

Gender Disparity in Late-life Cognitive Functioning in India: Findings From the Longitudinal Aging Study in India

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Objectives. To examine gender disparities in cognitive functioning in India and the extent to which education explains this disparity in later life.

Methods. This study uses baseline interviews of a prospective cohort study of 1,451 community-residing adults 45 years of age or older in four geographically diverse states of India (Karnataka, Kerala, Punjab, Rajasthan). Data collected during home visits includes cognitive performance tests, and rich sociodemographic, health, and psychosocial variables. The cognitive performance tests include episodic memory, numeracy, and a modified version of the Mini-Mental State Examination.

Results. We find gender disparity in cognitive function in India, and this disparity is greater in the north than the south. We also find that gender disparities in educational attainment, health, and social and economic activity explain the female cognitive disadvantage in later life.

Discussion. We report significant gender disparities in cognitive functioning among older Indian adults, which differ from gender disparities in cognition encountered in developed countries. Our models controlling for education, health status, and social and economic activity explain the disparity in southern India but not the region-specific disparity in the northern India. North Indian women may face additional sources of stress associated with discrimination against women that contribute to persistent disadvantages in cognitive functioning at older ages.

Key Words: Aging—Cognition—Cognitive function—Education—Gender disparity—India.

POOR cognitive function contributes to dementia and other chronic health conditions. Yet cognitive health among older adults in developing countries is understudied, particularly in India (Kalaria et al., 2008). Cognitive aging research on Indian populations has focused mainly on dementia among small, geographically limited samples (Jotheeswaran, Williams, & Prince, 2010; Kalaria et al., 2008). In this study, we examine the cognitive health of older Indians using cross-sectional data from the pilot round of the 2010 Longitudinal Aging Study in India (LASI), a representative sample of adults aged 45 years or older and their spouses from four Indian states.

Recent studies suggest that the cognitive health of women in developed countries is at least as good as that of men or better (Langa et al., 2008, 2009). By contrast, studies of cognitive function in developing countries (e.g., China, Latin America and the Caribbean, and Egypt) find that cognitive functioning of women is worse than men, even after adjusting for social, economic, and clinical risk factors (Lei, Hu, McArdle, Smith, & Zhao, 2011; Maurer, 2011; Yount, 2008; Zunzunegui, Alvarado, Beland, & Vissandjee, 2009).

The few studies of cognitive functioning in India among older adults have mixed results regarding gender disparity. One study found that women in the northern state of Haryana did worse than men (Ganguli et al., 1995). Other studies in southern India have not found gender differences in cognitive functioning (Mathuranath et al., 2003, 2007). Because these studies rely on small, nonrepresentative samples, their generalizability is limited. As a result, two questions remain unanswered: Do gender differences in cognitive function exist in India as in other developing countries? Do such disparities vary by region?

Gender differences in educational attainment may contribute to disparities in cognitive functioning in developing settings. Women in developing countries typically lack equal access to education (Herz & Sperling, 2004; United Nations, 2012). Traditional gender roles and inequitable investments in the human capital of sons and daughters have caused a substantial gender gap in educational attainment (Kindgon, 2002).

Prior literature has shown that low level of educational attainment is one of the most significant predictors of poor cognitive performance in later life (Cagney & Lauderdale,

2002). Education is believed to contribute to higher cognitive reserve because individuals with higher educational attainment are likely to engage in more cognitively stimulating activities and physical activity, which both mitigate cognitive decline by either building brain networks that have more capacity and are less susceptible to decline or activating alternate brain networks to compensate for stressors and insults to the brain (Bonaiuto et al., 1995; Fratiglioni & Wang, 2007; Katzman, 1993; Satz, 1993; Stern, 2002; Stern, 2006; Schooler, Mulatu, & Oates, 1999; Stern et al., 1995).

