

## Clinical Investigation

# Who Remains Cognitively Intact among the 80+ Age Group?

Laurel A. Strain, PhD<sup>1</sup>; Audrey A. Blandford, BA<sup>2</sup>; Philip D. St. John, MD, MPH, FRCPC<sup>3</sup>

<sup>1</sup>Centre on Aging and Department of Sociology; <sup>2</sup>Centre on Aging; <sup>3</sup>Centre on Aging and Section of Geriatrics, University of Manitoba, Winnipeg, MB

**Background:** Much of the research on health status of the oldest old has focused on declines in physical and cognitive functioning. This study investigates changes in cognitive status over a 5-year period, with an emphasis on factors associated with remaining cognitively intact.

**Methods:** The sample consisted of 611 community-dwelling Manitobans age  $\geq 80$  in 1991/92. Logistic regression analysis was used to examine baseline characteristics associated with remaining cognitively intact over a 5-year period (age, gender, education, Winnipeg/non-Winnipeg residence, living arrangement, physical functioning, Modified Mini-Mental State score (3MS), number of chronic health problems, self-rated health).

**Results:** Among the 453 individuals who were cognitively intact at baseline, 38% remained intact 5 years later. Individuals who were younger, had better physical functioning, had more years of education, and higher 3MS scores were significantly more likely to remain cognitively intact.

**Conclusions:** These findings highlight the importance of age and the ability to perform basic and instrumental activities of daily living in maintaining cognitive functioning among the oldest old.

**Key words:** Oldest old, cognitive functioning, activities of daily living

## INTRODUCTION

The oldest old are the most rapidly growing segment of the Canadian population aged  $\geq 65$ .<sup>1</sup> Much of the research on this age-group focuses on declines in cognitive and physical functioning. For example, Hogan and colleagues<sup>2</sup> reported that over one-half of the Canadian Study of Health and Aging (CSHA) participants age  $\geq 85$  who were diagnosed with no cognitive impairment at baseline had a diagnosis of cognitive impairment 5

years later and two-thirds had a decline in their functional abilities. Even after age 85, age is associated with an increasing risk of developing cognitive impairments.<sup>3,4</sup>

Interestingly, relatively little attention has been given to the likelihood of maintaining cognitive functioning and the oldest old's characteristics associated with remaining cognitively intact. This study examines changes in cognitive status over a 5-year period among Manitobans aged  $\geq 80$ . The objectives are: 1) to describe changes in cognitive status from 1991/92 to 1996/97; and 2) to identify characteristics associated with remaining cognitively intact.

## METHODS

The data are from the Manitoba Study of Health and Aging (MSHA). The MSHA is an expansion of the Canadian Study of Health and Aging (CSHA), whose primary objectives were to estimate the prevalence of dementia<sup>3</sup> and to examine issues related to informal caregiving.<sup>5</sup> Study methods are briefly described; more detailed information is available elsewhere.<sup>6,7</sup>

The MSHA at baseline involved in-person screening interviews of 1,763 individuals aged  $\geq 65$  living in the community in 1991/92. These respondents were randomly selected according to health region and age group, with an oversampling in the older age groups, from a list provided by Manitoba Health. This source provides one of the most complete listings of residents, because individuals in the province need to be registered in order to receive government-funded medical services cov-

**Correspondence to:** Laurel Strain, PhD, Centre on Aging, 338 Isbister Building, University of Manitoba, Winnipeg, MB R3T 2N2. Fax: 204-474-7576; e-mail: laurel\_strain@umanitoba.ca

erage. In 1996/97, attempts were made to re-interview elders who had participated in 1991/92.

