

Appendix: Methodology

The Alzheimer's Association report, *The Impact of Alzheimer's Disease on Medicaid Costs: A Growing Burden for States*, presents information on the costs of Alzheimer's and other dementias to the Medicaid budgets of each state and the District of Columbia. This Appendix describes the model and calculations used in developing state Medicaid spending estimates for individuals with Alzheimer's disease and other dementias.

The State Medicaid Spending Extension of The Lewin Group Model

The Alzheimer's Association contracted with The Lewin Group to develop a model on the health and long-term care costs of Alzheimer's disease. The model, which was originally developed in 2003¹ and most recently updated in 2015,² includes a national estimate of Medicaid spending on individuals with Alzheimer's and other dementias.³ Using that underlying model as a starting point, The Lewin Group has developed a state Medicaid spending extension ("model extension") for the Alzheimer's Association, which estimates each state's Medicaid spending on people with Alzheimer's disease and other dementias.

The methodology of the underlying model is detailed in an Appendix to the Alzheimer's Association report *Changing the Trajectory of Alzheimer's Disease: How a Treatment by 2025 Saves Lives and Dollars*.³ This Appendix describes only the methodology of the model extension.

To estimate each state's Medicaid spending on individuals with Alzheimer's disease and other dementias, the model extension calculates the sum of home- and community-based services (HCBS) spending and nursing facility spending for each state. Beginning with the national estimates of Medicaid spending from the underlying model,³ the model extension assigns a proportion of the national spending to each state based on the number of individuals with Alzheimer's disease in that state and the relative use and cost of long-term services and supports (LTSS) in that state.

Medicaid Home- and Community-Based Services (HCBS) Spending Estimates

To estimate state-level HCBS spending, the model extension assigns a proportion of national spending to each state based on:

- relative estimated prevalence of Alzheimer's disease in that state for a given year⁴ ($p_{state,year}$);
- relative use of HCBS in that state⁵ (r_{state}); and
- relative Medicaid expenditures per person served for HCBS in that state⁵ (e_{state}).

Relative Prevalence of Alzheimer's Disease. The relative prevalence of Alzheimer's disease ($p_{state,year}$) in a given state is estimated by taking the number of adults age 65 and older with Alzheimer's disease in that state as reported by Weuve, et al.,⁶ divided by the number of older adults with Alzheimer's disease summed across states.

$$p_{state,year} = \frac{N_{state,year}}{\sum_{i=1}^{51} N_{i,year}}$$

where $N_{state,year}$ is the number of older adults with Alzheimer's disease that reside in a given state in a given year, and $N_{i,year}$ is the number of older adults with Alzheimer's disease that reside in each of the 50 states plus the District of Columbia in that year.

Relative Use of Medicaid Home- and Community-Based Services (HCBS). The relative use of HCBS in each state (r_{state}) is estimated by dividing the state-specific HCBS use rate by the national HCBS use rate, both as reported by Houser, et al.⁵

$$r_{state} = \frac{h_{state}}{h_{US}}$$

where h_{state} is the state-specific HCBS use rate per 1,000 people and h_{US} is the U.S. HCBS use rate per 1,000 people. Because of the unique nature of the Arizona and Vermont LTSS systems, the HCBS use rate is not available; for those states, the model assumes the national average.

Relative Medicaid HCBS Expenditures Per Person Served for HCBS. The relative Medicaid expenditures per person served for HCBS (e_{state}) are calculated as the state-specific Medicaid HCBS per capita expenditures divided by the national average per capita expenditures, as reported by Houser, et al.⁵

$$e_{state} = \frac{x_{state}}{x_{US}}$$

where x_{state} is the sum of the state-specific Medicaid non-home health HCBS expenditures for older people and adults with physical disabilities per person served plus the expenditures for home health services. x_{US} is the same calculation for the national expenditures. For Arizona and Vermont, the model assumes the national average since Medicaid HCBS per capita expenditures are not available.

Total State-Specific Medicaid HCBS Spending. To determine the proportion of national Medicaid spending for each state, the model extension multiplies the three state-specific weighting values ($p_{state,year}$, r_{state} , e_{state}) and divides by the sum of the weights across all 50 states plus the District of Columbia.

$$w_{C_{state,year}} = \frac{p_{state,year} \times r_{state} \times e_{state}}{\sum_{i=1}^{51} (p_{i,year} \times r_i \times s_i)}$$

The model extension then multiplies each state-specific weighting factor by the national Medicaid community spending estimate from the underlying model (c_{year}):

$$MC_{state,year} = w_{C_{state,year}} \times c_{year}$$

where $MC_{state,year}$ is the estimate of how much of the national Medicaid HCBS spending for a given year is accounted for by a given state.

Medicaid Nursing Facility Spending Estimates

For Medicaid nursing facility spending estimates, the model extension assigns a proportion of national expenditures to each state based on:

- relative proportion of nursing home users with moderate to severe cognitive impairment in that state⁷ ($u_{state,year}$); and
- relative Medicaid expenditures per nursing facility resident in that state⁵ (r_{state}).