Education is also associated with higher exposure to stressors, fewer financial or social resources (Butler, Ashford, & Snowdon, 1996; Lee, Buring, Cook, & Grodstein, 2006), and less social and cognitive stimulation (Bonaiuto et al., 1995; Schooler et al., 1999; Stern et al., 1995), all of which are harmful to cognitive health (Rieker & Bird, 2005). Other risk factors of late-life cognition include poor physical health (Cagney & Lauderdale, 2002; Stewart et al., 2000; van Boxtel et al., 1998), lack of social engagement through work or other organized social activities (Berkman et al., 1993; Seeman et al., 2001), sedentary life style or lack of physical activities (Colcombe & Kramer, 2003), and emotional distress (Gerstorf, Hoppmann, Kadlec, & McArdle, 2009; Gerstorf, Hoppmann, Anstely, & Luszcz, 2009; Macdonald, Hultsch, & Bunce, 2006; McDonough & Walters, 2001; Rieker & Bird, 2005). In India, women may face an additional risk: discrimination. Discrimination against women has been recognized as a critical issue in India, particularly so in northern states (Chakraborty & Kim, 2008; Sen, 2003). Imbalanced sex ratios in this region illustrate this: Sen (1990) argued the low female-to-male gender ratio was caused by “missing women” who perished due to socially determined excess female mortality, for example, discriminatory access to health care and inequitable treatment in and outside the home.

There are many examples of how implicit and explicit discrimination toward women and girls is more common in the northern regions, including disparities in access to health care and marriage practices. Mishra, Roy, and Retherford (2004) show that girls in northern India were less likely to be vaccinated and more likely to have poor nutritional health and stunting than girls in southern India compared with boys in their respective regions. Other studies show that northern states also have higher incidence of marriage without consent, younger marrying ages for women, and stricter patrilineal relationships (Banerji, Martin, & Desai, 2008; Das Gupta, 1987; Dyson & Moore, 1983).

These patterns may have important consequences for cognitive status in later life. Inadequate nutrition and basic health care in childhood can lead to cognitive impairment directly or indirectly through other health conditions and disabilities in late life (Glewwe et al., 2001). Early marriage ages indicate significant breaks with supportive social networks and can limit women’s livelihoods and social

stimulation, which are known to affect cognitive and mental health (Dyson & Moore, 1983; Walker et al., 2011). With cumulative exposure to developmental risks, disparities widen and become more firmly established at older ages (Walker et al., 2011).

In this study, we examine whether there is disparity in cognitive functioning in India with a geographically diverse sample. Taking advantage of the multistate sampling scheme, we explore regional variation in this disparity, that is, whether there is higher disparity in the north than the south. We examine specifically the role of education in explaining gender disparity in cognitive functioning. The evidence for regional biases toward women also led us to investigate other sources of discrimination across the life course related to health and socioeconomic activity that might explain gender differences in cognitive functioning.

METHOD

Data

The LASI is designed to be a panel survey representing persons at least 45 years of age in India and their spouses (regardless of spouses’ age). The data source for this study uses only the 2010 pilot survey fielded in four states—Karnataka, Kerala, Punjab, and Rajasthan—chosen to capture regional, as well as socioeconomic and cultural differences across India (Arokiasamy, Bloom, Lee, Feeney, & Ozolins, 2012; Lee et al., 2012). Primary sampling units (PSUs) were stratified by urban and rural districts within states. LASI randomly sampled 1,546 households from these stratified PSUs, interviewing 950 of those households with a member aged at least 45 years. LASI collected data from 1,683 individuals from October to December 2010.

The multidisciplinary survey includes questions about demographic, economic, behavioral, social, physical, and mental-health characteristics, as well as an extensive set of cognitive functioning tests. The survey questions were administered in the language of respondent’s choice (i.e., Hindi, Malayalam, Kannada, and English). We excluded all respondents aged 45 and younger, resulting in 1,451 respondents in the study.

