

Mortality from Alzheimer's Disease: An Update

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Abstract

Alzheimer's disease is a progressive degenerative condition that has devastating implications for those afflicted. An estimated 4 million Americans, mainly elderly, have this condition, which is characterized by forgetfulness in early stages and increasingly severe debilitating symptoms as the disease progresses over what can be as long as a 20-year period. As an individual's impairment increases, informal or formal care giving becomes necessary to take care of basic needs. Annually, an estimated \$80 to \$100 billion dollars are spent on health care expenses or lost in wages for the persons with Alzheimer's disease or their care givers. At later stages of the disease, persons with Alzheimer's disease are bedridden and vulnerable to developing other medical conditions and dying before they would if they did not have Alzheimer's disease (1).

Physicians report that Alzheimer's disease caused the death of 21,397 persons in 1996 and contributed to the death of 21,703 additional persons. This information is from death certificates completed by physicians for all deaths in the United States, a fundamental source of information on what caused death for the 2.3 million deaths in the United States. The risk of dying from Alzheimer's disease has leveled off in recent years after rapid increases in the early 1980's and subsequent slower growth in the 1990's. The trend likely reflects changes in attitudes of physicians and the public about attributing Alzheimer's disease as a cause of death as well as the availability of improved diagnostic procedures; the recent leveling in mortality trends from this condition may signal that death certificate diagnoses for Alzheimer's disease are more reliable now.

Alzheimer's disease is a major cause of death, which exhibits variations by age, sex, race, and geographic area. This report provides recent mortality data on Alzheimer's disease. A previous report covers historic trends (2).

Keywords: death certificate • vital statistics • underlying cause • multiple cause • dementia

Risk remains unchanged between 1995 and 1996 after earlier periods of increased reporting

The trend in mortality from Alzheimer's disease (figure 1), has slowed considerably. It rose rapidly from 1979 through 1988, changed little from 1988 through 1992, and increased from 1992 to 1995, but appears to have leveled off again. In 1996 the age-adjusted death rate from this cause was 2.7 per 100,000 standard population, the same as in the previous year (figure 1 and table A). Preliminary data for 1997 indicate that the age-adjusted rate remained at the same level as 1996 (3). The rapid earlier increases most likely reflected changes in the acceptance of Alzheimer's disease as a cause of death and changes in diagnostic procedures (2); the leveling of the trend may reflect that reporting practices have stabilized as well.

Ranking of leading causes of death is ordered according to the number of deaths caused by specific conditions. The number of deaths from Alzheimer's disease in 1996 made Alzheimer's disease the 13th leading cause of death for all age groups and 8th leading cause for persons 65 years of age or more (4). Although there was little change between 1995 and 1996 in the number of deaths from Alzheimer's disease, the disease moved from the 14th to the 13th leading cause of death, reflecting decreases in homicides between the two years. The relative importance of Alzheimer's disease as indicated by rank

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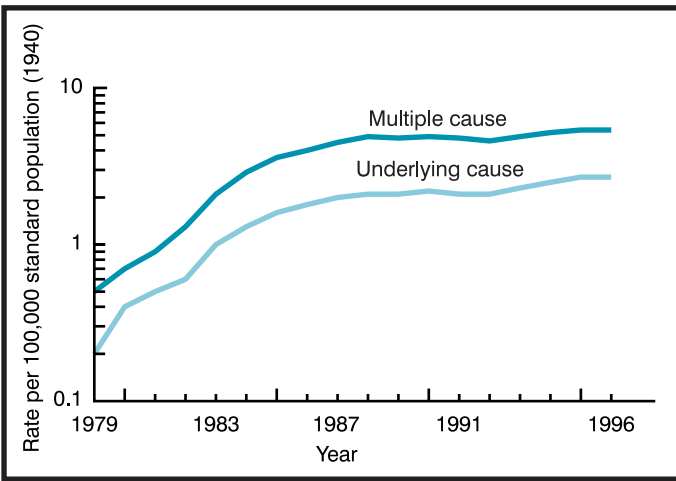


Figure 1. Age-adjusted death rates for Alzheimer's disease: United States, 1979-96

did not change for persons 65 years of age and over between 1995 and 1996. For 1997 preliminary data indicate that Alzheimer's disease moved from the 13th to the 12th leading cause, reflecting major decreases in Human immunodeficiency virus infection (HIV) deaths between the two years. The rank did not change for persons 65 years of age and over between 1996 and 1997.