Relative Proportion of Nursing Home Users with Cognitive Impairment. The estimate of nursing facility spending per state starts with an estimate of the number of people with moderate to severe cognitive impairment* residing in nursing facilities in a given state, based on 2012 data from the Centers for Medicare and Medicaid Services.⁷ The proportion of national nursing home users with moderate to severe cognitive impairment in a state ($u_{state,2012}$) is given by:

$$u_{state,2012} = \frac{(i_{Mod(state)} + i_{Sev(state)}) \times nf_{state}}{(i_{Mod(US)} + i_{Sev(US)}) \times nf_{US}}$$

where i_{Mod} and i_{Sev} are the rates of moderate and severe cognitive impairment in nursing homes, and nf_{state} and nf_{US} are the total number of nursing home residents.

The number of people using nursing homes is expected to grow over time with the aging population. In order to estimate the number of users, and thus the number of residents with Alzheimer's and other dementias, for the years 2015 and 2025, the model extension increases the total number of nursing home residents in each state and the nation by the same proportion as the respective increase in the prevalence of Alzheimer's disease among those age 85 and older, reported by Weuve, et al.⁶ The model extension uses the percentage increase in Alzheimer's prevalence among this subpopulation as a proxy for the percentage increase in total nursing home residents given the high rates of prevalence and long length of stays in nursing homes among this population. The adjusted number of nursing home users for a given year ($u_{state,year}$) is calculated as:

$$u_{state,year} = u_{state,2012} \times \frac{N(85+)_{state,year}}{N(85+)_{state,2012}}$$

where $N(85+)_{state,year}$ is the number of people age 85 and older with Alzheimer's disease in a given state in a given year.

* State-by-state data on the number of nursing home residents with Alzheimer's disease or other dementias are limited. The model extension uses the rates of moderate to severe cognitive impairment among nursing home residents as a proxy for dementia.

Relative Medicaid Nursing Facility Expenditures Per Person Served. The model extension calculates the relative Medicaid spending on nursing facilities in a given state (rs_{state}) using average per person Medicaid expenditures on nursing facility services for each state (nf_{state}) and the nation (nf_{US}), as reported by Houser, et al.⁵

$$rs_{state} = \frac{nf_{state}}{nf_{US}}$$

Total State-Specific Medicaid Nursing Facility Spending. The model extension calculates each state's nursing facility weighting factor by multiplying the given state's relative proportion of nursing home users with cognitive impairment ($u_{state,year}$) by that state's relative per person Medicaid nursing facility expenditures (rs_{state}) and then dividing that weighting factor by the sum of the weights across all 50 states plus the District of Columbia.

$$wnf_{state,year} = \frac{u_{state,year} \times rs_{state}}{\sum_{i=1}^{51} u_{i,year} \times rs_i}$$

The model extension then multiplies each state's weighting factor by the national Medicaid nursing facility spending estimate from the underlying model (z_{year}).

$$MNF_{state,year} = w_{state,year} \times z_{year}$$

where $MNF_{state,year}$ is the estimate of how much of the national Medicaid nursing facility spending for a given year is accounted for by a given state.

Total Medicaid LTSS State Spending Estimate

The final step is to add each state's Medicaid HCBS spending ($MC_{state,year}$) and Medicaid nursing facility spending ($MNF_{state,year}$) to derive the total state Medicaid spending on individuals with Alzheimer's and other dementias for a given year.

References

1. The Lewin Group. Saving Lives, Saving Money: Dividends for Americans from Investing in Alzheimer's Research (2004). Available at http://www.lewin.com/~media/Lewin/Site_Sections/Publications/2867.pdf.
2. Alzheimer's Association. Appendix A of Changing the Trajectory of Alzheimer's Disease: How a Treatment by 2025 Saves Lives and Dollars (2015). Available at http://www.alz.org/alzheimers_disease_trajectory.asp.
3. Alzheimer's Association. Changing the Trajectory of Alzheimer's Disease: How a Treatment by 2025 Saves Lives and Dollars (2015). Available at http://www.alz.org/alzheimers_disease_trajectory.asp.
4. Unpublished estimated prevalence of Alzheimer's disease in the 50 states and the District of Columbia, 2014-2025 – Revised (2014). Provided to the Alzheimer's Association by a team led by Liesi Hebert, Sc.D., Rush University Institute on Healthy Aging.
5. Houser A, Fox-Grage W, Ujvari K. Across the States 2012: Profiles of Long Term Services and Supports (2012). Available at <http://www.aarp.org/home-garden/livable-communities/info-09-2012/across-the-states-2012-profiles-of-long-term-services-supports-AARP-ppi-ltc.html>.
6. Weuve J, Hebert LE, Scherr PA, Evans DA. Prevalence of Alzheimer Disease in U.S. States. *Epidemiology* 2015;26(1):e4-e6. Age-specific prevalence rates for each state provided under contract to the Alzheimer's Association by the authors.
7. Centers for Medicare and Medicaid Services. Nursing Home Data Compendium 2013 Edition (2013). Available at https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/CertificationandCompliance/downloads/nursinghomedatacompendium_508.pdf.

alzheimer's  association®

THE BRAINS BEHIND SAVING YOURS.®

800.272.3900 | alz.org®

The Alzheimer's Association® is the leading voluntary health organization in Alzheimer's care, support and research. Our mission is to eliminate Alzheimer's disease through the advancement of research; to provide and enhance care and support for all affected; and to reduce the risk of dementia through the promotion of brain health.

Our vision is a world without Alzheimer's®