Cognitive Well-Being among Grandparents in Rural South Africa

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Short Abstract
We focus on how caring for grandchildren may be associated with cognitive health among grandparents. We use the first data on cognition among a population in sub-Saharan Africa from the "Health and Aging in Africa: Longitudinal Studies of an INDEPTH Community" (HAALSI): a sister study of the U.S. Health and Retirement Study (HRS) in rural South Africa. Preliminary results reveal a robust association between grandchild caregiving and cognitive health, net of physical and mental health, and social and sociodemographic factors. Going forward, we will further investigate this association, including how it may be mediated by community connectedness, or moderated by co-residence with grandchildren and help received as a caregiver. We will employ new data from the Harmonized Cognitive Assessment Protocol (HCAP) administered among a sub-sample of HAALSI respondents, to determine if there are differential associations between grandchild caregiving and cognition across domains of cognition.

Description of Topic and Significance
Caring for grandchildren may help to stimulate cognitive capacity. At the same time, the ability to give care may be a function of social and economic circumstances and health status among older adults. Grandparents across the globe have taken on much of their grandchildren's care, making it important to unpack these relationships (Arpino & Bordone, 2014; Bachman & Chase-Lansdale, 2005). We focus on a setting in rural South Africa where the association between grandchild care and cognitive function is especially salient: Intergenerational relationships are strong and the burden of HIV among middle generations is high, leaving many grandparents to provide care to their grandchildren (Kabudula et al., 2014; Kahn, Garenne, Collinson, & Tollman, 2007; Nyasani, Sterberg, & Smith, 2009; Schatz & Ogunmefun, 2007). The high burden of both communicable and non-communicable disease in rural South Africa means that life expectancy is low relative to Western settings, at 61 and 67 for men and women, respectively (PRB, 2017). Hence, aging successfully can come with greater challenges. If grandchild caregiving is associated with better cognitive function, then caregiving may be a route through which older adults may delay the onset of their own dependency on younger generations.

Cognitive function and cognitive decline are not well understood in this setting, largely because data on cognitive function among the older population in sub-Saharan Africa have not been available until now. It is especially important to understand the factors impacting cognitive function in this setting, with the combination of other co-morbid diseases that can create added difficulty for aging adults (Clark et al., 2015; Kabudula et al., 2014).

In this paper, we use a measure of cognition that mirrors the measure used in the U.S. Health and Retirement Study (HRS) to investigate whether caring for grandchildren is associated with improved cognition in rural South Africa. We find strong effects that providing care for grandchildren is associated with better cognitive function, net of health and sociodemographic indicators. As we work to develop the paper, we will investigate how factors such as social well-being and community connectedness may mediate the association between grandchild care and cognition, as providing care to grandchildren may facilitate social integration between older adults and people in their social circles and villages. We will also investigate whether co-residence with grandchildren may reduce the positive impact of caregiving on cognitive function. Finally, we will investigate whether receipt of assistance in caregiving, such as emotional, financial, or physical assistance, may moderate the association between grandchild caregiving and cognitive function.

Setting & Background
We focus on a setting in rural South Africa, where the population is almost entirely made up of Black South Africans. Our target population is adults aged 40 and older. As such, this population was highly affected by Apartheid and the social context has been changing since the fall of Apartheid in 1994 (Collinson, Tollman, & Kahn, 2007). HIV is prevalent, with nearly a quarter of the HAALSI sample of people aged 40 and older found to be infected with HIV (Rosenberg et al., 2017). These dynamics play

into family functioning, as the different generations experience different social surroundings, and as families work to support one another in the face of diseases that can take a toll on certain members. Intergenerational relationships tend to be strong among this population, and people often rely on their family when they need help or support (Lloyd-Sherlock, 2000).