Measures

Cognitive functioning.—LASI administered three tests of cognitive function, which have been validated in India (Ganguli et al., 1995, 1996; Mathuranath et al., 2003, 2007). First, for an episodic memory test, interviewers read 10 words aloud to respondents and asked them to recall the words immediately and then again at the conclusion of the cognitive functioning module. Scores on the immediate and delayed word recall each range from 0 to 10, which we sum together for a total word recall score ranging from 0 to 20.

Second, LASI used a modified version of the Mini-Mental State Exam (Breitner et al., 1995), which asks respondents to name the date and the prime minister and to count backward from 20. Respondents were assigned a single point for each correct response to the day of the week, day of the month, name of the month, year, and prime minister. Respondents who successfully counted backwards from 20 were awarded two points; those who did with error were scored a single point, and respondents who reported they could not count were given 0 points.

Third, respondents were asked to serially subtract 7 from 100 a total of five times (“serial 7s”). The score for correct responses ranged from 0 to 5. Respondents who indicated they could not count were scored 0 for this component.

We created a summary index of cognitive functioning, adding up the number of correct responses on all cognitive tests. The cognitive summary index ranges from 0 to 32 ($\alpha = 0.90$ for men; $\alpha = 0.91$ for women).

Demographics.—We control for age, an important predictor of cognitive decline. We categorize age into four groups as the relationship may be nonlinear with cognitive performance. We also control for urban/rural differences by including a binary variable for urban residency.

Education.—We included two measures: a binary measure of literacy (able to read and write) and a categorical schema for educational attainment (no formal education, primary education, or secondary education) based on self-reports.

Region.—We derive a binary variable for northern states (Rajasthan and Punjab). We also create an interaction term between gender and region.

Socioeconomic and health covariates.—We control for caste and tertiles of per capita household consumption, as they are robust predictors of socioeconomic status. Household consumption is a better measure of economic status than income in developing countries (Strauss & Thomas, 1995), and consumption items are collected at weekly, monthly and yearly frequencies, respectively, to minimize recall bias. Food expenditure is collected on a weekly basis. It includes expenditures on dining out, food bought from market, and values of home-produced food consumed. Monthly expenditures are those usually spent each month, including fees for utilities, communications, and so on. Yearly items record expenditures that occurred occasionally in a year, including traveling, expenditures on durables, and so forth.

We included a categorical variable of castes: scheduled caste, scheduled tribe, other backward class (OBC), and all “other” caste or affiliations, including “no caste” affiliation (reference). Scheduled castes and scheduled tribes are particularly disadvantaged due to a historical legacy of

inequality. Scheduled tribes are more geographically isolated, highly heterogeneous ethnic minority populations, whereas scheduled castes can generally be characterized as socially segregated and excluded by traditional Hindu society (Subramanian et al., 2009). OBC is an official term used by the government. Although less marginalized and stigmatized than scheduled castes or tribes, members of OBC face similar barriers to economic and educational opportunities. (Under Article 340 of the Indian Constitution, the government has an obligation to promote the welfare of OBC by implementing several welfare schemes and programs [see www.socialjustice.nic.in/aboutdivision4.php for further information about constitutional obligations and current welfare schemes and programs for OBC.])

We control for the following risk factors of poor cognitive functioning: body mass index (BMI), cardiovascular health, physical functioning, physical and social activities, work status, and emotional distress. We categorized BMI into underweight (<18.5), overweight (25–30), and obese (30+) based on the direct assessment of height and weight during the interview. For cardiovascular health, we created a binary variable for respondents ever diagnosed with heart condition, stroke, diabetes, or hypertension. LASI interviewers also measured blood pressure at the time of the interview, which we use as an indicator of hypertension. We controlled for disability by including a binary measure of limitation in activities of daily living (ADL). Respondents were asked about six ADLs (dressing, walking across a room, bathing, eating, getting in and out of bed, and using the toilet). Respondents who reported that they had difficulty with or could not do at least one of the six tasks were considered disabled. LASI also measured grip strength using a Smedley hand dynamometer, and we included the average value of the grip strength of dominant hand as a measure of physical functioning, and it ranges from 2 to 58 kg.

