JOINT DEPENDENCE OF COGNITIVE IMPAIRMENT AND ADL DISABILITY IN THE U.S. ELDERLY POPULATION: ESTIMATES FROM THE 2004 NATIONAL LONG TERM CARE SURVEY

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ABSTRACT

Purpose: To estimate the joint distribution of cognitive impairment (CI) and ADL disability among aged Medicare enrollees using HIPAA disability triggers. **Methods**: ADL disability was defined as active personal assistance in 2+ ADLs. CI was defined as 3+ SPMSQ errors, caregiver report of Alzheimer's disease/dementia, or similar problems, with concurrent substantial supervision. **Results**: Overall prevalence rates were 8.2% for ADL disability, 6.7% for CI, and 10.1% for ADL+CI combined. Sex differences in ADL+CI were large: 7.5% (males) v. 12.0% (females). Conditional probabilities of CI for community residents increased from 22% at 1 ADL to 65% at 6 ADLs; for institutional residents, from 50% at 1 ADL to 90% at 6 ADLs; and for both residence types, from 26% at 1 ADL to 78% at 6 ADLs. **Conclusions**: CI and ADL disabilities exhibited complex dependencies by residence type and sex. Demographic analyses that ignore these dependencies may be severely biased.

INTRODUCTION

Accurate characterization of the joint distribution of cognitive impairment (CI) and activity-of-daily-living (ADL) disability is a major challenge for population scientists seeking to understand the pathways between health and mortality. Both conditions exhibit rapid increases in incidence and prevalence beyond age 65. Both conditions are associated with markedly increased risks of death. But neither condition is routinely recorded in national or state vital statistics systems, making it necessary to rely on government surveys to obtain the data needed to address the issue.

Unfortunately, the options for using such surveys are limited by the standard practice among government agencies of targeting general-purpose surveys to *either* the community-based subpopulation *or* the nursing-home subpopulation, but rarely to both. Freedman et al. (2002) considered the options for dealing with these limitations and identified the National Long Term Care Survey (NLTCS) as the best single-survey solution in that its unified-population design simultaneously covered both the community and nursing-home subpopulations with no significant gaps for the elderly population. The National Health Interview Survey (NHIS), in combination with the National Nursing Home Survey (NNHS), was the only other data source rated close in quality.

In this paper, we use the 2004 NLTCS to estimate the joint distribution of CI and ADL disability among aged Medicare enrollees using the corresponding disability triggers defined by the Health Insurance Portability and Accountability Act of 1996 (Public Law 104–191) (HIPAA; see Internal Revenue Service, 1997). These specific triggers have been widely adopted by the LTC insurance industry and are currently the only triggers that can be legally used in tax-qualified LTC insurance products. Stallard (2011a) estimated that over 90% of LTC costs for disabled elderly persons were incurred during episodes of severe disability that would satisfy the HIPAA triggers, indicating that the HIPAA triggers provide a reasonable basis for characterizing the population distributions of CI and ADL disability.

DATA

The NLTCS was designed to measure disability and use of LTC among a representative sample of the U.S. elderly (age 65+) population at multiple points in time from 1982 to 2004. The cumulative sample size (n) over all six survey years (waves) was 49,258 distinct persons.

The six survey years were 1982, 1984, 1989, 1994, 1999, and 2004. Each wave consisted of a telephone screener interview followed by an in-person detailed interview for those respondents who met various disability screening criteria (designated as "screen-ins"). In-person screening visits were also conducted for those respondents who could not be contacted by telephone, followed by detailed interviews for those who screened-in. The number of persons who completed the screener interviews defined the cross-sectional sample size for each survey year.

Each survey year, the cross-sectional sample size was in the range 16,000–21,000, with approximately 6,000–7,500 detailed in-person interviews for persons who met various disability screening criteria. Detailed interviews were conducted for both community and institutional residents at all survey years except for 1982, when the fact of institutionalization was noted without further information being collected. The institutional detailed interview was a shortened,

modified form of the community detailed interview with sample sizes in the range 970–1,770 for the period 1984–2004.