Conceptual Framework

Grandparents who provide care to their grandchildren may experience strain and stress as a result of this caregiving role (Ates, 2017; Bowers & Myers, 1999). On the other hand, they may experience rewards in the form of intrinsic happiness or increased social connectedness (Ates, 2017; Hughes, Waite, LaPierre, & Luo, 2007). Studies have found mixed results of how grandchild care may affect health, although most point to high intensity or full-time care leading to detrimental health outcomes (Arpino & Bordone, 2014; Ates, 2017; S. Lee, G. Colditz, L. Berkman, & I. Kawachi, 2003), while less intensive care is often associated with improved health outcomes (Bowers & Myers, 1999; Hilbrand, Coall, Gerstorf, & Hertwig, 2017; Hughes et al., 2007). To date, the majority of these studies have been focused in the U.S. or in other settings where grandchild caregiving is not normative.

Grandparents in the U.S. who co-reside with or provide full time care for their grandchildren often do so as a result of stressful family events, such as drug addiction among the grandchildren's parents (Bowers & Myers, 1999). In the U.S., it is more common among socioeconomically disadvantaged families than more advantaged families for grandparents to be responsible for care of their grandchildren (Bachman & Chase-Lansdale, 2005). These adverse situations can be associated with increased emotional or behavioral problems among the grandchildren (Bowers & Myers, 1999), which can be stressful for their caregivers. Hence, grandchild care in the U.S. can be associated with especially high stress and strain, and may lead to poor health outcomes for the grandparents.

In South Africa, it is more normative for grandparents to provide care to their grandchildren. Intergenerational family relationships are strong (Lloyd-Sherlock, 2000), and grandparents are often involved in their grandchildren's upbringing due to these strong kin ties (Schatz & Ogunmefun, 2007). They may also be responsible for their grandchildren's care due to stressful events such as HIV infection or death of the middle generation (i.e., parents) (Kahn et al., 2007; Nyasani et al., 2009; Schatz & Ogunmefun, 2007). Nonetheless, whereas grandparents in the U.S. often take on the care of their grandchildren unexpectedly or somewhat unwillingly (Bowers & Myers, 1999), grandparents in rural South Africa often expect to help with the rearing of their grandchildren with the long history of intergenerational childcare and fostering (Zimmerman, 2003). With this more normative aspect of grandparent care in South Africa, we might expect different health outcomes for caregiving grandparents, compared to the U.S. (Ates, 2017).

We expect that grandchild caregiving may have a stimulating impact on cognitive function among older adults in rural South Africa. We expect this for a number of reasons. First, being around school-aged children may provide cognitive stimulation to their caregiving grandparents. Much of the older generation in rural South Africa did not attend school, as they grew up during Apartheid and may not have had access to education (Collinson, 2010). Their grandchildren's school-going may provide them with insight into school and schoolwork, which may stimulate them cognitively. Second, grandchildren are likely to be active and energetic, leading grandparents to be more physically active (Waldrop & Weber, 2001), which can enhance cognitive function (Carvalho, Rea, Parimon, & Cusack, 2014; Colcombe et al., 2004; Rea, 2017). Third, caring for grandchildren can allow grandparents to be more socially connected (Chen & Liu, 2012). This caregiving role may increase the frequency with which they leave the house and engage in their local community and socially interact with other parents and grandparents. In fact, the mere act of grandchild caregiving is a social activity that may stimulate the brain (Arpino & Bordone, 2014). The second two mechanisms are just as likely to be operating in the United States, while the first gives reason to expect that associations in South Africa may be distinct.

The effects of caregiving on cognitive health may be moderated by support that the caregiving grandparents receive. If the grandparents get help in taking care of grandchildren, there may be a more positive association with cognitive function. For example, Ates (2017) found that caregiving grandparents self-report better health if they are getting more emotional support. Other studies have found that negative health outcomes associated with custodial grandparenting can be buffered if the grandparents are getting support in their caregiving (S. Lee, G. A. Colditz, L. F. Berkman, & I. Kawachi, 2003).

The issue of endogeneity is salient with this topic (Arpino & Bordone, 2014; Ates, 2017). It is important to account for the factors which lead certain grandparents to have the ability and resources to provide care for their grandchildren. Background characteristics can be an important predictor of both caregiving and health (Arpino & Bordone, 2014; Hughes et al., 2007).

