Distal and Proximal Resource Influences on Economic Dependency among the Oldest Old

Maurice MacDonald[a] Aradhana Aneja[a] Peter Martin[a] Jennifer Margrett[a]
Leonard W. Poon[b] for the Georgia Centenarian Study

[a]Human Development and Family Studies, Iowa State University, Ames, Iowa, and [b]University of Georgia, Athens, Ga., USA

Abstract

Background: As exceptional survivors, centenarians may have characteristics that reduce their dependency on family and community support systems despite the expectation that their extreme age creates a burden on those systems. The Georgia Centenarian Study obtained information about assistance for income, medical care, and caregiving of all types for a sample of centenarians and octogenarians. Previous studies have not established which characteristics may contribute to economic dependency among the oldest old. *Objective:* To identify distal and proximal resource influences on economic dependency, considering past lifestyle, proximal health, economic resources, personality, and coping behavior. *Methods:* Analysis sample sizes ranged from 109 to 138 octogenarians and centenarians. Blockwise multiple regressions predicted whether they received income assistance, number of medical care events, number of caregiving types, and total caregiving hours. *Results:* Past life style, gender, ethnicity, socioeconomic status, functional health, and coping were not related to economic dependency. With the exception of the number of types of care, centenarians were not more dependent than octogenarians. Cognitive ability had the strongest effects for medical care and caregiving services. 'Extraversion', 'ideas', 'neuroticism', and 'competence' personality factors had significant effects for caregiving types and total hours of care received. *Conclusion:* Monitoring and intervention to maintain cognitive ability are critical practices for autonomy and reduced economic dependency among the oldest old. Psychological resources are more important influences on social support than functional health and other proximal economic resources.

Copyright © 2010 S. Karger AG, Basel

Population trends associated with increased longevity world-wide include rapid growth in the oldest-old segment and the emergence of more centenarians as exceptional survivors [1]. Caring for the extreme survivors among the oldest old may create a substantial new burden on family and public support systems, so maintaining

Maurice MacDonald, PhD
College of Human Ecology
Kansas State University
302 Justin Hall, Manhattan, KS 66506-1403 (USA)
Tel. +1 785 532 1472, Fax +1 785 532 5505, E-Mail morey@ksu.edu

commitments to provide quality care for oldest-old adults in aging populations presents a dependency burden challenge that must be met if 'adding years to life' will mean 'adding life to years'. However, exceptional survivors may be unique in that they could be selected for and partially protected by characteristics and resources that mitigate any effects of their mental and functional health decline on their support system. The extent to which centenarians are unique survivors with special, perhaps protective characteristics has been the subject of recent research devoted to analysis of variables such as functional health, mental health, cognition, and psychological well-being [2–5]. However, except for descriptions of social networks [6], and the receipt of income from government old-age assistance sources [7], no studies of the oldest old have collected quantitative information about aspects of dependency such as medical care and caregiving services provided by family members or hired caregivers [8]. This study of centenarians and octogenarians who participated in the second Georgia Centenarian Study analyzes the influence of personal and support system characteristics on: income assistance, medical care, the number of caregiving service types, and total hours of caregiving received. In addition to isolating characteristics that are associated with dependency to suggest areas of attention for policy-makers and geriatric intervention, the results may be useful for identifying which kinds of centenarians receive more support and, thus, suggest hypotheses for future research on the influence of dependency measures on well-being.

Our theoretical framework is the life-span developmental adaptation model proposed by Martin and Martin [9], which Martin [10] used to analyze the role of personality, social support, and economic resources in the first Georgia Centenarian Study. Key to this model is consideration of proximal and distal influences on adaptation. MacDonald [11] reviewed Martin's findings and evidence from comparable international studies of social support for oldest-old adults. For Georgia, the interviewers' rating of social support was negatively related to adverse cumulative life events, which demonstrated the importance of distal influences on proximal social support. Martin also found direct and positive effects of social resources on activities of daily living (ADLs) and the interviewer ratings of centenarians' mental health. For Heidelberg centenarians, Jopp and Rott [4] found that social network size and health had positive effects on happiness, but they did not report what contributed to network size. Similarly, an Israeli study of mortality among oldest-old adults [12] found that social engagement in group leisure

activities had a positive effect on survival, but there was no effect of perceived levels of instrumental support. To summarize, social resources had positive influences on well-being among oldest-old adults in Germany, Israel, and Georgia. However, research to date has not established the next link, specifically which characteristics of the oldest old are associated with economic dependency by types and amounts of medical care and instrumental support services.