Disability included basic and instrumental ADL (abbreviated as ADL and IADL, respectively) impairments whose duration had lasted or was expected to last 3+ months, cognitive impairment (CI), and institutionalization in a nursing home or similar LTC facility. During the later waves of the NLTCS, the options for residing in an assisted living facility (ALF) expanded substantially. Approximately half of the ALF residents in 2004 were classified as institutionalized using the standard temporally-consistent NLTCS protocol for making this determination.

HIPAA established requirements for qualified LTC insurance contracts and issuers of those contracts; and for qualified LTC services and the chronically disabled recipients of those services (Internal Revenue Service, 1997).

The HIPAA ADL trigger required that a "chronically ill individual"[1] be unable to perform without "substantial assistance" (hands-on or standby) from another individual at least two out of six ADLs:

bathing,	continence,
dressing,	eating,
toileting,	transferring,

for at least 90 days due to a loss of functional capacity.

The HIPAA CI trigger required that a chronically ill individual needs "substantial supervision" (i.e., continual oversight) to protect him/herself from threats to health and safety due to "severe cognitive impairment," defined as:[2]

> A loss or deterioration in intellectual capacity that is (a) comparable to (and includes) Alzheimer's disease and similar forms of irreversible dementia, and (b) measured by clinical evidence and standardized tests that reliably measure impairment in the individual's
>
> (i) short-term or long-term memory,
> (ii) orientation as to people, places, or time, and
> (iii) deductive or abstract reasoning.

ADL Assessment

The NLTCS assessed the performance status for each non-institutionalized individual during the screener interview and for all individuals regardless of institutional status during the detailed interview for seven ADLs:

[1] HIPAA uses the term "chronically ill individual" rather than "chronically disabled individual." See <http://www.law.cornell.edu/uscode/search/display.html?terms=7702B&url=/uscode/html/uscode26/usc_sec_26_00007702---B000-.html>. We use the terms interchangeably throughout this paper.

[2] http://www.unclefed.com/Tax-Bulls/1997/Not97-31.pdf

bathing,	continence,
dressing,	eating,
toileting,	transferring,
inside mobility,	

of which only the latter (inside mobility) was not included in the HIPAA ADL trigger.

The NLTCS assessment on the detailed interview allowed each screened-in individual to be rated on each ADL according to the following *impairment hierarchy*:

0. Performs ADL
1. Needs, but does not receive, help with ADL
2. Performs ADL with special equipment
3. Standby help with/without special equipment
4. Active help with/without special equipment
5. Unable to perform ADL

Following Stallard and Yee (2000), we assumed that two or more ADLs at levels 3–5 were required to meet the simulated HIPAA ADL trigger. This was substantially stricter than the traditional NLTCS triggers which counted the ADLs at levels 2–5 as disabled, thereby including ADL impairments that could have been resolved through the use of special equipment.

Cognitive Assessment

Cognitive impairment can be assessed in the NLTCS using either the Short Portable Mental Status Questionnaire (SPMSQ; Pfeiffer, 1975), with the cut-points for the HIPAA CI trigger based on a choice of 3+, 4+, or 5+ errors out of 10 questions; or a caregiver report of Alzheimer's disease, dementia, or other cognition problems sufficient to prevent completion of the SPMSQ with a passing score of 0–2, 0–3, or 0–4 errors.

The indicated SPMSQ cut-points span the range of generally accepted values. For example, Hughes et al. (1982, Table II) reported average SPMSQ error scores of 1.8 ± 1.7 SD and 5.7 ± 2.2 SD, respectively, for *very mild* vs. *mild* Alzheimer's disease, supporting the SPMSQ cut-point range of 3–5 errors.

For the analyses in this paper, we used the lower end of the 3–5 range, setting the SPMSQ cut-point at 3 errors, which, based on Lee et al. (1998), corresponds to a failing score of 22 or below on the Mini-Mental State Exam (MMSE; Folstein et al., 1975). This choice was well supported by results based on the MMSE, which took advantage of the crosswalk between the SPMSQ and MMSE provided by Lee et al. (1998).