Data and Sample
To investigate the association between grandchild caregiving and cognitive function, we use data from the population-based "Health and Aging in Africa: Longitudinal Studies of an INDEPTH Community" (HAALSI) study, which aims to examine and characterize a population of older men and women in rural South Africa with respect to economic, social, health, and well-being outcomes during aging. Participants were sampled from the existing framework of the Agincourt Health and Socio-Demographic Surveillance System (Agincourt HDSS) site in Mpumalanga province, a majority Black African area. Individuals aged 40 years and older as of July 1, 2014 who were permanently living in the study area during the 12 months previous to the 2013 Agincourt census update were eligible to be sampled. A total of 6,281 women and men were selected for the main household study. Out of these 6,281, 391 had moved outside of the study site or were deceased. From the remaining 5,890 eligible individuals, 5,059 (86%) participated in the baseline survey.

Respondents were visited at home between November 2014 and November 2015. Data collection involved a survey using Computer Assisted Personal Interviewing (CAPI), as well as collection of biomarker and cognitive data among a sub-sample. The data used in this paper come from the CAPI interview. Our analytic sample includes all respondents with complete information on measures used in the analyses and who had grandchildren at the time of the survey, leaving us with a sample of 4,040.

Measures
Dependent. We use a score of global cognition that ranges from 0 to 24. This measure includes immediate recall of 10 words (up to 10 points), recall of those 10 words after a 1-minute delay (up to 10 points), and orientation items (i.e., year, month, date, and name of the current South African president; up to 4 points).

Independent. Our key independent measure is an indicator of whether the respondent provided care for their grandchildren. The variable comes from a series of two items in the survey. The first asked "Did you spend any time taking care of your grandchildren last year?". The second asked "Approximately how many weeks did you spend in the last year taking care of (your grandchild[ren])?". Most grandparents who reported taking care of their grandchildren reported doing so in every week or 48 weeks out of the year (77%) and doing so for seven days a week (90%). Hence, in this sample, grandparents who provide care to their grandchildren typically provide full time care. We code this variable as 1 if the respondent reported caring for their grandchildren for at least half the year (i.e., at least 26 weeks of the year) and 0 otherwise.

Controls. We account for other factors that may affect cognition in our models. First, we account for the grandparents' age, which is coded into a series of dummy variables to indicate decade of age. We also control for their sex, coded 1 if female and 0 if male.

Next, we control for respondents' physical and mental health. We first control for self-rated health, which comes from a survey item asking "In general, how would you rate your health today?" The item is coded on a scale from 1 to 5, with 1 indicating very bad health and 5 indicating very good health. We also control for the number of ADL limitations that the respondent has, which is coded as the total number of limitations including difficulty walking across a room, difficulty bathing, difficulty eating, difficulty getting in and out of bed, and difficulty using the toilet. This item thus ranges from 0 to 5. We also account for depressive symptoms using the 8-item Center for Epidemiologic Studies Depression Scale. We code this measure as a dummy measure, coded '1' if the respondent scored 3 or higher on the CES-D (indicating that they fall within the highest quartile). We also control for a measure of social connectedness, indicating the total number of people—up to seven—that the respondent was in contact with over the past six months (in person, by phone, or by internet).

Lastly, we control for socioeconomic measures and household characteristics. We control for respondents' education, coded into three dummy variables that indicate that (1) the respondent had not completed any formal education, (2) the respondent has some primary or completed primary education, or (3) the respondent has some secondary or higher education. Next, we control for respondents' primary employment status. These measures come from a survey item in which respondents could check as many response options as applied to them. We coded their employment status as (1) employed if they checked employed, as (2) homemaker if they did not check employed by checked homemaker, or (4) not working, if they did not say they were any of the previous statuses. We additionally control for individual income, with is coded as a three category measure of individual earnings and transfers such that 1=0 RAND, 2=1-1400 RAND, and 3= over 1400 RAND. We also control for a series of five dummy variables that indicate household wealth quintiles. Households were ranked according to the scores from principal components analysis of household ownership of items such as televisions, refrigerators, livestock, vehicles as well as housing characteristics, type of water and sanitation facilities (Filmer & Pritchett, 2001). We also control for the total number of people living in grandparents' household with a measure coded 0 if living alone, 1 if living with one other person, 2 if living in a 3 to 6-person household, and 3 if living in a household with seven or more people.