In addition to the more than 20,000 deaths for which Alzheimer's disease was reported as the underlying cause of death, Alzheimer's disease was mentioned on more than 20,000 additional death certificates as contributing to the death. All together, the total of underlying and contributing causes on the death certificate is referred to as multiple cause of death (figure 1).

Who is at greatest risk? Older persons, white persons, and females

Risk of death from Alzheimer's disease increases sharply with age (figure 2 and table B). In 1996 death rates ranged from 0.1

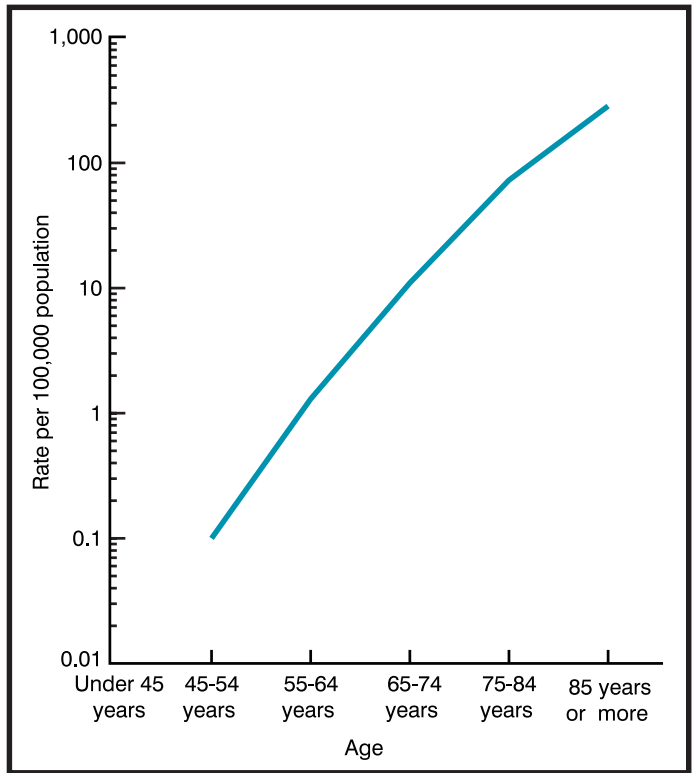


Figure 2. Death rate for Alzheimer's disease by age: United States, 1996

deaths per 100,000 population aged 45-54 years to 284.7 for persons 85 years of age and over. This pattern of increase with age characterized the mortality experience of men and women, black and white.

The number of women dying from Alzheimer's disease was much greater than the number for men, 14,426 compared with 6,971 in 1996, or more than 2:1. However, the risk of death was only slightly higher, 2.8 versus 2.6 deaths per 100,000 standard population (figure 3 and

Table A. Age-adjusted death rates for Alzheimer's disease by race and sex: United States, 1979-96

[Age-specific rates per 100,000 population in specified group, age-adjusted rates per 100,000 U.S. standard population (1940)]