For example, Petersen et al. (1999, unnumbered Table) reported that the average MMSE score for patients diagnosed with *mild* Alzheimer's disease was 21.4 ± 0.4 SD (standard deviation), compared to averages of 22.6 ± 0.5 SD for *very mild* Alzheimer's disease and 26.0 ± 0.3 SD for *mild* cognitive impairment (MCI). With respect to *very mild* Alzheimer's disease, Morris et al. (2001, Table 1) reported an average MMSE score of 23.7 ± 2.7 SD, 1.1 points higher than Petersen et al. (1999). Both studies support the MMSE failing score of 22 or below cited above,

implying that *very mild* Alzheimer's disease and *mild* cognitive impairment would generally be excluded by our cut-point, whereas *mild* Alzheimer's disease would only be excluded if the respondent's score was relatively high. Hence, when using our cut-point, patients with mild Alzheimer's disease could meet the simulated HIPAA CI trigger, which specifically mentions Alzheimer's disease without excluding mild cases.

IADLs

We used the NLTCS IADLs to assess the functioning of screened-in individuals who exhibited lower levels of disability and to supplement the cognitive information in our simulated HIPAA CI triggers. The temporal trends in IADLs correlated well with the temporal trends in ADLs and CI, consistent with reports that IADL impairments tend to occur earlier in the disablement process (Manton et al., 1998; LaPlante, 2010).

The NLTCS assessed the performance status for each non-institutionalized individual during the screener interview and again during the detailed interview for nine IADLs:

1. Doing laundry
2. Doing light housework
3. Getting around outdoors
4. Going places outside of walking distances
5. Making telephone calls
6. Managing money
7. Preparing meals
8. Shopping for groceries
9. Taking medications

Barberger-Gateau et al. (1992) found that four of the nine IADLs (i.e., #4, 5, 6, and 9 above) could be used as a CI/dementia screening tool for elderly community residents, possibly replacing rather than just supplementing the CI information. These authors reported diagnostic sensitivities[3] of 0.62, 0.67, 0.88, and 0.94, respectively, for mild, moderate, and severe CI (defined as MMSE <24, <22, and <18 correct) and dementia (based on NINCDS-ADRDA criteria for clinical diagnosis); with corresponding specificities of 0.80, 0.76, 0.73, and 0.71. Subsequent papers by the same authors (Barberger-Gateau et al., 1993 and 1999) reported that IADL impairments were predictive of subsequent diagnoses of dementia for 1–3 years, but not 5 years, after assessment; e.g., the relative risks of incident dementia one year after assessment increased from 11:1 for one IADL impairment to 318:1 for four IADL impairments. The findings of strong IADL-dementia relationships were independently replicated by De Lepeleire et al. (2004) who reported a diagnostic sensitivity of 0.81 with specificity of 0.48 compared with the MMSE (but without reporting the associated cut-point).

These findings were important for our purpose because the NLTCS screening protocols tested for IADL impairment but not for cognitive impairment. To the extent that cognitively impaired community residents were identifiable through their IADL impairments, the NLTCS screening

[3] The *sensitivity* of a diagnostic test is the conditional probability of a positive test result given that the person actually has the condition; the *specificity* of a diagnostic test is the conditional probability of a negative test result given that the person actually does not have the condition. The higher these values, the better the test.

criteria would have correctly designated these persons to receive the detailed interview, at which point they would have received the cognitive assessment protocols described below.

Barberger-Gateau's and De Lepeleire's *sensitivity* values indicated that the loss to the sample of severely cognitively impaired (at a level comparable to Alzheimer's disease) individuals would have been small. Thus, the risk of erroneous exclusion (i.e., screen-out) would have been limited to severely cognitively impaired persons who had no impairments on the four IADLs identified by Barberger-Gateau, and no impairments on the remaining five of nine IADLs and seven ADLs queried on the NLTCS screener. Such persons were highly unlikely to be in need of substantial supervision to protect themselves from threats to health and safety due to severe cognitive impairment, as required by HIPAA.