Preliminary Results
Preliminary results show that grandchild caregiving is associated with better cognitive health.
In Table 1 we show the overall mean values on key measures for the sample of all grandparents, as well as for caregiving grandparents and non-caregiving grandparents. Grandparents who are providing care to their grandchildren score significantly better on the cognition than non-caregiving grandparents (12.03 points vs. 11.01 out of the possible 24 points). Caregiving grandparents also report more social contacts (3.51 vs. 3.11), they are more likely to be female (68% vs. 54%), they are more likely to fall between ages 50 and 69, but less likely to fall above age 69. Caregiving grandparents are also less likely to have received no formal education (44% vs. 48%), but more likely to have received a primary education (40% vs. 35%). Forty-seven percent of the full sample of grandparents have no formal education, reflecting the poor access to schooling during Apartheid. They are less likely to not be working (66% vs. 77%) and more likely to be homemakers (21% vs. 9%). They also are less likely to live in households rated as "poor" on the wealth index (17% vs. 20%), and more likely to be living in the "less poor" (23% vs. 20%) and "least poor" (24% vs. 20%) households. They also tend to live in larger households (mean of 2.39 vs. 1.99 on this categorical measure), probably due, in part, to the higher likelihood that they live with their grandchildren.

The OLS regression models, in Table 2, show that providing care to grandchildren is associated with a higher score on cognition. Specifically, caregiving grandparents exhibit a 1.02 increase on the scale of cognitive function, compared to non-caregiving grandparents. Although the magnitude slightly declines with the addition of controls, the association remains highly significant with a coefficient of 0.85 net of

health indicators, sex, age, education, employment status, individual earnings and transfers, household wealth, and household size.

Next Steps

In the coming weeks and months we will develop this project to look more closely into how grandchild caregiving may be related to cognition. First, we will look into the possible mediating impact of village connectedness, with measures indicating how much the respondent believes that people in their village are trustworthy, will work together to deal with problems, and are willing to help each other. Next, we will investigate the possible moderating impact of support received as a caregiver. An item in the survey asks "What kind of help have you, as a caregiver, received?", with response options reflecting financial help, emotional help, help with health, physical help, and personal care. This will allow us to move beyond the general effects of receiving social support to uncovering what specific types of help may enhance (or reduce) the association between grandchild caregiving and cognition.

We will also investigate whether there are important effects of custodial care, with a measure of co-residence with grandchildren. As much of the previous literature has found this to have a detrimental impact on health, it will be important to uncover the effects in this setting.

Finally, an entire battery of cognition tests, from the Harmonized Assessment Protocol (HCAP), were administered to a subset of about 600 people in the HAALSI sample between October 2016 and July 2017. Once these data are cleaned, we will be able to use them to investigate how grandparent caregiving may be differently associated with the different domains of cognition, such as memory, executive function, language, and attention. For example, if the positive effect of caregiving on cognition can be attributed to increased social- and village-connectedness, we may expect stronger associations with language functions, like word retrieval and verbal fluency, compared to non-verbal tasks, like selective attention. Conversely, if the effect is driven by the specific cognitive demands of caregiving, such as planning, organizing, and multi-tasking, then we may expect strongest association with executive function tasks.

