the Census, KNHANES, and KLoSA, and for women in the Census and the KLoSA.

DISCUSSION

In presenting a case of an Asian country undergoing rapid population aging, this paper seeks to understand ADL prevalence as well as the relationship between education and ADL among older Koreans in five data sets. Overall, we find the relationship between education and disability to be strongest between less than primary school graduates and primary school graduates. Beyond the primary school level, the educational gradient on disability is weak. This may suggest that how education is embedded in life course could be culture-specific, a Korean version of cumulative disadvantages.

Our findings might also benefit from the context of Korean history. In rapid modernization, persons with higher socio-economic status may have fewer health-promoting behaviors (e.g., Kim, Symons, & Popkin, 2004). Additionally, in a collective

culture, individuals are more likely to be influenced by norms, and behave according to the collective self instead of the private self (Triandis, 1989). Individual habits of drinking and smoking, for example, may be the result of social pressure rather than of individual choices. Persons with higher levels of education, especially older ones, may find it harder to adopt health-promoting behaviors than they would in other cultures. Even younger Koreans aged 30 to 64 show no consistent socio-economic gradient on several behavioral risk factors (Kim & Ruger, 2010). For example, the most educated Korean men and women have the highest rates of obesity and regular exercise. Younger Koreans also show higher educational gradient in mortality than older cohorts (Khang, Lynch, & Kaplan, 2004). In short, in later economic transformation (Ofstedal et al., 2007) Koreans have not consistently acted in ways that fulfill the beneficial effects of education.

How do we explain the non-linear relationship between education and disability among men and the lack of a relationship among women? We speculate that, for older men whose educational achievements were accomplished during a period of rapid modernization, primary school graduation might be the most critical determinant for life course and thus for cumulative disadvantage. For women, life course might have depended more on their husbands' education rather than their own given cultural norms regarding women's place at home.

We did find that in four data sets old persons have the most difficulty in bathing. This supports the hierarchical structure of ADL questions typically used in surveys (Wiener et al., 1990), although our results do not show a clear hierarchy of other ADL items. Because bathing is consistently the most reported ADL difficulty, bathing items

can help identify maximum levels of long-term care needs and to identify the barriers of home environment.

By investigating multiple data sets, we shed light on the critical importance of measurement issues embedded in estimating the prevalence of disability. A careful examination of the disability measurement is required, especially in tracing the disability trend. For example, a recent study of LP survey data shows a striking reduction of age-adjusted prevalence ratio for ADL disability among older Koreans between 1998 and 2004—from 24.98 in 1998 to 3.67 in 2004 for men and from 41.10 in 1998 to 4.80 in 2004 for women—but did not consider changes in question wording and response categories in that time (Jang, Cho, & Kawachi, 2010). “Difficulty questions” have elicited higher levels of prevalence for ADL limitations than “assistance questions” have in the United States (Jette, 1994; Kovar & Lawton, 1994; Laditka & Jenkins, 2001) and may have also done so in the LP survey.

Despite critical importance, disability measurement and data quality issues often do not receive adequate attention from the statistical offices, and analysts have been reluctant to disclose the limitations of data partly due to the relationship with statistical organizations or due to the unavailability of details about the data (Hull, 2005). Given a wide variation of data quality, replication by analyzing several data sets may guard against data bias and increase the credibility of findings. Future surveys may wish to include a global disability item (Verbrugge, Merrill, & Liu, 1999) in order to check whether different data sets yield similar results for it.

Our results should be interpreted cautiously. The weak educational gradient in disability among older Koreans may be a result of mortality selection. Because persons of

lower educational attainment may have higher mortality rates, our analysis may not capture the full potential impact of educational gradients on disability. Also, we were able to control only a few variables across all five data sets in order to take full advantage of comparability across five data sets and could not fully incorporate other socio-economic indicators (e.g., Duncan et al., 2002) or other known risk factors (Braveman et al., 2005; Fillenbaum et al., 2010). Compared to the previous studies that include additional risk factors, our results are consistent with Kang (2007) but not with other studies that found no relationship between education and ADL limitations in Korea (Lee and Shinkai 2003; Jang, Cho, and Kawachi 2010).