Barberger-Gateau's and De Lepeleire's *specificity* values were lower, but these were not relevant because the consequence of erroneous inclusion (i.e., screen-in), compared to the counterfactual that we were actually screening for cognitive impairment, not IADL impairment, would be that some number of additional non-cognitively impaired individuals would screen-in for the detailed interview. Once these individuals received the cognitive assessment on the detailed interview, our "error" would be recognized and could then be corrected.

Although neither HIPAA trigger directly mentions IADLs, they can be used to simulate the substantial supervision component of the CI trigger, a use which is important to us because substantial supervision was not queried in the NLTCS cognitive assessments. Moreover, as described below, we used the IADLs only to *supplement*, not to replace, the CI information on the detailed interview, implying that the loss to the sample of individuals meeting the substantial supervision component of the HIPAA CI trigger also would have been small, given the close relationship between IADL impairment and cognitive impairment. Some risk of erroneous classification could remain if the IADL help were not sufficiently "substantial" to meet the HIPAA criteria.

Following Stallard (2011b), we assumed that the HIPAA substantial supervision criterion was met by NLTCS respondents with cognitive impairment who simultaneously met:

1. The NLTCS criteria for any ADL or IADL disability at the screener interview (which then qualified them for the detailed interview); or
2. The NLTCS criteria for IADL disability or inside mobility impairment at the detailed interview; or
3. The simulated HIPAA criteria for at least one ADL disability at the detailed interview.

Thus, our simulated HIPAA CI trigger was restricted to respondents who met:

1. The NLTCS criteria for cognitive impairment; and
2. The NLTCS criteria for substantial supervision.

SURVEY WEIGHTS

Survey weights were employed for tabulation of responses as described in Manton et al. (2006). Standard errors (SEs) of weighted estimators of binomial proportions were based on rescaled

survey weights using the procedures developed by Potthoff et al. (1992). These procedures yielded overall estimated survey design effects of 1.13 in the 1984 NLTCS and 1.19 in the 2004 NLTCS, implying, after inverting the design effect, losses in effective sample size of 11.5% and 16.0%, respectively, compared to a simple random sampling design with the same sample size, but with equal weights (Kish, 1965, p. 259).

RESULTS

ADL DISABILITY

Weighted tabulations of the number of respondents who did or did not meet the simulated HIPAA ADL trigger in 2004 are shown in Table 1, stratified by 5-year groups based on attained age at the time of the survey. The overall prevalence rate was 8.2% with a 0.2% standard error (SE).

Table 1
Number and Percent of Persons Meeting HIPAA ADL Trigger, United States 2004, Unisex, Age 65 and Above, by Age

	Meets HIPAA ADL Trigger				
Age	No	Yes	Total	Percent	Std Error (Pct)
65-69	8,302,057	186,582	8,488,639	2.2%	0.3%
70-74	8,404,035	333,111	8,737,147	3.8%	0.3%
75-79	7,139,472	484,462	7,623,934	6.4%	0.5%
80-84	5,389,370	639,477	6,028,847	10.6%	0.7%
85-89	2,782,747	669,256	3,452,003	19.4%	1.1%
90-94	1,058,680	423,553	1,482,233	28.6%	1.9%
95+	211,606	220,917	432,523	51.1%	4.0%
Total	33,287,967	2,957,359	36,245,325	8.2%	0.2%

Note: HIPAA Triggers are 2+ ADL Impariments or Severe Cognitive Impairment

Source: Author's calculations based on the 2004 NLTCS.

Tables 2 and 3 present the corresponding sex-specific prevalence rates, in the same format. Sex differences in overall ADL prevalence rates were large: 5.8% (males) v. 9.8% (females).