In the screening phase, cognitive status was assessed using the *Modified Mini-Mental State Examination* (3MS).<sup>8</sup> Individuals whose scores were  $\geq 78$  out of a possible 100 on the 3MS were considered cognitively intact. Those who scored  $< 78$  were asked to participate in a clinical assessment that involved physical, neurological, and mental status testing. During a consensus meeting, the clinical team determined a diagnosis of cognitive impairment-not dementia (CIND) or dementia, using the *Diagnostic and Statistical Manual of Mental Disorders, 3rd Edn, revised* (DSM-III-R)<sup>9</sup> and the NINCDS-ADRDA diagnostic criteria.<sup>10</sup> The CIND category included cognitive loss associated with depression, delirium, chronic alcohol and drug use, other psychiatric illness, mental retardation, age-associated memory impairment, or 'other' presumed origins such as Parkinson's disease or epilepsy.<sup>11,12</sup> Dementia included Alzheimer's disease, vascular dementia, other specific dementias, and unclassifiable dementia.

At the time of the 1991/92 screening interview, 650 individuals were aged  $\geq 80$ . The sample for the analyses presented here consisted of 611 older adults; the 1996/97 cognitive status was not known for the remaining 39 respondents.

## Measures

**Cognitive status categories.** The screening 3MS score and the clinical team's diagnosis of cognitive impairment were used to create four categories of cognitive status: 1) *cognitively intact* (scored  $\geq 78$  on 3MS and not eligible for a clinical assessment or scored  $\leq 77$  on 3MS and diagnosed with no cognitive impairment); 2) *possible cognitive impairment* ( $\leq 77$  on 3MS and no diagnosis available as clinical assessment was not completed); 3) *CIND* (met criteria for cognitive impairment - not dementia); and 4) *dementia* (met criteria for dementia). In 1996/97, the category of *deceased* (died between 1991/92 and 1996/97) was added.

**Baseline characteristics.** Sociodemographic characteristics included age, gender, education, living arrangement, and Winnipeg/non-Winnipeg place of residence.

Physical functioning was measured using the OARS Multidimensional Functional Assessment Questionnaire.<sup>13,14</sup> Ability to perform 14 activities

(eating, dressing, taking care of appearance, walking, getting in/out of bed, taking a bath/shower, getting to the bathroom, using the telephone, getting to places out of walking distance, shopping, preparing meals, doing housework, taking medications, handling money) were coded 0 = *unable to perform*, 1 = *with some help*, and 2 = *without help*. Using the OARS methodology,<sup>14</sup> five groups were then created: *excellent/good*; *mild impairment*; *moderate impairment*; *severe impairment*; and, *total impairment*. A dichotomy of excellent/good functioning versus mild, moderate, severe and total impairment was used in the analyses.

Other health measures at baseline included the number of self-reported chronic health problems such as high blood pressure and heart problems (0 to 10+) and the 3MS score. Self-rated health was measured by responses to the question "For your age, would you say in general your health is excellent, good, fair, poor or bad?"

## RESULTS

### Baseline Sample Characteristics

Of the sample, 61% were female. Their ages in 1991/92 ranged from 80 to 98, with a mean of 85 years. On average, they had 9 years of education. One-half (53%) lived in Winnipeg; 56% lived alone.

Baseline 3MS scores ranged from 41 to 100, with a mean of 81. Forty-three percent had excellent/good physical functioning. They reported an average of five chronic health problems. One-half (51%) rated their health as good for their age, and 17% rated their health as excellent.

### Cognitive Status

At baseline, 74% were cognitively intact. Sixteen percent were diagnosed with cognitive impairment, 9% with CIND and 7% with dementia. An additional 10% screened as possibly cognitively impaired.

### Changes in Cognitive Status

Among the 453 individuals who were cognitively intact at baseline, 38% remained intact 5 years later (Table 1). One-quarter (24%) were diagnosed with cognitive impairment (11% - CIND, 13% - dementia). Over one-third (36%) had died since 1991/92.