We have examined the underlying premise that there is an association between education and disability. We found widely varying prevalence of ADL limitations in different data sets and no evidence of beyond primary school graduation for older Koreans performing ADLs. Similar future studies in other East and South Asian countries may provide better understanding of the risk factors of old age disability. Given that knowledge of aging is predominantly based on Western countries (Kendig, 2004) and that there are data quality issues in Asian countries (Hull, 2005), congruent findings based on multiple data sets may allow us to understand the extent to which social, economic, and cultural conditions affect health independent of education. This, in turn, may lead to better plans to address the challenges of rapid population aging.

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Appendix A. Descriptive Statistics for Variables Across Five Data Sets

	KCM 2005	SSS 2006	KIHASA 2004	KHANES 2005	KLOSA 2006
Education					
No formal School	37.2	41.0	40.1	45.5	42.2
can't read					15.7
can read					26.5
Primary school graduate	34.1	29.8	35.0	29.5	31.9
Middle school graduate	10.4	10.5	9.6	9.7	10.1
High school graduate +					
High school graduate	12.0	12.6	9.8	10.8	10.9
More than high school graduate	6.3	6.0	5.6	4.5	4.9
Home ownership	78.1	78.9	71.4	77.2	76.6
Age					
65-69	38.7	39.0	37.8	38.5	36.4
70-74	28.8	30.3	28.5	28.5	27.9
75-79	17.6	16.9	17.5	18.2	20.0
80-84	9.7	9.6	10.3	9.6	10.0
85+	5.2	4.2	5.9	5.1	5.8
Female	60.1	59.5	61.7	60.3	58.6
Marital Status					
Married	56.2	57.6	54.8	56.4	62.3
Widowed	42.2	41.3	42.2	42	36.1
Divorced/Separated	1.6	1.1	3.1	1.6	1.6
Urbanicity	63.1	65.7	67.9	63	66.3

Appendix B. Activities of Daily Living Questions for Five National Surveys

KCM:

<p>Do you have any difficulty in doing any of the following activities?</p> <p>. Check all that apply.</p>	<p>1. Learning, remembering, or concentrating?</p> <p>2. Dressing, bathing, eating, or getting around inside the home</p> <p>3. Shopping, visiting a doctor's office, or going outside the home</p> <p>4. (16 YEARS OLD OR OVER.) Working at a job</p> <p>5. none</p>
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SSS:

Are you able to do the following activities by yourself?

(Indicate each category that applies)

	1 I can do it by myself	2. I can do it with some help	3. I cannot do it by myself
1. sit and stand			
2. dressing			
3. toilet use			
4. eating			
5. walking inside the home			
6. bathing			

LP:

The following items are activities of daily living. Do you need assistance when you do the following activities?

Items	Level of Independence
1) dressing and undressing	1. completely independent, 2. needs some help, 3. completely dependent
2) washing face	1. completely independent, 2. needs some help, 3. completely dependent
3) brushing teeth	1. completely independent, 2. needs some help, 3.

	completely dependent
4) bathing	1. completely independent, 2. needs some help, 3. completely dependent
5) eating	1. completely independent, 2. needs some help, 3. completely dependent
6) repositioning	1. completely independent, 2. needs some help, 3. completely dependent
7) getting up and sitting	1. completely independent, 2. needs some help, 3. completely dependent
8) moving to a different position or sit	1. completely independent, 2. needs some help, 3. completely dependent
9) getting out of the room	1. completely independent, 2. needs some help, 3. completely dependent
10) Toilet use	1. completely independent, 2. needs some help, 3. completely dependent
11) Bowl continence	1. completely independent, 2. needs some help, 3. completely dependent
12) Bladder continence	1. completely independent, 2. needs some help, 3. completely dependent

KNHANES:

The next question are applicable to persons who are 1) over 65 years of age, or 2) have had at least 3 months of inactivity, or 3) have a physical disability.
 -Do you need help from others for the following actions of daily life?

1) When you put on clothes or change clothes, do you dress without help?

- (1) I can take clothes from my closet/dresser and dress by myself. ¹⁾
- (2) Sometimes I need help to put on clothes. ²⁾
- (3) I always need someone else to help me dress.

-Putting on clothes: Removing clothing from closet or drawers, being able to handle zippers, buttons, and belts.

¹⁾ I am independently being able to handle zippers, buttons, and belts.

²⁾ If someone takes out the clothing and prepares it or isn't able to handle buttons, zippers, and belts [applies to 2]

2) Can you independently wash your face, rinse your mouth, and wash your hair?