Table 2
Number and Percent of Persons Meeting HIPAA ADL Trigger, United States 2004, Males, Age 65 and Above, by Age

	Meets HIPAA ADL Trigger				
Age	No	Yes	Total	Percent	Std Error (Pct)
65-69	3,901,966	84,560	3,986,527	2.1%	0.4%
70-74	3,772,777	144,266	3,917,043	3.7%	0.5%
75-79	3,038,784	192,068	3,230,853	5.9%	0.7%
80-84	2,163,128	206,884	2,370,013	8.7%	1.0%
85-89	1,034,299	138,381	1,172,680	11.8%	1.5%
90-94	335,161	92,981	428,141	21.7%	3.3%
95+	60,221	27,561	87,782	31.4%	8.3%
Total	14,306,337	886,702	15,193,039	5.8%	0.3%

Note: HIPAA Triggers are 2+ ADL Impariments or Severe Cognitive Impairment

Source: Author's calculations based on the 2004 NLTCS.

Table 3
Number and Percent of Persons Meeting HIPAA ADL Trigger, United States 2004, Females, Age 65 and Above, by Age

	Meets HIPAA ADL Trigger				
Age	No	Yes	Total	Percent	Std Error (Pct)
65-69	4,400,090	102,022	4,502,112	2.3%	0.4%
70-74	4,631,258	188,845	4,820,103	3.9%	0.5%
75-79	4,100,688	292,394	4,393,081	6.7%	0.6%
80-84	3,226,241	432,593	3,658,834	11.8%	0.9%
85-89	1,748,448	530,875	2,279,323	23.3%	1.5%
90-94	723,519	330,573	1,054,092	31.4%	2.3%
95+	151,385	193,356	344,741	56.1%	4.4%
Total	18,981,630	2,070,657	21,052,287	9.8%	0.3%

Note: HIPAA Triggers are 2+ ADL Impariments or Severe Cognitive Impairment

Source: Author's calculations based on the 2004 NLTCS.

CI DISABILITY

Table 4 presents the weighted tabulation of the number and percent of persons meeting the HIPAA CI trigger for the 2004 unisex data, using the same format as in Table 1. The overall prevalence rate was 6.7% with a 0.2% SE – significantly smaller than the overall ADL prevalence rate of 8.2% in Table 1.

Table 4
Number and Percent of Persons Meeting HIPAA CI Trigger, United States 2004, Unisex, Age 65 and Above, by Age

	Meets HIPAA CI Trigger				
Age	No	Yes	Total	Percent	Std Error (Pct)
65-69	8,384,960	103,679	8,488,639	1.2%	0.2%
70-74	8,539,577	197,570	8,737,147	2.3%	0.3%
75-79	7,247,763	376,171	7,623,934	4.9%	0.4%
80-84	5,482,051	546,796	6,028,847	9.1%	0.6%
85-89	2,840,985	611,018	3,452,003	17.7%	1.1%
90-94	1,086,664	395,569	1,482,233	26.7%	1.9%
95+	239,316	193,207	432,523	44.7%	3.9%
Total	33,821,316	2,424,010	36,245,325	6.7%	0.2%

Note: The CI trigger used 3+ errors on the SPMSQ.

Source: Author's calculations based on the 2004 NLTCS.

Tables 5 and 6 present the corresponding sex-specific changes, in the same format. Sex differences in overall CI prevalence rates were large: 4.7% (males) v. 8.1% (females).

Table 5
Number and Percent of Persons Meeting HIPAA CI Trigger, United States 2004, Males, Age 65 and Above, by Age

	Meets HIPAA CI Trigger				
Age	No	Yes	Total	Percent	Std Error (Pct)
65-69	3,943,328	43,199	3,986,527	1.1%	0.3%
70-74	3,814,788	102,255	3,917,043	2.6%	0.4%
75-79	3,085,027	145,825	3,230,853	4.5%	0.6%
80-84	2,210,159	159,854	2,370,013	6.7%	0.8%
85-89	1,025,095	147,585	1,172,680	12.6%	1.6%
90-94	341,467	86,675	428,141	20.2%	3.2%
95+	62,722	25,060	87,782	28.5%	7.9%
Total	14,482,585	710,453	15,193,039	4.7%	0.3%

Note: The CI trigger used 3+ errors on the SPMSQ.

Source: Author's calculations based on the 2004 NLTCS.