Additionally, the existing literature is unclear about the impact of cognitive functioning on the full range of economic dependency forms. Instead, previous studies have been restricted to the relationship between cognitive function and acute care utilization [13–15], or medications and outpatient services [16]. Cognitive impairment was associated with increased hospital and emergency room use, and lower cognitive functioning reduced the use of medication and outpatient services.

From an economic perspective, a unique feature of the Georgia Centenarian Study is its extensive information concerning personality as a resource for resiliency and maintaining autonomy. Martin [17] recently summarized what is known about the personality characteristics of international centenarians. He emphasized the consistent findings for low levels of neuroticism, and that a number of studies report somewhat higher levels of extraversion and conscientiousness relative to the norms. Hence 'Extraverted individuals may … obtain more social support' and 'conscientious persons may … take better care of daily tasks necessary to survive' [17, p 98]. Additionally, Martin reported there is substantial evidence that centenarian personality traits and states affect their functional and mental health, which may influence dependency [18–20].

We expected to find that participants with more economic resources, personality strengths and active coping were less dependent, i.e. used less medical and caregiving services. However, higher neuroticism scores may indicate inability to engage socially and, thus, reduce all types of social support. Additionally, given that centenarians tend to be at risk and constituted most of the analysis sample, we hypothesized that subjective health and ADL would be the most important determinants of dependency. With respect to demographics, we viewed centenarians as much more dependent than the octogenarian reference group in terms of a greater likelihood of living in nursing homes or requiring more assistance in general. Given their relative longevity, women may be expected to be more autonomous than men. African Americans may have had disadvantages due to discrimination and early

life poverty that make them more vulnerable and in need of diverse assistance. Finally, nursing home residents may appear to be less dependent because their living arrangements provide some types of assistance under study (income, medical services), but they are dependent for all types of caregiving services and, thus, may receive the most caregiving hours.

Methods

Based on questions from the Asset and Health Dynamics Survey [21], the most recent Georgia Centenarian Study [22] obtained detailed measures of family and government support for centenarian and octogenarian participants from proxy reporters, including assistance with income, caregiving, and health services. The current study included a population-based sample of 239 centenarians and near centenarians, plus 82 octogenarians. The smaller sample of octogenarians serves as a control group to assess cross-sectional differences associated with age. The study design did not include nonagenarians because that would have increased costs without providing the more marked contrast that was expected for the octogenarian control group. The centenarians' ages ranged from 98 to 108. Participant self-reports provided most of our predictor variables, but caregiving information was obtained from proxy informants. To restrict the analysis to competent reporters, 102 centenarian and 11 octogenarian cases with Mini-Mental Status Exam scores (MMSE) [23] less than 17 were excluded from consideration for the analysis. There was no separate screening to exclude persons with neurological or psychiatric illness. The data set included 98 centenarians and 58 octogenarians for 156 cases altogether. Thus, our analysis relies on proxy reports about participants with MMSE scores greater than 16 for income assistance, medical service events, number of caregiving services, and total hours of care received for 5 different services (personal care, nursing, supervision, household chores, and meal preparation). After accounting for missing data, our largest analysis sample consisted of 138 cases for the medical service events analysis, and the smallest had 109 cases for the analysis of caregiving hours. Tests for octogenarian and centenarian differences in means for variables on income assistance, medical care events, the number of caregiving services, and caregiving hours were not significant ($p < 0.05$). However, centenarians had less education, lower MMSE scores, and more functional health problems. The mean MMSE score for the sample was 23.58 (SD = 3.94). Twenty-nine percent received income assistance from their family, charities, or means-tested Supplemental Security Income (SSI) or welfare payments from the government (n = 126). On average, the participants had required important medical services about 1.5 times during the previous 2 years (n = 138). Their mean number for receipt of the 5 different types of services during the past month was 3.3 (n = 124, $\alpha = 0.81$). For community-dwelling centenarians (including those in assisted living facilities), proxies reported for each type of service how many hours were provided during the previous month. For all residents of nursing homes, we imputed 720 h of care (i.e. we estimated that 30.5% of the analysis sample received 24 h of care every day, which permits analysis of the entire sample's care hours burden). Therefore, the mean number of monthly care hours was nearly 460 h per month, and the distribution ranges from zero to 720 h (n = 109).