- (1) I am able to do all three things by myself without any help.
- (2) I can wash my face and rinse my mouth by myself but I need help washing my hair.
- (3) I cannot do any of these things without help.

-Washing your face: washing your face, rinsing your mouth, washing your hair

-Being able to put water on your face qualifies as washing your face.

3) Can you bathe yourself without help?

- (1) I can scrub my body and take a shower without help. ¹⁾

(2) I can take a shower by myself but sometimes I cannot scrub my body by myself. I only receive help for one part of my body (other than the back).²⁾

(3) I need to rely on someone else in order to bathe.

-Bathing: Taking a bath, a shower, and using a washcloth all apply

¹⁾ Though unable to scrub the back, is able to go in and out of the bathtub without help.

²⁾ Though able to bathe oneself, needs help going in and out of the bathing area [applies to 2]

4) When someone prepares a meal, are you able to eat without receiving help?

(1) I can eat without help. ¹⁾

(2) When eating fish or having to cut food, I need assistance.

(3) I always need help when eating or I often receive nutrition through tubes. ²⁾

-Eating: when food is prepared and ready to eat

¹⁾ Unable to use chopsticks but able to use forks and spoons without help [applies to 1]

²⁾ Able to use forks and spoons but often spills the food when eating without help [applies to 3]

5) Are you able to get out of bed and walk from your room without receiving aid from somebody else?

(1) Yes, I am able to do this without receiving any aid. ¹⁾

(2) No, when coming out of the room, I need help or assistance from someone else.

(3) No, I have to be carried out of the room.

-Getting out of bed and walking out of the room

¹⁾ Having to hold on to something, such as a cane, wheelchair, or crutch, or by crawling [applies to 1]

6) Are you able to use the toilet without receiving aid?

(1) Yes, I am able to use the toilet, wipe myself, and put my clothes back on afterwards. ¹⁾

(2) No, I need help sitting on the toilet, wiping myself, and putting clothes back on. Whenever I use a bed pan, I need help emptying it afterwards.

(3) No, even if someone helps me, I am unable to use a standard toilet and I am unable to use a bed pan – even if someone empties it for me.

-Using the toilet: performing bodily functions and being able to clean up afterwards.

¹⁾ Being able to use the toilet and empty the bed pan while using a cane, a walker, or a wheelchair

7) Are you able to control your bladder and bowel movements?

(1) Yes – I am able to control my bladder and bowel movements. ¹⁾

(2) Sometimes I cannot control my bladder and bowel movements. ²⁾

(3) No – I am not able to control my bladder and bowel movements at all.

-Controlling bladder and bowel movements: having the ability to restrain oneself or restrict bodily functions when needed.

¹⁾ Able to use a catheter without help [applies to 1]

²⁾ Incontinence happens at least once a day for bladder and once a week for bowels.

KLOSA^a

Cb01. We need to understand difficulties people may have with various activities because of a health or physical problem and the help they need from others to do these activities. Please tell me whether you had any difficulty doing the following everyday activities during the last week. Exclude any difficulties that you expect to last less than three months.

Because of health and memory problems, do you have any difficulty with dressing?

Dressing includes taking clothes out from a closet, putting them on, buttoning up, and fastening the belt.

- [1] No, I don't need any help.
- [3] Yes, I need help to some extent.
- [5] Yes, I need help in every respect.

Cb02. Do you have any difficulty with washing your face and hair and brushing your teeth?

- [1] No, I don't need any help.
- [3] Yes, I need help to some extent.
- [5] Yes, I need help in every respect.

Cb03. Do you have any difficulty with bathing or showering?

- [1] No, I don't need any help.
- [3] Yes, I need help to some extent.
- [5] Yes, I need help in every respect.

Cb04. Do you have any difficulty with eating, such as cutting up your food?

- [1] No, I don't need any help.
- [3] Yes, I need help to some extent.
- [5] Yes, I need help in every respect.

Cb05. Do you have any difficulty with getting out of bed and walking across a room? You may use equipment or devices to get out of bed and walk across a room.

- [1] No, I don't need any help.
- [3] Yes, I need help to some extent.
- [5] Yes, I need help in every respect.

Cb06. Do you have any difficulties with using the toilet, getting up and down?

- [1] No, I don't need any help.
- [3] Yes, I need help to some extent.
- [5] Yes, I need help in every respect.

Cb07. Do you have any difficulties with controlling urination and defecation? You may use a catheter (conduit) or a pouch by yourself.