Table 6
Number and Percent of Persons Meeting HIPAA CI Trigger, United States 2004, Females, Age 65 and Above, by Age

	Meets HIPAA CI Trigger				
Age	No	Yes	Total	Percent	Std Error (Pct)
65-69	4,441,632	60,480	4,502,112	1.3%	0.3%
70-74	4,724,789	95,315	4,820,103	2.0%	0.3%
75-79	4,162,736	230,345	4,393,081	5.2%	0.6%
80-84	3,271,892	386,943	3,658,834	10.6%	0.8%
85-89	1,815,890	463,433	2,279,323	20.3%	1.4%
90-94	745,197	308,894	1,054,092	29.3%	2.3%
95+	176,594	168,147	344,741	48.8%	4.4%
Total	19,338,730	1,713,556	21,052,287	8.1%	0.3%

Note: The CI trigger used 3+ errors on the SPMSQ.

Source: Author's calculations based on the 2004 NLTCS.

COMBINED ADL AND CI DISABILITY

Table 7 presents the weighted tabulation of the number and percent of persons meeting either of the HIPAA ADL and CI triggers for the 2004 unisex data, using the format in Tables 1 and 4. The overall combined ADL and CI prevalence rate was 10.1% with a 0.2% SE – significantly larger than the separate prevalence rates of 8.2% and 6.7% in Tables 1 and 4, respectively.

Tables 8 and 9 present the corresponding sex-specific changes, in the same format. Sex differences in the overall ADL+CI prevalence rates were large: 7.5% (males) v. 12.0% (females).

Table 7
Number and Percent of Persons Meeting Either HIPAA Trigger, United States 2004, Unisex, Age 65 and Above, by Age

	Meets Either HIPAA Trigger				
Age	No	Yes	Total	Percent	Std Error (Pct)
65-69	8,249,343	239,296	8,488,639	2.8%	0.3%
70-74	8,353,574	383,573	8,737,147	4.4%	0.4%
75-79	7,023,298	600,636	7,623,934	7.9%	0.5%
80-84	5,230,199	798,648	6,028,847	13.2%	0.7%
85-89	2,602,925	849,078	3,452,003	24.6%	1.2%
90-94	951,734	530,500	1,482,233	35.8%	2.0%
95+	178,647	253,875	432,523	58.7%	3.9%
Total	32,589,719	3,655,606	36,245,325	10.1%	0.2%

Note: The HIPAA triggers are based on 2+ ADL Impariments or 3+ errors on the SPMSQ.

Source: Author's calculations based on the 2004 NLTCS.

Table 8
Number and Percent of Persons Meeting Either HIPAA Trigger, United States 2004, Males, Age 65 and Above, by Age

	Meets Either HIPAA Trigger				
Age	No	Yes	Total	Percent	Std Error (Pct)
65-69	3,886,848	99,679	3,986,527	2.5%	0.4%
70-74	3,745,832	171,211	3,917,043	4.4%	0.5%
75-79	2,986,655	244,197	3,230,853	7.6%	0.8%
80-84	2,109,355	260,657	2,370,013	11.0%	1.1%
85-89	968,496	204,184	1,172,680	17.4%	1.8%
90-94	306,837	121,304	428,141	28.3%	3.6%
95+	53,996	33,786	87,782	38.5%	8.5%
Total	14,058,020	1,135,019	15,193,039	7.5%	0.3%

Note: The HIPAA triggers are based on 2+ ADL Impariments or 3+ errors on the SPMSQ.

Source: Author's calculations based on the 2004 NLTCS.

Table 9
Number and Percent of Persons Meeting Either HIPAA Trigger, United States 2004, Females, Age 65 and Above, by Age

	Meets Either HIPAA Trigger				
Age	No	Yes	Total	Percent	Std Error (Pct)
65-69	4,362,495	139,617	4,502,112	3.1%	0.4%
70-74	4,607,742	212,362	4,820,103	4.4%	0.5%
75-79	4,036,643	356,438	4,393,081	8.1%	0.7%
80-84	3,120,844	537,991	3,658,834	14.7%	1.0%
85-89	1,634,429	644,894	2,279,323	28.3%	1.5%
90-94	644,896	409,196	1,054,092	38.8%	2.5%
95+	124,651	220,090	344,741	63.8%	4.2%
Total	18,531,699	2,520,587	21,052,287	12.0%	0.3%

Note: The HIPAA triggers are based on 2+ ADL Impariments or 3+ errors on the SPMSQ.