Year	All races			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
1996	2.7	2.6	2.8	2.8	2.7	2.9	1.9	1.8	1.9
1995	2.7	2.7	2.7	2.8	2.8	2.8	1.9	2.0	1.9
1994	2.5	2.6	2.5	2.6	2.7	2.6	1.8	1.8	1.7
1993	2.3	2.4	2.3	2.4	2.5	2.4	1.6	1.8	1.5
1992	2.1	2.2	2.0	2.2	2.3	2.1	1.5	1.6	1.4
1991	2.1	2.2	2.1	2.2	2.3	2.2	1.4	1.6	1.3
1990	2.2	2.3	2.1	2.3	2.4	2.2	1.4	1.8	1.2
1989	2.1	2.3	2.0	2.2	2.4	2.1	1.4	1.7	1.2
1988	2.1	2.3	2.0	2.2	2.4	2.1	1.2	1.2	1.1
1987	2.0	2.3	1.8	2.1	2.4	1.9	1.1	1.3	1.0
1986	1.8	2.0	1.6	1.9	2.1	1.7	0.9	0.9	0.9
1985	1.6	1.9	1.5	1.7	2.0	1.5	0.8	0.9	0.8
1984	1.3	1.6	1.1	1.4	1.7	1.2	0.5	0.6	0.5
1983	1.0	1.2	0.9	1.1	1.3	0.9	0.4	0.5	0.4
1982	0.6	0.7	0.6	0.7	0.8	0.6	0.3	0.3	0.2
1981	0.5	0.5	0.4	0.5	0.6	0.4	0.2	0.2	0.2
1980	0.4	0.4	0.3	0.4	0.5	0.3	0.2	0.3	0.1
1979	0.2	0.3	0.2	0.3	0.3	0.2	0.1	*	*

* Figure does not meet standard of reliability or precision.

Table B. Deaths, death rates, and age-adjusted death rates for Alzheimer's disease: United States, 1996

[Age-specific rates per 100,000 population in specified group, age-adjusted rates per 100,000 U.S. standard population (1940)]

Race and sex	All ages	Under 45 years	45-54 years	55-64 years	65-74 years	75-84 years	85 years and over	Age-adjusted rate
Deaths								
All races	21,397	5	29	286	2,049	8,319	10,709	---
Male	6,971	3	11	122	925	3,249	2,661	---
Female	14,426	2	18	164	1,124	5,070	8,048	---
White	20,198	3	29	261	1,880	7,862	10,163	---
Male	6,564	2	11	111	854	3,085	2,501	---
Female	13,634	1	18	150	1,026	4,777	7,662	---
Black	1,083	1	—	25	155	412	490	---
Male	350	—	—	11	65	146	128	---
Female	733	1	—	14	90	266	362	---
Death rate								
All races	8.1	*	0.1	1.3	11.0	72.8	284.7	2.7
Male	5.4	*	*	1.2	11.1	72.4	248.7	2.6
Female	10.6	*	*	1.5	10.9	73.0	299.0	2.8
White	9.2	*	0.1	1.4	11.4	76.0	298.4	2.8
Male	6.1	*	*	1.3	11.5	75.7	260.7	2.7
Female	12.2	*	*	1.6	11.3	76.2	313.1	2.9
Black	3.2	*	*	1.2	9.5	48.7	171.1	1.9
Male	2.2	*	*	*	9.5	46.9	153.6	1.8
Female	4.2	*	*	*	9.5	49.7	178.4	1.9

--- Data not available.

— Quantity zero.

* Figure does not meet standards of reliability or precision.

table B). The larger numbers for women reflect the larger number of women alive at these older ages when the risk of death from this cause is prevalent.

For the black population, only 1,083 persons died of this cause in 1996, compared with 20,198 for the white population. Rates were much greater (47 percent in 1996) for the white than black population (figure 4 and table B). This mortality risk is in contrast with risk of acquiring Alzheimer's disease, which is higher for the black population than for the white population (1).

Reported risk varies across Nation; highest rates in Northeast and Northwest

States with the highest age-adjusted death rates for 1990-96 tended to be in the Northeast and Northwest regions of the country (figure 5 and table C), but States with the lowest rates exhibited no consistent geographic clustering. The highest rates were for Maine and Oregon (3.7 per 100,000 standard population) and the lowest for New York State (1.0), Hawaii (1.6), and the District of Columbia (1.7).