We controlled for respondent’s engagement in vigorous physical activities (hardly ever or never, some, and daily) and for a continuous measure of social engagement (the number of times per month respondents participate in social activities such as community organizations, attending religious celebrations, or visits to relatives or friends). We included binary variables indicating any paid work, both in the formal and informal sectors. Finally, we controlled for emotional distress by using the 20-item Center of Epidemiologic Studies-Depression (CESD) Scale (Radloff, 1977) (Cronbach’s $\alpha = 0.907$, ranges from 2 to 42).

Analysis

We first examined gender differences in the age-standardized mean scores of the cognitive measures across region. We account for survey design in our estimate of standard error and use survey weights in descriptive inference. We formally test mean gender difference in the cognitive measures, first within and then between regions.

Although there is a wide consensus about using survey weights in descriptive inference, whether to use survey weights when studying relationships among survey variables is debatable (Skinner & Mason, 2012). Because all our unweighted models yielded consistent results and unweighted regression models provide more efficient estimates (Faiella, 2010), we report the findings from unweighted regression models.

We then examined gender differences in educational attainment. We “tested” gender differences in educational attainment by conducting a design-corrected chi-square test within and across regions. We also presented descriptive statistics on our other health and socioeconomic covariates, similarly testing gender differences within and across regions in LASI.

Finally, we estimated a series of unweighted and design-corrected multivariate ordinary least squares regression models to examine whether gender disparity in cognition persists after controlling for education, health, and other socioeconomic covariates. We ran four models. In the first model (Model 1), we estimated the age-adjusted gender disparity by regressing our cognitive measure on covariates for female, north region, females in the northern region, age, and any disturbance during the cognitive battery. Disturbances were assessed by interviewers as events that interrupted the testing such as distractions or interruptions from others at the interview. Model 2 builds off Model 1, introducing education and literacy. We examined whether gender disparity persists after controlling for educational attainment. In Model 3, we introduced health covariates as another source of gender disparity in cognition, and in Model 4, we included all other socioeconomic covariates.

RESULTS

Table 1 presents the mean scores for each component of the cognitive battery by gender and region. Women in the sample performed worse than men on every measure and the summary index. Comparing gender differences in late-life cognitive functioning across regions, we find evidence

that the gender gap is greater in the north than in the south. Gender disparity in the summary index and delayed recall are particularly acute in the north at a statistically significant level ($p < .050$).

Table 2 shows a significant gap in educational attainment and literacy for men and women by region. In each region, men have a higher literacy rate; in the north, the literacy rate for men is twice that for women. Both men and women in the south are more educated than those in the north, which reflects a long history of social policy around education in southern India (Sankar, 2007). This is not to say we do not observe differences in educational attainment across gender in our southern states: although there are nearly equal percentages of southern men and women who have primary and secondary school attainment, but men gain on women in tertiary education. In the north, there are disparities across all levels of educational attainment, with women half as likely as men to have any level of schooling.

Education may contribute most to our cognitive disparity, but other health and socioeconomic factors may also contribute to cognitive disparity. Table 3 shows gender differences in these additional covariates. We test gender differences within and across regions to determine if differences are greater in the north than in the south. Among socioeconomic control variables, social activity and paid work show statistically significant gender differences. Men are more social than women in the north, but this is not the case in the south. Not surprisingly, men are also more likely to work than women in both the north and the south.