Source: Author's calculations based on the 2004 NLTCS.

JOINT DISTRIBUTION OF ADL AND CI DISABILITY

Table 10 displays weighted tabulations for the combined community and institutional populations stratified by ADL/IADL disability levels. The CI triggering rates (shown in the bottom panel, under the respective heading "CI Only" or "ADL & CI") for the combined population exhibited a monotonic increase over the ADL counts, increasing from 26.5% to 78.2% at 1 and 6 ADLs, respectively.

Table 11 displays the corresponding weighted tabulations for the community population. The CI triggering rates for the combined population exhibited a near-monotonic increase over the ADL counts, increasing from 21.8% to 64.9% at 1 and 6 ADLs, respectively.

Table 12 displays the corresponding weighted tabulations for the institutional population. The CI triggering rates for the combined population exhibited a generally increasing trend over the ADL counts, increasing from 49.6% to 90.4% at 1 and 6 ADLs, respectively.

Table 10
Distribution of HIPAA Triggers by ADL/IADL Disability Level, United States 2004, Unisex, Age 65 and Above

	HIPAA Trigger					
ADL/IADL Disability Level	Neither	CI Only	ADL Only	ADL & CI	Total	Std Error (%-CI)
			Number of Persons			
Nondisabled	29,675,587	64,014			29,739,601	
IADL/Inside-Mobility/Institutional	2,215,298	382,542			2,597,840	
1 ADL	698,834	251,692			950,526	
2 ADLs			268,546	202,027	470,573	
3 ADLs			231,219	192,294	423,514	
4 ADLs			261,289	257,720	519,009	
5 ADLs			294,215	440,844	735,060	
6 ADLs			176,327	632,877	809,204	
Total	32,589,719	698,247	1,231,597	1,725,762	36,245,325	
			Percent Distribution			
Nondisabled	99.8	0.2			100.0	0.0
IADL/Inside-Mobility/Institutional	85.3	14.7			100.0	1.1
1 ADL	73.5	26.5			100.0	2.3
2 ADLs			57.1	42.9	100.0	3.7
3 ADLs			54.6	45.4	100.0	4.0
4 ADLs			50.3	49.7	100.0	3.6
5 ADLs			40.0	60.0	100.0	3.0
6 ADLs			21.8	78.2	100.0	2.4
Total	89.9	1.9	3.4	4.8	100.0	0.2
Std Error (Tot Pct)	0.3	0.1	0.2	0.2		

Note: IADL/Inside-Mobility/Institutional describes certain NLTCS respondents with with no ADL impairments at the time of the detailed interview: it includes community residents with IADL or inside-mobility impairments and institutional residents. All other community residents with no ADL impairments were classified as nondisabled. The CI trigger used 3+ errors on the SPMSQ.

Source: Author's calculations based on the 2004 NLTCS.

Table 11
Distribution of HIPAA Triggers by ADL/IADL Disability Level, United States 2004, Unisex, Age 65 and Above

ADL/IADL Disability Level	HIPAA Trigger: Neither	CI Only	ADL Only	ADL & CI	Total	Std Error (%-CI)
			Number of Persons			
Nondisabled	29,675,587	64,014			29,739,601	
IADL/Inside-Mobility/Institutional	2,182,737	341,847			2,524,584	
1 ADL	618,366	172,620			790,986	
2 ADLs			232,446	124,136	356,581	
3 ADLs			176,533	84,989	261,522	
4 ADLs			187,510	125,711	313,222	
5 ADLs			220,136	192,636	412,773	
6 ADLs			136,075	251,917	387,992	
Total	32,476,691	578,481	952,701	779,389	34,787,261	
			Percent Distribution			
Nondisabled	99.8	0.2			100.0	0.0
IADL/Inside-Mobility/Institutional	86.5	13.5			100.0	1.1
1 ADL	78.2	21.8			100.0	2.4
2 ADLs			65.2	34.8	100.0	4.1
3 ADLs			67.5	32.5	100.0	4.8
4 ADLs			59.9	40.1	100.0	4.5
5 ADLs			53.3	46.7	100.0	4.0
6 ADLs			35.1	64.9	100.0	4.0
Total	93.4	1.7	2.7	2.2	100.0	0.2
Std Error (Tot Pct)	0.2	0.1	0.1	0.1		