The overall analysis strategy was based on blockwise multiple regressions, beginning with variables representing distal influences, followed by demographic characteristics (age, gender, ethnicity, and residence type), proximal resources (cognitive ability, health, perceived economic resources, social connections, and personality), and coping behavior. The participants' MMSE measured their cognitive ability [23]. For health, participants responded to the Duke Older Adults Resources and Services (OARS) questions [24] about overall subjective health, and to obtain a scale for ADLs for our functional health variable ($\alpha = 0.85$). OARS questions were used to measure participants' perceived economic status with a 3-item scale ($\alpha = 0.74$), and for social connections on a 5-item scale ($\alpha = 0.68$). Psychological resources were assessed through self-reports administered for the NEO-PI R [25], for a subset of traits chosen based on experience with the first Georgia Centenarian Study: extraversion ($\alpha = 0.61$), neuroticism, ($\alpha = 0.85$), ideas, ($\alpha = 0.54$), competence ($\alpha = 0.70$), and trust ($\alpha = 0.73$). Selected items based on the Coping Response Indices Scale [26] were included as predictors concerning religious coping and seeking support ($\alpha = 0.62$ and $\alpha = 0.53$, respectively).

Results

Based on Martin's findings concerning the negative effect of cumulative adverse events on social support [10], preliminary regressions for distal influences included the number of life events, and an 8-item scale for engaged lifestyle, about e.g. whether the centenarian reported a major vacation or activity as a public speaker ($\alpha = 0.54$). However, those distal variables were not significant predictors for any of the dependent variables. Regarding economic resources, we also included education, occupation, and current income level as socioeconomic status predictors that were established by abilities and activities long ago, but those were not significant. Hence, in addition to demographic characteristics, the independent variables for the final regressions were restricted to measures of proximal resources and coping behavior.

For brevity, table 1 displays only the final regressions for caregiving services and total care hours, but we report the results here for income assistance and medical care as well. Variables that were not significant for any dependency measure included gender, ethnicity, ADLs, social connections, and coping behavior.

Economic Resources
Perceived economic status was negatively related to receiving income assistance, but had no significant effects otherwise.

Table 1. Regression results for proximal resources and coping: caregiving services (n = 124), and caregiving hours (n = 109)

Predictors	Caregiving services; adjusted R^2 = 0.268			Caregiving hours; adjusted R^2 = 0.721		
	B	SE B	β	B	SE B	β
Age	1.18	0.50	0.23**	−23.21	50.68	−0.02
Perceived health	−0.21	0.25	−0.07	−3.93	25.63	−0.00
Nursing home	−0.43	0.26	−0.14	362.06	27.15	0.76***
Cognition	−0.08	0.02	−0.36***	−6.75	2.36	−0.17**
Economic status	−0.17	0.12	−0.12	−7.03	12.96	−0.03
Extraversion	−0.09	0.04	−0.18*	−7.39	4.76	−0.08
Neuroticism	−0.02	0.04	−0.06	9.58	4.04	0.13*
Ideas	0.10	0.04	0.19*	3.26	4.78	0.04
Competence	0.00	0.09	0.00	23.63	9.99	0.13*
Trust	0.10	0.09	0.10	0.15	9.21	0.00

Additional predictors which were not significant included gender, ethnicity, ADL, social connections, and coping behavior (religious, and seeking). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Age

Keeping in mind that our age variable indicates centenarian versus octogenarian status, only the number of caregiving service types was associated with that extreme survivorship. Evidently octogenarians were as likely to require income and medical assistance, and their impact on caregiving hours dependency was the same as for centenarians. On the other hand, centenarians did require more types of services.

Health

The subjective health rating had the expected negative and significant effect on medical care, but was not significant in any other regression.

Cognition

Perhaps our most striking finding was the consistent negative effect of MMSE for medical events, number of care types received, and total caregiving hours. The MMSE standardized β-coefficients in table 1 show greater effect sizes than for all but one of the other predictors (the exception is nursing home residence on total care hours.)

Personality

None of the personality variables were associated with income assistance or the number of medical care services proxies reported for our participants. However, for the number of caregiving types, extraversion had a negative effect, and ideas had a positive effect. Competence and

neuroticism were positively related to total caregiving hours. Trust was not a significant predictor for any dependency measure.