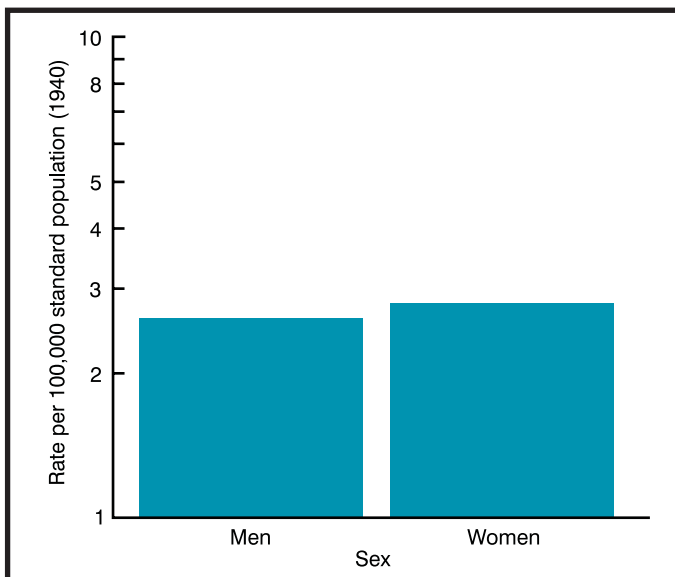


Figure 3. Age-adjusted death rates by sex: United States, 1996

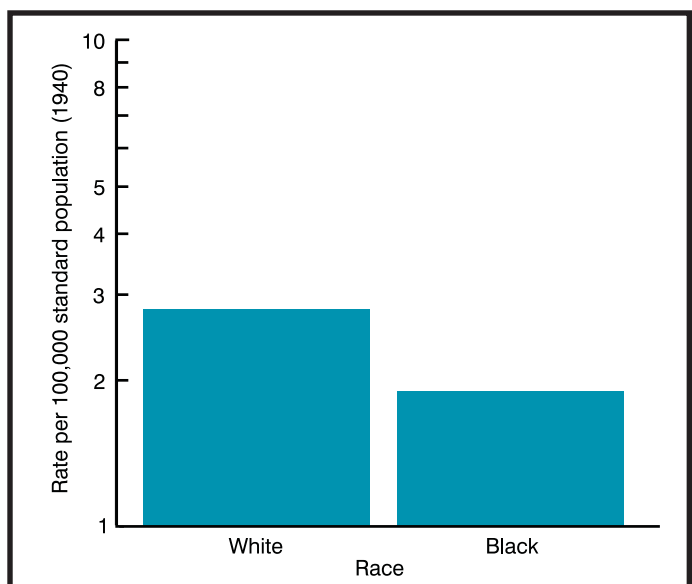


Figure 4. Age-adjusted death rates by race: United States, 1996

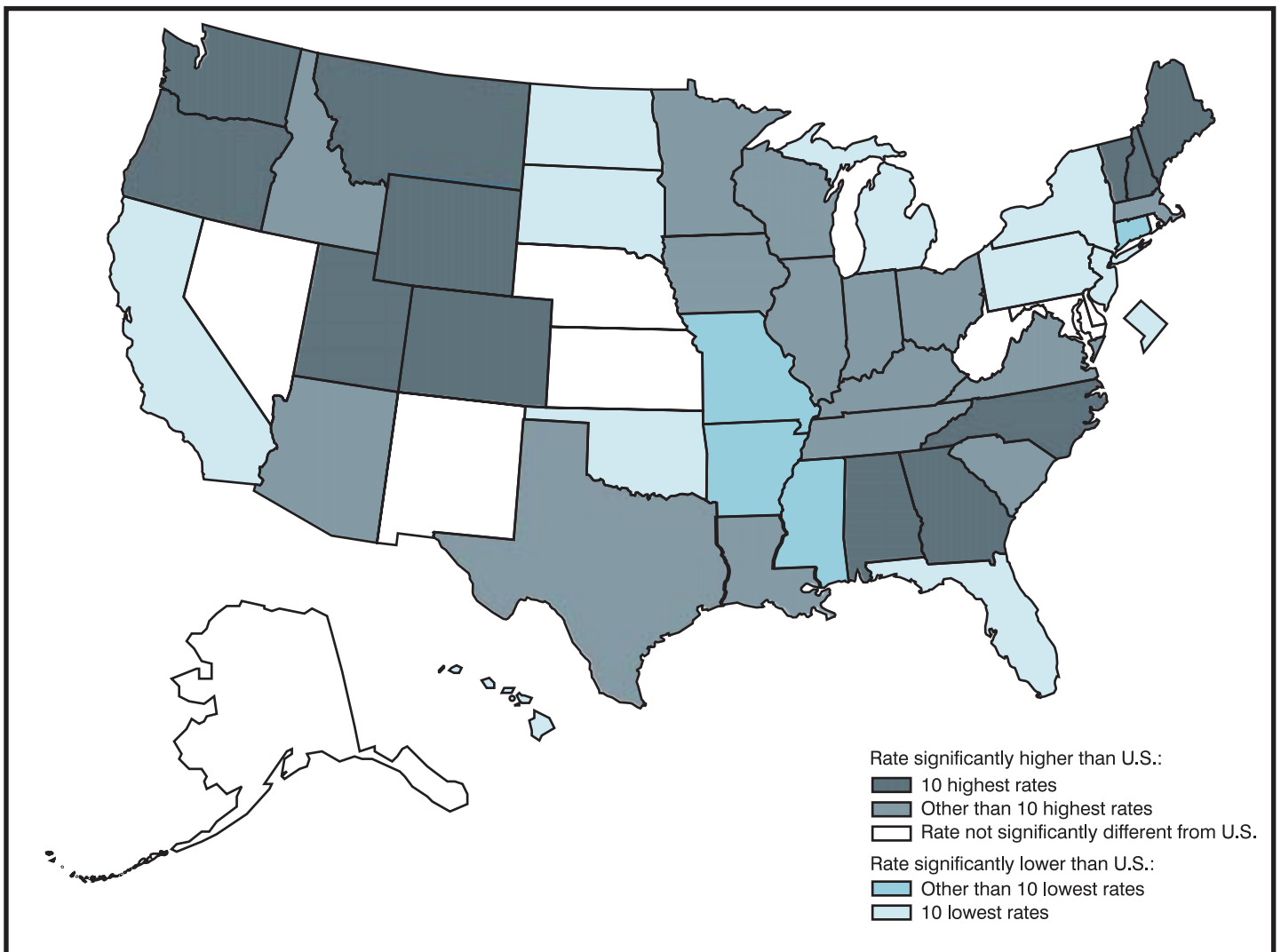


Figure 5. Age-adjusted death rates for Alzheimer's disease by State: United States, 1990-96

While the present study does not examine rates in the territories of the United States (Puerto Rico, Virgin Islands, and Guam), data from the National Vital Statistics System indicate that Puerto Rico has high death rates from Alzheimer's disease (4). The observed geographic variation may represent to some degree variations in reporting practices rather than variation in mortality. Thus, reporting practices may reflect variations in medical care settings, or in physicians' diagnostic procedures, terminology, and medical opinions.

Estimates of Alzheimer's disease vary

Estimates of mortality attributable to Alzheimer's disease vary greatly (4-8). In this report estimates are based on explicit reporting by attending physicians of Alzheimer's disease on the death certificate. Other estimates are based on different methodologies including a broader range of diagnoses, multiple cause rather than underlying cause of death, and ratio adjustments based on generalizations from specific studies to the entire population. While multiple cause-of-death data are presented in this report, leading causes of death are based on underlying cause counts for Alzheimer's disease for other causes.

Conclusion

Alzheimer's disease causes severe impairment, creates demanding care-giving needs, complicates ongoing medical treatment, and affects survival (5, 9-13). Data in this report indicate a leveling in the trend of Alzheimer's disease mortality after years of rapid increase that may reflect, in part, diagnostic and reporting changes. Nonetheless, as the population continues to age, that is, as more and more persons reach advanced ages, the number of persons suffering and dying from this disease will increase unless a cure or effective treatment is found.