Among health covariates, we find that BMI, disability, grip strength, physical activities, and CESD show significant gender differences. There are more underweight men than women and more overweight women than men, but such gender difference is statistically significant only in the north. More women are obese than men at a statistically significant level both in the north and south. No gender difference is observed in cardiovascular diseases. Disability rates are higher for women than for men, but statistically significant only in the north. Men have stronger grip strength

Table 1. Gender Differences in Cognitive Functioning by Region: Regional Variation in Gender Difference

Mean score for cognitive functioning			North			South			Regional difference in gender disparity in cognition?	
			Range	Men	Women	Mean gender difference	Men	Women		
<i>N</i>				351		394	334		<i>F</i> -test	<i>p</i> < <i>t</i>
Episodic memory	Immediate	0–10	5.58	4.80	0.78***	5.04	4.61	0.43***	3.19	.081
	Delayed	0–10	4.19	3.44	0.75***	3.80	3.48	0.32*	4.22	.046
Mental status	Date naming	0–4	2.83	2.13	0.70***	3.19	2.75	0.44***	3.06	.087
	Naming prime minister	0–1	0.45	0.27	0.18***	0.69	0.45	0.24***	0.64	.427
	Backward count from 20	0–2	0.93	0.52	0.41***	1.51	1.25	0.26***	2.85	.098
Serial 7s		0–5	1.68	0.65	1.03***	2.42	1.77	0.65***	3.56	.065
Summary index		0–32	15.64	11.84	3.80***	16.69	14.37	2.32***	5.37	.025

Notes. Scores are standardized by age categories. * $p < .05$, *** $p < .001$ indicate gender differences in within each region.

Table 2. Gender Differences in Education by Region

		Men	Women	Chi square	Men	Women	Chi square
<i>N</i>		351	372		394	334	
Literacy	Literate	34.5	17.2	18.05***	78.5	59.2	27.94***
	Illiterate	65.5	82.8		21.5	40.8	
	Total	100%	100%		100%	100%	
Education	No schooling	64.7	82.0	11.11***	18.6	37.8	13.34***
	Primary	14.2	8.4		37.8	33.5	
	Secondary	14.5	7.3		27.9	25.1	
	Tertiary	6.6	2.2		15.7	6.6	
	Total	100%	100%		100%	100%	

Notes. *** $p < .001$.

Table 3. Respondent Characteristics by Gender and Region

		North		South		Regional Difference	
		Men	Women	Men	Women	<i>F</i> -statistic	<i>p</i> < <i>t</i>
Health	Underweight	33.38%	24.63%*	22.57%	18.27%	0.97	.331
	Normal	54.16	52.33	61.24	54.61	0.74	.396
	Overweight	9.81%	15.12%*	14.52%	19.29%	0.02	.900
	Obese	2.65%	7.92%*	1.67%	7.83%***	0.10	.752
	Cardiovascular condition	52.15%	53.48%	50.78%	56.07%	0.45	.508
	Disability	5.71%	12.12%*	16.32%	18.59%	0.87	.356
	Grip strength (kg)	24.036	17.210***	28.460	19.043***	5.19*	.027
	Some exercise	17.71%	9.65%**	14.36%	6.50%***	0.00	.953
	Frequent exercise	28.84%	11.28%***	29.90%	16.19%***	0.59	.448
CESD Score		12.074	13.561**	11.757	12.074*	1.29	.263
Demographics	Mean Age	58.02	58.34	58.30	57.31	0.88	.353
	Standard deviation for age	11.56	12.55	9.56	10.3		
	Number of children	3.482	3.484	2.782	3.016	1.62	.210
	Scheduled Caste	16.99%	16.85%	11.39%	13.43%	0.56	.459
	Scheduled Tribe	25.12%	24.48%	5.42%	4.35%	0.01	.927
	OBC	22.57%	24.19%	54.03%	51.10%	0.97	.331
	Urban residency	20.09%	25.00%	29.27%	32.34%	0.23	.635
Socioeconomic status	Middle Consumption	28.90%	30.39%	33.87%	33.60%	0.24	.624
	High Consumption	22.74%	23.08%	42.18%	37.70%	1.89	.176
	Social activity index	1.188	0.989*	2.360	2.284	0.22	.644
	Working	74.28%	25.82%***	64.15%	23.07%***	1.92	.172

Notes. CESD = Center of Epidemiologic Studies-Depression; OBC = other backward class.