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Table 1: Mean Values across Measures, Sample of Grandparents

	Grandparent Sample (n=4040)	Caregiving Grandparents Sample (n=2456)	Non-caregiving Grandparents Sample (n=1584)
Cognition			
Global cognition [a]	11.24	12.03	11.01*
Grandchild caregiving			
Cares for grandchildren	0.61		
Health and social indicators			
Self-rated health [b]	3.66	3.64	3.67
Number of ADL limitations [c]	0.17	0.17	0.17
High score on depression indicator	0.18	0.18	0.18
Total number of social contacts reported [d]	3.20	3.51	3.11*
Controls			
Female	0.57	0.68	0.54*
Age			
40-49	0.11	0.11	0.12
50-59	0.29	0.31	0.28*
60-69	0.29	0.34	0.28*
70-79	0.19	0.15	0.20*
80-89	0.11	0.09	0.12*
Education			
No formal	0.47	0.44	0.48*
Primary	0.36	0.40	0.35*
Secondary	0.17	0.16	0.17
Employment status			
Not working	0.75	0.66	0.77*
Employed	0.14	0.13	0.14
Homemaker	0.11	0.21	0.09*
Individual earnings and transfers, 3 Categories [e]	1.76	1.84	1.74*
Household wealth index			
Poorest	0.19	0.17	0.20
Poor	0.20	0.17	0.20*
Middle	0.20	0.19	0.19
Less poor	0.20	0.23	0.20*
Least poor	0.21	0.24	0.20*
Number of people in household (categorical) [f]	2.08	2.39	1.99*

* Indicates significant difference by caregiving status at p<.05.

[a] Standard deviation for full grandparent sample is 4.35, for caregiving sample is 4.22, and for non-caregiving sample is 4.36. Min=0, max=24.

[b] Standard deviation for full grandparent sample is 1.03, for caregiving sample is 1.04, and for non-caregiving sample is 1.03. Min=1, max=5.

[c] Standard deviation for full grandparent sample is 0.66, for caregiving sample is 0.71, and for non-caregiving sample is 0.65. Min=1, max=5.

[d] Standard deviation for full grandparent sample is 1.65, for caregiving sample is 1.60, and for non-caregiving sample is 1.65. Min=0, max=7.

[e] Standard deviation for full grandparent sample is 0.83, for caregiving sample is 0.83, and for non-caregiving sample is 0.85. Min=1, max=3.

[f] Standard deviation for full grandparent sample is 0.87, for caregiving sample is 0.61, and for non-caregiving sample is 0.92. Min=0, max=3.

Table 2: OLS Models Predicting Global Cognition with Grandchild Caregiving

	Model 1		Model 2		Model 3		Model 4	
	Parameter estimate	SE	Parameter estimate	SE	Parameter estimate	SE	Parameter estimate	SE
Grandchild indicators								
Cares for grandchildren	1.02***	0.16	0.93***	0.15	0.91***	0.15	0.85***	0.14
Health indicators								
Self-rated health					0.65***	0.06	0.53***	0.06
Number of ADL limitations					-0.43***	0.10	-0.43***	0.09
High score on depression indicator					-0.39*	0.17	-0.46**	0.16
Total number of social contacts reported					0.17***	0.04	0.14***	0.04
Controls								
Female			-0.97***	0.13	-0.83***	0.12	-0.60***	0.12
Age (Ref= 40s)								
50-59			-1.36***	0.22	-1.21***	0.21	-0.74***	0.21
60-69			-2.61***	0.22	-2.35***	0.21	-1.13***	0.23
70-79			-4.05***	0.23	-3.57***	0.23	-2.02***	0.24
80-89			-6.22***	0.26	-5.34***	0.26	-3.45***	0.28
Education (Ref=Secondary+)								
No formal							-2.93***	0.20
Primary							-1.19***	0.18
Employment status (Ref=Not working)								
Employed							0.76***	0.20
Homemaker							-0.04	0.20
Individual earnings and transfers, RAND, 3 categories							-0.31***	0.08
Household wealth index (Ref: Poorest)								
Poor							0.29	0.19
Middle							0.54**	0.19
Less poor							0.51**	0.19
Least poor							0.87***	0.20
Number of people in household (categorical)							0.05	0.07
N	*4040*		*4040*		*4040*		*4040*	
R^2	*0.01*		*0.18*		*0.22*		*0.30*	

two-tailed tests, + p<.10 , * p<.05, **P<.01, *** p<.001