Nature and sources of data

Data in this report are based on information from all death certificates for the Nation (14), which are filed in State vital statistics offices. Cause of death is reported on the death certificate by the attending physician (15), while the rest of the death certificate (e.g., age, race, sex) is completed by a funeral director using information usually provided by respondents, usually family members. The information from death certificates is coded using the *Ninth Revision*,

Table C. Deaths and age-adjusted death rates for Alzheimer's disease by State: United States 1990-96

[Age-adjusted rates per 100,000 U.S. standard population (1940)]

State	Deaths	Rate	95-percent confidence limits	
			Lower	Upper
United States	119,627	2.4	2.4	2.4
Alabama	2,351	3.0	2.9	3.2
Alaska	71	2.3	1.8	2.9
Arizona	2,145	2.7	2.6	2.8
Arkansas	1,118	2.2	2.0	2.3
California	9,956	2.0	1.9	2.0
Colorado	1,692	3.0	2.9	3.2
Connecticut	1,573	2.2	2.1	2.3
Delaware	289	2.4	2.1	2.6
District of Columbia	214	1.7	1.4	1.9
Florida	8,129	2.1	2.1	2.2
Georgia	3,192	3.2	3.0	3.3
Hawaii	327	1.6	1.4	1.8
Idaho	587	2.8	2.6	3.1
Illinois	5,971	2.6	2.5	2.7
Indiana	3,128	2.8	2.7	2.9
Iowa	2,191	2.9	2.7	3.0
Kansas	1,450	2.4	2.3	2.6
Kentucky	2,147	2.9	2.8	3.1
Louisiana	1,993	2.9	2.7	3.0
Maine	1,046	3.7	3.5	4.0
Maryland	2,022	2.5	2.4	2.6
Massachusetts	4,034	2.9	2.8	3.0
Michigan	3,409	2.0	2.0	2.1
Minnesota	2,826	2.8	2.7	2.9
Mississippi	1,005	2.2	2.0	2.3
Missouri	2,596	2.2	2.1	2.3
Montana	667	3.5	3.2	3.8
Nebraska	1,062	2.6	2.4	2.8
Nevada	497	2.6	2.4	2.8
New Hampshire	787	3.6	3.3	3.8
New Jersey	2,934	1.9	1.8	1.9
New Mexico	648	2.5	2.3	2.7
New York	3,639	1.0	1.0	1.0
North Carolina	3,711	3.0	2.9	3.1
North Dakota	342	2.0	1.8	2.3
Ohio	5,848	2.6	2.5	2.7
Oklahoma	1,334	2.0	1.9	2.1
Oregon	2,486	3.7	3.5	3.9
Pennsylvania	5,166	1.8	1.8	1.9
Rhode Island	617	2.4	2.1	2.6
South Carolina	1,683	2.9	2.8	3.1
South Dakota	395	2.1	1.8	2.3
Tennessee	2,703	2.9	2.7	3.0
Texas	7,948	2.9	2.9	3.0
Utah	849	3.4	3.1	3.6
Vermont	412	3.5	3.1	3.9
Virginia	2,932	2.8	2.7	2.9
Washington	3,215	3.2	3.1	3.3
West Virginia	908	2.2	2.0	2.4
Wisconsin	3,120	2.7	2.6	2.8
Wyoming	262	3.3	2.9	3.8

International Classification of Diseases (ICD-9) (15), in which Alzheimer's disease is classified as ICD-9 No. 331.0. Some deaths due to Alzheimer's disease, if not explicitly attributed to this cause of death, may be included in ICD titles for other conditions, especially less specific conditions such as Senile and presenile organic psychotic conditions (ICD-9 Nos. 290.0-290.9), Senility (ICD-9 No. 797), and other titles in the classification (15). These other titles are not included in the analysis of Alzheimer's disease presented in this report.

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Also, visit the mortality Web page on the National Center for Health Statistics Web site for more information:

www.cdc.gov/nchswww/about/major/dvs/mortdata.htm

Other Web sites with information on Alzheimer's disease include:

National Institutes on Aging

www.nih.gov/nia/

Alzheimer's Disease Education and Referral Center

www.alzheimers.org/adearf/

Agency for Health Care Policy and Research

www.ahcpr.gov

Alzheimer's Association

www.alz.org

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