**Table 1. Cognitive Status in 1991/92 and 1996/97**

1991/92 Cognitive Status	1996/97 Cognitive Status	n	%
<b>Cognitively intact</b>	Cognitively intact	170	37.5
	Possible cognitive impairment	13	2.9
	Cognitive impairment - not dementia	49	10.8
	Dementia	58	12.8
	Deceased	163	36.0
	<b>Total</b>		453
<b>Possible cognitive impairment</b>	Cognitively intact	3	4.8
	Possible cognitive impairment	5	8.1
	Cognitive impairment - not dementia	6	9.7
	Dementia	10	16.1
	Deceased	38	61.3
	<b>Total</b>		62
<b>Cognitive impairment -not dementia</b>	Cognitively intact	2	3.5
	Possible cognitive impairment	1	1.8
	Cognitive impairment - not dementia	9	15.8
	Dementia	18	31.6
	Deceased	27	47.4
	<b>Total</b>		57
<b>Dementia</b>	Dementia	12	30.8
	Deceased	27	69.2
	<b>Total</b>	39	100.0

Among the 62 individuals with possible cognitive impairment at baseline, one-quarter (26%) were diagnosed with cognitive impairment in 1996/97 (10% - CIND, 16% - dementia) (Table 1). Over half (61%) had died since 1991/92.

Among the 57 individuals diagnosed with CIND at baseline, 47% were diagnosed with cognitive impairment (16% - CIND, 32% - dementia) and 47% had died five years later (Table 1). Lastly, among those who had been diagnosed with dementia at baseline, 31% had this same diagnosis in 1996/97 while 69% had died.

### Characteristics Associated with Remaining Cognitively Intact

Attention now turns to factors associated with remaining cognitively intact. The analysis was lim-

ited to the 453 individuals who were cognitively intact at baseline. Specifically, the comparison was between the 170 individuals who remained cognitively intact 5 years later and the 283 who did not. The deceased are included in the latter group, although it is recognized that some individuals may not have developed cognitive impairment prior to death.

In the unadjusted logistic regression models, individuals who were younger, had more years of education, higher 3MS scores, better physical functioning, fewer chronic health problems, and better self-rated health (excellent or good) at baseline were more likely to remain cognitively intact 5 years later (Table 2). Gender, Winnipeg/non-Winnipeg residence, and living alone versus with others were not significantly associated with remaining cognitively intact. These results remained the same when controlling for age and gender (details available upon request).

The full model considered all these factors together, with the exception of education and 3MS score (Table 2). The correlation between education and 3MS scores is well documented;<sup>13</sup> therefore, education and 3MS score were entered into separate models. Once again, younger individuals and those with excellent/good physical functioning were significantly more likely to remain cognitively intact. Both more years of education and higher 3MS score was associated with the likelihood of remaining cognitively intact.

## DISCUSSION

This study identified changes in cognitive status over a 5-year period among Manitobans age  $\geq 80$  and the factors associated with remaining cognitively intact. Over one-third of the individuals with no cognitive impairment at baseline remained cognitively intact 5 years later. This is similar to the percent of cognitively intact who had died over the 5 years.

Of particular note is the finding that over one-half of the oldest old who were cognitively intact at baseline and still alive 5 years later remained cognitively intact. In other words, the development of cognitive impairment with increasing age is in no way universal even in this age group.

Our results suggest that the youngest of the oldest old are more likely to remain cognitively intact. This underscores the importance of considering

**Table 2. Characteristics Associated with Remaining Cognitively Intact**

Baseline characteristics	Unadjusted		Full model	
	RR	95%CI	RR	95%CI
Age (years)	0.83***	0.79-0.89	0.85***	0.80-0.91
Female	1.03	0.69-1.54	1.45	0.87-2.42
Education (years)	1.13***	1.06-1.20	1.15***	1.07-1.24
3MS score (continuous)	1.13***	1.09-1.17	(1.14***)	(1.09-1.18)
Lives in Winnipeg <sup>a</sup>	1.20	0.82-1.75	0.87	0.55-1.39
Lives alone <sup>b</sup>	0.83	0.57-1.22	0.94	0.58-1.52
Excellent/good physical functioning <sup>c</sup>	2.73***	1.84-4.04	2.94***	1.78-4.83
Chronic health problems (number)	0.90**	0.84-0.98	1.00	0.91-1.10
Self-rated health <sup>d</sup>				
Good	1.83*	1.14-2.93	1.61	0.94-2.75
Excellent	1.90*	1.07-3.37	1.12	0.55-2.26