- [1] No, I don't need any help.
- [3] Yes, I need help to some extent.
- [5] Yes, I need help in every respect.

NOTE: We have translated the survey questions of the four data sets with the exception of the KLoSA. However, these questions can be translated differently. ^aWe also noticed that English questionnaire provided by the KLoSA, not translated by ourselves, misses the statement regarding whether the ADL can be done by oneself or with the help of another, which should appear at the end of each item. In other words, readers should be caution that, although the English questionnaire of the KLoSA shown in Appendix B seems be asking “difficulty questions,” they are actually “need assistance” questions as can be discerned from the response categories.

Table 1. Percent of at least one ADL and Percent of each specific ADL items across five data sets, total % (CI 95%), Weighted

	KCM 2005	SSY 2006	LP 2004	KNHANES 2005	KLOSA 2006
Number of items	1	6	12	7	7
Question wording					
Difficulty question	x				
Need Assistance question ("by yourself," "need assistance," "help from others")		x	x	x	x
Response Categories					
Yes vs. No	x				
Able vs. Some/Unable		x	x	x	x
Duration (expected to last more than 3 months)				x	x
% of at least one ADL	5.4 (5.2/5.5)	7.5 (6.9/8.0)	8.2 (7.3/9.2)	17.7 (16.5/18.9)	10 (9.1/10.9)
% of specific ADL					
Dressing, bathing, eating, walking inside home	5.4 (5.2/5.5)				
Bathing or shower		6.8 (6.3/7.3)	6.5 (5.6/7.3)	14.0 (12.9/15.2)	8.1 (7.2/8.9)
Dressing		2.8 (2.4/3.1)	3.7 (3.1/4.4)	5.6 (4.8/6.3)	6.2 (5.5/7.0)
Using Toilet		2.1 (1.9/2.4)	2.5 (2.0/3.0)	3.0 (2.4/3.6)	3.9 (3.3/4.5)
Sitting down or standing up		2.7 (2.3/3.0)			
Getting out of bed and walking across the room				2.4 (1.9/2.9)	5.4 (4.7/6.1)
Walking inside the home		2.3 (2.0/2.6)			
Eating		1.4 (1.1/1.6)	1.9 (1.5/2.4)	3.2 (2.7/3.8)	4.4 (3.8/5.1)
Washing face			2.4 (1.9/2.9)		
Brushing teeth			2.4 (1.8/2.9)		
Washing face/brushing teeth				5.9 (5.1/6.7)	5.4 (4.7/6.1)
Repositioning			1.2 (0.8/1.5)		
Getting up and sitting			1.5 (1.1/1.9)		
Moving to a different position or sit			1.7 (1.3/2.2)		
Getting out of the room			2.2 (1.7/2.7)		
Bowl continence			2.6 (2.0/3.1)		
Bladder continence			3.6 (3.0/4.2)		
Bladder and bowl continence				7.5 (6.7/8.4)	3.9 (3.3/4.5)

Table 2 Percent of disability prevalence rate by gender and education, Weighted

Surveys	MEN				
	Less than primary school graduates	Primary school graduates	Middle school graduates	High school graduates or more	ALL
KCM	7.9	5.3	4.5	3.4	5.0
SSS	10.6	5.6	5.3	4.4	6.0
LP	15.8	5.2	4.5	5.9	7.0
KNHANES	22.2	12.6	14	8.1	13.6
KLoSA	16.7	6.6	8.5	6.7	8.9

	WOMEN				
	Less than primary school graduates	Primary school graduates	Middle school graduates	High school graduates or more	ALL
KCM	7.5	4.1	3	2.7	5.7
SSS	10.6	6.3	4.5	4.2	8.4
LP	10.6	6.2	12.2	7.7	9.0
KNHANES	24.1	16.2	10.9	8.9	20.3
KLoSA	14.1	6.9	4.6	3.3	10.6

Table 3. Odds Ratio of at least one ADL difficulties on Education net of home ownership, age group, marital status, and urbanicity, Weighted