* $p < .05$, ** $p < .01$, *** $p < .001$.

than women, particularly in the south. Men exercise more frequently than women in both the north and the south, and women have more depressive symptoms than men in both the north and the south.

Table 4 presents the results of four regression models for cognitive functioning. Model 1 shows significant negative coefficients for both the main effect of women and the interaction effect of women and the north region, suggesting that women perform worse than men by 2.3 points and women in the north perform worse by another 1.4 points, after adjusting for age (total cognitive index score ranges 0–32). Introducing education and literacy in Model 2 substantially reduces the coefficient estimate for the female main effect. We formally test the main effect for women across the two models (Model 1 vs Model 2), and chi-square statistic is 38.14, significant at $p < .0001$. Education and literacy explain 60% of female disadvantage in cognitive functioning for the main effect of being women. For the interaction

effect of women and north region, adjusting for literacy and education reduced the coefficient only by 8%. We formally test the difference in the interaction term across the two models and found no significant reduction in the region-specific female disparity.

In Model 3, we control for additional health covariates to Model 2. Once we control for health covariates, the female main effect is no longer significant, but the female and region interaction effect remains significant. In fact, after controlling for health, the coefficient for the interaction term is even more magnified, suggesting significant female disadvantage in cognitive functioning for women in the north.

In Model 4, we control for the remainder of the socioeconomic covariates discussed above. Introducing these additional covariates does not explain the persistent female disadvantage in the north. We present the estimates of the full model in Supplementary Table 1. Due to the

Table 4. Ordinary Least Squares Estimation of Summary Index of Cognitive Functioning

	Model 1			Model 2			Model 3			Model 4		
	Age adjusted			Age and education adjusted			Age, education, and health adjusted			Fully adjusted		
	β	SE	t	β	SE	t	β	SE	t	β	SE	t
Female	-2.258***	0.364	-6.20	-0.888**	0.308	-2.88	-0.229	0.343	-0.67	-0.160	0.365	-0.44
North state	7.204***	1.121	6.43	4.530**	1.385	3.27	2.041**	0.616	3.31	2.374***	0.624	3.80
Female x north	-1.394*	0.581	-2.40	-1.286*	0.492	-2.61	-1.513**	0.517	-2.92	-1.532**	0.512	-2.99
Age												
(45-49)												
50-59	-0.049	0.448	-0.11	0.018	0.304	0.06	-0.031	0.326	-0.10	-0.192	0.335	-0.57
60-69	-2.238***	0.537	-4.17	-1.312**	0.380	-3.46	-0.753	0.394	-1.91	-0.814*	0.387	-2.10
70+	-4.466***	0.607	-7.36	-3.055***	0.407	-7.51	-2.041***	0.443	-4.60	-2.062***	0.465	-4.43
Education												
(No school)												
Primary				4.123***	0.795	5.19	3.657***	0.748	4.89	3.163***	0.777	4.07
Secondary+				6.832***	0.860	7.95	6.163***	0.773	7.97	5.295***	0.833	6.36
Literate				3.011***	0.751	4.01	2.896***	0.683	4.24	2.728***	0.680	4.01
Intercept	7.800***	1.309	5.96	6.991***	1.426	4.90	8.454***	0.961	8.80	8.522***	0.989	8.62
N	1354			1354			1205			1205		
F-statistic	25.87***			81.23***			42.35***			28.19***		
R ²	0.2137			0.4864			0.5199			0.5406		

cross-sectional nature of the analysis, the interpretation of covariates requires caution. A critical component of the sensitivity analysis was to examine individual components of the cognitive measure listed in Table 1. Results were consistent across submeasures and not driven by any one particular domain (e.g., numeracy or episodic memory). These results are available upon request.