Discussion

Testing methods to measure economic dependency burden and understand the correlates of that burden for oldest-old adults can sharpen our understanding of the instrumental and public assistance aspects of social resources for maintaining their well-being. Our multivariate analysis was designed to determine whether some centenarians are extreme survivors with protective characteristics or adaptation behaviors that permit continued autonomy despite an increasing likelihood of health challenges and psychological difficulty. Thus, the study focused on the determinants of dependency, comparing octogenarians with centenarians from Georgia and considering distal life events and proximal resources including health, cognitive ability, economic resources, personality, and coping. Exploratory analysis rejected the hypothesis that distal variables for life events and engaged lifestyle promote economic dependency, and there was no evidence that socioeconomic status influenced dependency. Focusing on government services (income assistance and medical care, plus total care hours that are often funded by Medicaid) it is reassuring that gender and ethnicity are not significant. African Americans and women may be economically disadvantaged, but they are just as likely to

obtain those public services as other citizens. Furthermore, the result that only perceived economic status was associated with income assistance (negatively) suggests that kind of aid is accessible to all and available to those who need it most. Similarly, less socially connected participants were not disadvantaged as indicated by our economic dependency measures. Also there was no apparent dependency gradient with respect to functional health.

Despite our expectation that extreme age would amplify centenarians' dependency on all 4 measures, our finding of no effect for medical care services and total care hours suggests that a substantial fraction of Georgia centenarians are able to remain as autonomous as octogenarians. However their autonomy was not associated with coping behaviors. On the whole, the results reported here demonstrate that distal experiences, demographics, personal economic resources, and functional health are much less important than personality and, especially, cognitive ability as concomitants of economic dependency.

The dominance of cognitive ability effects compared to subjective health and ADLs suggests that better cognition provides the ability to seek and manage some important social resources as health deteriorates, particularly the number of care services and amount of care hours needed. These results are consistent with research reported by others who noted that cognitive impairment is associated with increased hospital use and increased emergency room use [13, 14]. However, the ability to comprehend and respond effectively to developing needs may be less relevant as an explanation of the negative influence of cognitive ability on medical care events, especially if those events occur unpredictably as diseases progress or because of accidents (e.g. falls). Instead, MMSE could be a leading indicator of stage in health deterioration and, thus, perhaps a more comprehensive measure of actual functional health than ADLs or subjective health. If so, extreme survivors with greater MMSE may remain hardy and less dependent overall.

The economic dependency effects we observed for personality traits and facets confirm, once again, that centenarians' personalities act as resources to maintain their resiliency. Controlling for social connections, the finding that extraversion reduces dependence suggests that extraverts have other protective factors that we have not yet identified. With regard to the influence of 'ideas', a facet of 'openness', it may be that those who are open to new ideas are more likely to seek and accept caregiving services. The same may be true for competence as a positive influence on caregiving hours; more competent people may seek more caregiving. For example, the more

competent participants may have been able to accomplish a residential move into a nursing home or skilled nursing facility, or obtain assistance in their own home more often. Our maintained hypothesis concerning neuroticism was that it may be a barrier to successful social interactions necessary for obtaining assistance. Although centenarians on the whole tend to be less neurotic than younger age groups, those with greater neuroticism scores receive more care hours, which suggests neuroticism is a vulnerability factor.

Based on the findings for both cognition and personality, a prescription for personal longevity with life quality would be to remain mentally active and outgoing, avoid dwelling on the negative, and continue habits of competence.

For policy makers and geriatric medicine, the overall importance of cognition certainly recommends greater investment in research to develop methods and treatments to delay cognitive decline, or at least to assure better monitoring of cognitive ability to help target timely delivery of social resources. For future research, it would be valuable to study how specific types of services help some centenarians maintain mental health. In addition, clarifying what aspects of social resources are associated with positive well-being, including more detailed dependency measures, may improve estimates of the well-being effects of personality and cognition.

References

1 He W, Velkoff VA, DeBarros KA: U.S. Census Bureau Current Population Reports, P23–209, 65+ in the United States: 2005. Washington, U.S. Government Printing Office, 2005.

2 Andersen-Ranberg K, Vasegaard L, Jeune B: Dementia is not inevitable: a population-based study of Danish centenarians. J Gerontol B Psychol Sci Soc Sci 2001;56:S152–S159.

3 Gondo Y, Hirose N, Arai Y, et al: Functional status of centenarians in Tokyo, Japan: developing better phenotypes of exceptional longevity. J Gerontol A Biol Sci Med Sci 2006; 61:M305–M310.