\* $P < .05$ ; \*\* $P < .01$ ; \*\*\* $P < .001$

<sup>a</sup>Reference category: lives outside Winnipeg

<sup>b</sup>Reference category: lives with others

<sup>c</sup>Reference category: mild/moderate/severe/total impairment

<sup>d</sup>Reference category: fair/poor/bad

age within the oldest old.

Remaining cognitively intact was also significantly associated with having more years of education. It could be that individuals with a higher education may have more “cognitive reserve” or may be better “test-takers”. This is somewhat supported by the fact that older adults with higher 3MS scores were also more likely to remain intact. The possible protective effect of education on maintaining cognition may mitigate, at least in part, the effect of an aging population on the numbers of persons developing cognitive impairment.

Consistent with previous research, we found a relationship between cognitive and physical functioning. The oldest old with excellent/good physical functioning were more likely to maintain their cognition. As noted by Njegovan et al,<sup>15</sup> the relationship between cognitive impairment and functional disability is important in understanding the future care needs as individuals decline both in cognitive and physical functioning. This finding may have particular clinical relevance. As changes in functional ability may be more readily noticed by both family members and clinicians, a change in the ability to perform activities of daily living may act as a tool in identifying changes in cognitive functioning.

It is important to note two specific study limitations, because they point to directions for future research. As mentioned previously, we do not know the cognitive status of those who died

between 1991/92 and 1996/97. These individuals may or may not have been cognitively intact at the time of death. In addition, because data were collected at only two points in time and 5 years apart, it is not known when the respondent became cognitively impaired. More frequent data collection would address these issues.

Overall, this study has highlighted the diversity among the oldest old. Increased attention to the ways in which these individuals can maintain their cognitive functioning is needed. As well, further research on the usefulness of incorporating cognitive assessment into clinical care is required.

The Manitoba Study of Health and Aging (MSHA) was funded primarily by Manitoba Health (1990-93) and Manitoba Health's Healthy Communities Development Fund (1995-99). Additional funding was provided through the Canadian Study of Health and Aging (CSHA) by the Seniors Independence Research Program of the National Health Research and Development Program of Health Canada (Project No. 6606-3954-MC(S)). The results and conclusions are those of the authors and no official endorsement by Manitoba Health is intended or should be inferred. The contributions of MSHA Research Group members at the University of Manitoba's Centre on Aging are gratefully acknowledged.