Note: IADL/Inside-Mobility/Institutional describes certain NLTCS respondents with with no ADL impairments at the time of the detailed interview: it includes community residents with IADL or inside-mobility impairments and institutional residents. All other community residents with no ADL impairments were classified as nondisabled. The CI trigger used 3+ errors on the SPMSQ.

Source: Author's calculations based on the 2004 NLTCS.

Table 12
Distribution of HIPAA Triggers by ADL/IADL Disability Level, United States 2004, Unisex, Age 65 and Above, Institutional Residents

ADL/IADL Disability Level	HIPAA Trigger: Neither	CI Only	ADL Only	ADL & CI	Total	Std Error (%-CI)
			Number of Persons			
Nondisabled						
IADL/Inside-Mobility/Institutional	32,560	40,695			73,255	
1 ADL	80,468	79,072			159,540	
2 ADLs			36,101	77,891	113,992	
3 ADLs			54,686	107,306	161,992	
4 ADLs			73,779	132,009	205,787	
5 ADLs			74,079	248,208	322,287	
6 ADLs			40,252	380,960	421,211	
Total	113,029	119,767	278,896	946,373	1,458,065	
			Percent Distribution			
Nondisabled						
IADL/Inside-Mobility/Institutional	44.4	55.6			100.0	9.5
1 ADL	50.4	49.6			100.0	6.5
2 ADLs			31.7	68.3	100.0	7.1
3 ADLs			33.8	66.2	100.0	6.1
4 ADLs			35.9	64.1	100.0	5.5
5 ADLs			23.0	77.0	100.0	3.8
6 ADLs			9.6	90.4	100.0	2.3
Total	7.8	8.2	19.1	64.9	100.0	1.9
Std Error (Tot Pct)	1.1	1.2	1.7	2.1		

Note: IADL/Inside-Mobility/Institutional describes certain NLTCS respondents with with no ADL impairments at the time of the detailed interview: it includes community residents with IADL or inside-mobility impairments and institutional residents. All other community residents with no ADL impairments were classified as nondisabled. The CI trigger used 3+ errors on the SPMSQ.

Source: Author's calculations based on the 2004 NLTCS.

CONCLUSIONS

CI and ADL disabilities exhibit complex dependencies by residence type and sex. Demographic analyses that ignore these dependencies may be severely biased.

The most likely reason for ignoring dependencies relating to residence type is that the survey being used for analysis does not cover the nursing home population. In this case, it may be possible to use supplemental data from another survey for a comparable time period. This was the solution offered by Freedman et al. (2002) when they considered using the National Health Interview Survey (NHIS) in combination with the National Nursing Home Survey (NNHS) to study population-wide temporal trends in disability.

Dependencies relating to sex and age can be addressed using standard demographic methods if the relevant sex and age variables are available. Comparisons across time or between subpopulations or geographic regions with differing population structures will be valid if the aggregate rates are adjusted by age and sex.

The tables in this paper were designed to serve as a benchmark for assessing future changes in age and sex specific ADL and CI disability prevalence rates. The disability definitions, assumptions, and methods were described in sufficient detail that they can be replicated by other researchers using later data.

The disability definitions, assumptions, and methods were also designed to be applicable to earlier waves of the NLTCS. We are currently in the process of using them in a comprehensive re-assessment of the temporal trends in ADL and CI disability prevalence rates over the 20-year period 1984–2004, which will be the subject of future reports.

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