4 Jopp D, Rott C: Adaptation in very old age: exploring the role of resources, beliefs, and attitudes for centenarians' happiness. Psychol Aging 2006;21:266–280.

5 Martin P, da Rosa G: Age differences in depressive symptoms and morale among the oldest old. Global Aging 2006;4:42–51.

6 Martin P, Poon LW, Kim E, et al: Social and psychological resources of the oldest old. Exp Aging Res 1996;22:121–139.

7 Goetting M, Martin P, Poon LW, et al: The economic well-being of community-dwelling centenarians. J Aging Stud 1996;10:43–55.

8 Morgan K: Estimating the health and healthcare costs of the oldest old: a challenge for centenarian studies; in Martin P, Rott C, Hagberg B, et al. (eds): Centenarians: Autonomy versus Dependence in the Oldest Old. New York, Springer, 2000, pp 105–113.

9 Martin P, Martin M: Proximal and distal influences on development: the model of developmental adaptation. Dev Rev 2002:22:78–96.

10 Martin P: Individual and social resources predicting well-being and functioning in later years: conceptual models, research, and practice. Ageing Int 2002;7:3–29.

11 MacDonald M: Social support for centenarians' health, psychological well-being and longevity; in Perls T, Poon LW (eds): Annual Review of Gerontology and Geriatrics, vol. 27: Biopsychosocial Approaches to Longevity. New York, Springer, 2007, pp 107–127.

12 Walter-Ginzburg A, Blumstein T, Chetrit A, et al: Social factors and mortality in the old-old in Israel. J Gerontol B Psychol Sci Soc Sci 2002;57:S308–S318.

13 Binder EF, Robins LN: Cognitive impairment and length of hospital stay in older persons. J Am Geriatrics Soc 1990;38:759–766.

14 Callahan CM, Hendrie HC, Tierney WM: Documentation and evaluation of cognitive impairment in elderly primary care patients. Ann Intern Med 1995;122:422–429.

15 Hanlon JT, Landerman LR, Wall WE Jr, et al: Is medication use by community-dwelling elderly people influenced by cognitive functioning? Age Ageing 1996;25:190–196.

16 Walsh EG, Wu B, Mitchell JB, et al: Cognitive function and acute care utilization. J Gerontol B Psychol Sci Soc Sci 2003;58:38–49.

17 Martin P: Personality and coping among centenarians; in Perls T, Poon LW (eds): Annual Review of Gerontology and Geriatrics, vol. 27: Biopsychosocial Approaches to Longevity. New York, Springer, 2007, pp 89–106.

18 Samuelsson SM, Nordbeck B, Bauer A, et al: The Swedish centenarian study: A multi-disciplinary study of five consecutive cohorts at the age of 100. Int J Aging Hum Dev 1997;45: 223–253.

19 Adkins G, Martin P, Poon L: Personality traits and states as predictors of subjective well-being in centenarians, octogenarians, and sexagenarians. Psychol Aging 1996;11: 408–416.

20 Martin P, Hagberg B, Poon L: Predictors of loneliness in centenarians: a parallel study. J Cross Cult Gerontol 1997;12:203–224.

21 Soldo BJ, Hurd MD, Rodgers WL, et al: Asset and health dynamics among the oldest old: an overview of the AHEAD study. J Gerontol B Psych Sci Soc Sci 1997;52:1–20.

22 Poon LW, Jazwinski M, Green R, et al: Methodological considerations in studying centenarians: lessons learned from the Georgia centenarian studies; in Perls T, Poon LW (eds): Annual Review Gerontology and Geriatrics, vol. 27: Biopsychosocial Approaches to Longevity. New York, Springer, 2007, pp 231–256.

23 Folstein MF, Folstein SF, McHugh PR: 'Minimental state'. A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res 1975;12:189–198.

24 Fillenbaum GG: Multidimensional Functional Assessment of Older Adults: The Duke Older Americans Resources and Services Procedures. Hillsdale, Lawrence Erlbaum, 1988.

25 Costa PT, McCrae RR: Set like plaster? Evidence for the stability of adult personality; in Heatherton TF, Weinberger JL (eds): Can Personality Change? Washington, American Psychological Association, 1994, pp 21–40.

26 Moos RH, Cronkite RC, Billing AG, Finney JW: Health and Daily Living Form Manual Revised Version. 1985, Veterans Administration and Stanford University Medical Centers, Social Ecological Laboratory.