## REFERENCES

1. Health Canada. Canada's Aging Population. Ottawa: Minister of Public Works and Government Services

- Canada, 2002.
2. Hogan DB, Fung TS, Eby EM. Health, function and survival of a cohort of very old Canadians: Results from the second wave of the Canadian Study of Health and Aging. *Can J Public Health* 1999; 90: 338-42.
  3. Canadian Study of Health and Aging Working Group. Canadian Study of Health and Aging: Study methods and prevalence of dementia. *Can Med Assoc J* 1994;150:899-913.
  4. Eby EM, Parhad IM, Hogan, DB et al. Prevalence and types of dementia in the very old: Results from the Canadian Study of Health and Aging. *Neurology* 1994; 44: 1593-600.
  5. Canadian Study of Health and Aging Working Group. Patterns of caring for people with dementia in Canada. *Can J Aging* 1994; 13: 470-87.
  6. Manitoba Study of Health and Aging Research Group. Manitoba Study of Health and Aging Final Report: Technical section. Winnipeg: University of Manitoba, Centre on Aging, 1995.
  7. MSHA-2 Research Group. Follow-up to the Manitoba Study of Health and Aging (MSHA-2) - methodology. Winnipeg: University of Manitoba, Centre on Aging, 1998.
  8. Teng EL, Chui HC. The Modified Mini-Mental state (3MS) Examination. *J Clin Psychiatry* 1987; 48: 314-8.
  9. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, 3rd Edn. Washington: American Psychiatric Association, 1987.
  10. McKhann G, Drachman D, Folstein M et al. Clinical diagnosis of Alzheimer's disease: Report of the NINCDS-ADRDA Work Group under the auspices of the Department of Health and Human Services Task Force on Alzheimer's disease. *Neurology* 1984; 34: 939-44
  11. Tuokko HA, Frerichs R, Kristjansson B et al. Cognitive impairment with no dementia - Yet? The meaning of mild cognitive impairment in older adults. *Mature Medicine Canada* 2000; 3: 116-8.
  12. Tuokko HA, Frerichs R, Kristjansson B. Cognitive impairment, no dementia: Concepts and issues. *Int Psychogeriatr* 2001; 13: 183-202.
  13. McDowell I, Newell C. *Measuring Health: A Guide to Rating Scales and Questionnaires*. 2nd Edn. New York: Oxford University Press, 1996.
  14. Fillenbaum GC. *Multidimensional Functional Assessment of Older Adults: The Duke Older American Resources and Services Procedure*. Hillsdale: Lawrence Erlbaum Associates, 1988.
  15. Njegovan V, Man-Son-Hing M, Mitchell SM et al. The hierarchy of functional loss associated with cognitive decline in older persons. *J Gerontol A Biol Sci Med Sci* 2001;56:M638-43.

## CONFUSION . . . . . by Shannon Paige, Bracebridge, ON

The following piece was sent to the Journal by a grade 12 student attending Bracebridge and Muskoka Lakes Secondary School in Bracebridge, Ontario, offered for publication:

"In my eyes, my grandma has always been the most amazing, loving, caring, and perfect person. For as long as I can remember, she always told me how much she loved me. The kisses on my face were endless, and the compliments on how beautiful she thought I was constantly poured out.

To me she was perfect. So full of love, life, and happiness, just being with her made everything seem okay. My grandma would be the one to reassure me when I was questioning myself, or to tell me how proud of me she was. Her wisdom, good advice, and positive outlook on life made me wish that one day, if I was lucky enough, I could be an amazing woman like her.

Three years ago my grandma was diagnosed with Alzheimer's. Since then everything's changed. The visits weren't as frequent, and the telephone didn't ring as often.

My grandma's condition got worse every time I went to visit. At first she couldn't remember where she put the chocolates, then she had trouble getting the grandchildren's names straight, then she was confused about

where she was or what she was doing. Eventually, she could barely hold a drink without spilling it; she'd forget it was in her hand.

I haven't seen my grandma in a year and a half now; she was put into a nursing home in Alliston because my grandpa could no longer take care of her. Since then, I haven't been able to visit her in the home. And she's gotten worse. My mom goes and visits her once a week and she tells me about it. My grandma doesn't even know who my mom or my grandpa are anymore. She can't go to the bathroom on her own, or eat real food.

I constantly question myself and wonder if I should take the chance and go see her. Alliston is only an hour and a half away from where I live. I could easily go visit; but I can't. And it bothers me. Part of me is afraid to go see her. The other part is afraid that if I don't go, when she does pass away, I will regret not seeing her one last time. My sister went and saw her a few months ago and she didn't even recognize my grandma. I'm afraid that my last thoughts of my grandma will be of her being very sick and frail. Right now I remember her being happy, healthy, and loving life. I don't want that to change.

I think for now it's best for me to not go and visit. I'm just so afraid that I will regret it one day. It confuses me so much, I could go crazy."