DISCUSSION

We found significant gender disparities in cognitive function among a geographically diverse, representative sample of adults aged 45 years or older across four Indian states. Our results were consistent with a growing literature on cognitive health in developing countries that show women perform worse than men on cognitive measures (Lei, Hu, McArdle, Smith, & Zhao, 2011; Maurer, 2011; Taboonpong, Chailungka, & Aassanangkornchai, 2008; Yount, 2008). These results contrast with those in industrialized countries, where women typically outperform men (Langa et al., 2008, 2009).

Education explained about 60% of gender disparity in cognitive functioning in our study, but it did not fully explain the additional female disadvantage in the north. Once we controlled for health in addition to education, the main effect of being female was no longer significant. It appears that out of all the health variables that we controlled for, exercise and physical activity contributed the most to the gender difference in cognition. Nonetheless, even after controlling for all covariates, the interaction term of being female in the north remained significant, suggesting persistent female disadvantage in cognitive health in the north.

These findings are consistent with prior literature reporting persistent gender disparities in cognitive health in the north (Ganguli et al., 1996) but no female disadvantage in the south (Mathuranath et al., 2003, 2007, 2010). Using a geographically diverse sample, we are able to examine regional differences reported in prior literature.

The cross-sectional design of this study limits our ability to establish causality for many of the control variables introduced in the full model. Hence, our interpretation of these risk factors remains associational. We controlled for them in order to better isolate the effects of education on cognitive function. Although geographic differences in gender discrimination have been documented, we are not able to directly examine sources of gender discrimination in childhood outside of education due to lack of data.

CONCLUSIONS AND IMPLICATIONS

We found that women in India have lower cognitive function than men, and this disparity is particularly acute in northern India. Education is the single factor that explains the most gender disparity in late-life cognitive functioning, accounting for about 60% of the disparity. Once we control for health together with education, female disadvantage in

cognitive function no longer exists in the south, but persists in the north. The causal pathways through which discrimination may have negative effects on health and cognitive health are important areas for future research. Differences by cohort and temporal trends in cognitive disparity are also important to examine in subsequent studies. With the decline in the gender gap in education, we expect that the gender gap in cognitive health may have lessened over time.

Our findings have important implications for the health of aging individuals in developing countries and India specifically. India is the second fastest growing economy in the world, but deep-seated cultural values that imbue a preference for males have led to large, persistent gender disparities in India. Particularly in the north where women are more likely to take on the primary caretaker role in the household, removing them from the economic workforce and increasing disparities in occupational prestige for Indian women. The World Economic Forum reports that although India scores around the average of the gender gap index across all participating countries, its score for women's economic participation and opportunity is worse than 95% of all countries (Hausmann, Tyson, & Zahidi, 2011).

The educational and occupational attainment disparities that Indian women experience through the life course may influence their cognitive trajectory. Poor cognitive health, lower education, and lower occupational attainment are strongly associated with greater risk for mild cognitive impairment and Alzheimer's disease (Doi et al., 2013; Evans et al., 1993, 1997; Lee et al., 2006; Meng & D'Arcy, 2012; Petersen et al., 1999; Stern et al., 1994), which places enormous emotional, physical, and financial stress on individuals and their families. Combined with the fact that Indian women have longer life expectancies than males (WHO Global Health Observatory Data Repository <http://apps.who.int/gho/data/node.main.688?lang=en>), Indian women may be more likely to be diagnosed with Alzheimer's disease. Thus, policies that continue to promote equitable access to educational attainment, workforce participation, and health care in India will not only have significant economic benefits but may potentially reduce gender disparities in the prevalence of Alzheimer's disease.

SUPPLEMENTARY MATERIAL

Supplementary material can be found at: <http://psychogerontology.oxfordjournals.org/>

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preparation of manuscript. K. Feeney was responsible for data analysis and preparation of manuscript. K. Langa contributed to concept and design, data interpretation, and preparation of manuscript.

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