FEMALE	<u>KCM (N=59,658)</u>		<u>SSS (N=5,823)</u>		<u>LP (N=2,005)</u>		<u>KNHANES (N=2,180)</u>		<u>KLoSA (N=2,412)</u>	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
(Primary grad. = referent)										
Less than primary grad.	1.33 ***	1.218-1.449	1.25	0.975-1.592	1.08	0.718-1.620	1.16	0.883-1.518	1.52 *	1.076-2.159
Mid. grad	0.82 *	0.678-0.995	0.77	0.456-1.305	2.06 *	1.031-4.108	0.69	0.364-1.304	0.67	0.285-1.554
High grad	0.75 **	0.619-0.907	0.71	0.418-1.208	1.21	0.550-2.654	0.56	0.295-1.055	0.49	0.190-1.277
home ownership (1=yes)	0.76 ***	0.698-0.824	0.98	0.782-1.235	0.99	0.697-1.402	0.75 *	0.581-0.967	0.60 **	0.438-0.809
(age 65-69 =referent)										
age 70-74	1.59 ***	1.419-1.777	1.81 ***	1.322-2.466	1.26	0.735-2.168	1.29	0.936-1.771	1.64 *	1.018-2.658
age 75-79	2.27 ***	2.017-2.549	2.57 ***	1.849-3.574	2.75 ***	1.609-4.701	2.53 ***	1.834-3.479	3.39 ***	2.150-5.351
age 80-84	3.62 ***	3.198-4.097	5.68 ***	4.062-7.942	5.37 ***	3.043-9.458	3.54 ***	2.432-5.161	5.76 ***	3.507-9.453
age 85-00	6.02 ***	5.279-6.863	10.86 ***	7.508-15.719	14.38 ***	8.051-25.696	9.64 ***	6.235-14.892	19.63 ***	11.699-32.952
single/divorced	1.28	0.959-1.719	0.47	0.100-2.221	1.13	0.456-2.805	1.33	0.498-3.550	0.76	0.245-2.362
widowed	0.99	0.907-1.088	1.01	0.789-1.300	0.67	0.441-1.009	0.96	0.735-1.247	0.70 *	0.503-0.974
urban	0.90 **	0.832-0.972	1.55 ***	1.237-1.931	1.23	0.854-1.761	0.93	0.734-1.184	1.12	0.825-1.510
MALE										
	<u>KCM (N=39,190)</u>		<u>SSS (N=3,762)</u>		<u>LP (N=1,268)</u>		<u>KNHANES (N=1,451)</u>		<u>KLOSA (N=1,733)</u>	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
(Primary grad. = referent)										
Less than primary grad.	1.23 **	1.086-1.384	1.52 *	1.056-2.182	2.19 *	1.202-3.983	1.62 *	1.080-2.422	2.17 **	1.360-3.463
Mid. grad	0.92	0.796-1.067	1.12	0.718-1.740	0.87	0.387-1.964	1.32	0.824-2.117	1.49	0.825-2.684
High grad	0.73 ***	0.641-0.824	0.90	0.619-1.299	1.40	0.754-2.610	0.76	0.477-1.196	1.09	0.663-1.790
home ownership (1=yes)	0.67 ***	0.601-0.754	0.80	0.565-1.130	0.90	0.523-1.565	0.80	0.529-1.207	0.65 *	0.432-0.978
(age 65-69 =referent)										
age 70-74	1.55 ***	1.375-1.756	1.56 *	1.058-2.304	1.47	0.754-2.857	1.61 *	1.047-2.462	1.29	0.761-2.189
age 75-79	2.02 ***	1.760-2.313	3.64 ***	2.458-5.390	2.34 *	1.139-4.811	3.73 ***	2.396-5.800	2.62 ***	1.549-4.438
age 80-84	2.98 ***	2.548-3.478	4.12 ***	2.630-6.442	5.83 ***	2.843-11.961	3.79 ***	2.238-6.418	5.78 ***	3.300-10.114
age 85-00	4.88 ***	4.041-5.895	9.19 ***	5.152-16.394	11.18 ***	4.820-25.917	7.90 ***	3.997-15.603	11.58 ***	6.038-22.208
single/divorced	1.47 *	1.065-2.035	0.50	0.076-3.303	1.12	0.259-4.859	0.53	0.123-2.280	2.16	0.679-6.873
widowed	0.91	0.800-1.041	0.96	0.652-1.425	1.31	0.690-2.492	0.52 *	0.292-0.908	0.40 *	0.196-0.829
urban	0.96	0.862-1.059	1.20	0.880-1.629	1.23	0.727-2.069	0.94	0.671-1.326	1.39	0.915-2.109

Note: N =unweighted N