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The Inconvenient Truth of Illiteracy Inequality

Intersectionality of Socio-demographic Disadvantage

SUNITA GANDHI, KAAREN MATHIAS, LINDA SEEFELDT, THOMAS DELANEY

This study analyses adult illiteracy in Lucknow, focusing on inequalities between different geographical regions, castes, age groups and genders. The reading ability of 1.06 million people in the 15–60 age group was tested, and the literacy rate found to be 65%—substantially lower than the census figures of 77% for Lucknow and 68% for Uttar Pradesh. Each socio-demographic dimension measured was a key determinant of literacy—disadvantaged groups had literacy rates substantially below the mean. Socio-demographic determinants also compound each other, highly disadvantaging some subgroups, an aspect that policymakers must take into consideration when developing policies to increase literacy equity.

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Literacy is a vital skill that enhances dignity, improves health outcomes, empowers people to access their rights, and bolsters educational and employment opportunities (UNESCO 2015). India's literacy rate has improved drastically, from 18% in the first post-independence census, to 74% in 2011 (GOI 2011a). Yet India has 280 million illiterate adults, which is more than the remaining top 10 nations added together (UNESCO 2014). India's literacy rate of 74% compares unfavourably with its international economic competitors, including China (97%) and Brazil (93%) (UIS 2018a, 2018b). India's rate of improvement is also comparatively modest: the literacy rate rose by 10 percentage points between 2001 and 2011, while Bangladesh's literacy rate has reportedly increased by 25 percentage points between 2011 and 2016 (GOI 2001, 2011a; UIS 2018c).

The Indian government recognises the need to promote adult literacy, and has set an ambitious target of 100% adult literacy by 2030 (MHRD 2020). However, for this target to be achieved, we must first understand the substantial inequality in literacy rates between different socio-demographic groups within India. For instance, women are much less literate than men. Disadvantaged castes, such as Scheduled Castes (scs) and Scheduled Tribes (strs), and minority religions, particularly Muslims, have lower literacy rates. People living in rural areas are less likely to be able to read than urban residents. Each of these inequalities is reducing among younger age cohorts, but remain pronounced among middle-aged and older adults (Shukla and Mishra 2019). Furthermore, while younger generations have relatively high literacy rates, over half of the population above the age of 50 remains illiterate. These socio-demographic literacy gaps are well-documented, as are the harmful impacts on the communities with lower literacy rates (Borooah and Iyer 2005; Ghose 2007; Asadullah and Yalonetzky 2012; Agarwal 2014).

Moreover, all people exist in multiple socio-demographic categories simultaneously (Phoenix and Pattynama 2006). For instance, as black feminists have long noted, the experiences of discrimination and disadvantage of many black women cannot be captured simply through either feminist or race-conscious frameworks (Crenshaw 1989). The intersectionality of multiple identities has significant educational implications (Yang nd). Reimao and Tas (2017) find that indigenous communities in Bolivia have larger gender gaps in educational attainment than non-indigenous communities. The interlocking nature of gender and caste disadvantage has been noted in the Indian context, with a larger gender gap in enrolment rates for sc/st children

(Bandyopadhyay and Subrahmanian 2008; Lewis and Lockheed 2007; Dunn 1993). The India Human Development Survey also found greater caste-based differences in literacy rates among females in India, compared to males (Shariff et al 2010).

However, there has been little research quantifying the extent to which various factors of socio-demographic disadvantage compound each other in India, and rarely have more than two factors been considered in conjunction. Our study aims to address this gap by examining the intersectional impacts of gender, geography, caste and age on literacy rates. While our survey covers a much smaller geographical range than the 2011 Census, it is likely more accurate due to our use of direct testing rather than self-reporting of literacy, and acts as a case study providing nationally relevant insights into educational inequalities.

Methodology

Setting: This study was conducted in Lucknow, the capital of Uttar Pradesh (UP), which is India's most populous state. Lucknow district has a population of over 4.6 million (GoI 2011b). Administratively, it is divided into eight rural blocks and 110 urban wards.

Sampling: The survey was conducted in April 2015–June 2015, in all eight rural blocks of Lucknow district, and three urban wards. As a sampling strategy, a sample with majority (71%) rural residents, comparable to the demographics of UP was created. The three urban wards surveyed—Alam Nagar, Aliganj and Chihat urban—were assigned by the district government.

Data collection: The chief development officer of Lucknow, Yogesh Kumar, requested Lucknow's government primary and anganwadi teachers to enlist as enumerators, and organised their assignment to each geographical area.¹ A one-day training was given to these 3,957 enumerators, which involved explaining techniques of door-to-door surveying, as well as going through each question on the survey form and its relevant coding (Appendix 1, Hindi, p 70). Special attention was given to explaining the concept of literacy (see "survey design"). The data collectors were instructed to survey all households in the selected blocks and wards. Each enumerator typically took around 10 working days to complete their assigned area, which had around 100 households. Within a household, all the family members aged between 6 and 60 were invited to participate in the survey. A total of 3,96,142 households participated, which included 12,18,438 adults and 3,25,645 children. This paper analyses findings among the adult sample.

Comprehensiveness: The comprehensiveness of our survey coverage can be checked against the 2011 Census data, which found a population of 1.55 million in Lucknow's rural blocks (GoI 2011b). Extrapolating with known population growth rates and demographic ratios of Uttar Pradesh, this implies a population of approximately 0.97 million rural 15–60 year olds in 2015, when this survey was conducted. Our survey covered a total rural population of 0.85 million rural 15–60 year olds, implying that around 88% of the rural population participated in the survey.

Figure 1: Literacy Test Passage



Survey design: Each participant was asked demographic questions, about their sex, age, religion and caste.² A literacy test was then conducted, in which survey participants were asked to read two simple Hindi passages, equivalent to a Grade 2 level text (Figure 1). One passage had “matras,” the other did not.³ Those who could read both passages with fewer than five mistakes in total were assessed as literate.

Data analysis: Data was collected on physical survey sheets and then recorded in a database. Meta-level information of number of literate and illiterate people in each category was extracted from the database and analysed using Excel and Stata 15.1.⁴ We created a logistic regression model for estimating the illiteracy rate of a subsection of the population, given its demographic features. This simple model, without interaction terms, enabled us to juxtapose the hypothetical situation that socio-demographic factors operate independently with the actual data. We then performed a logistic regression with interaction terms, to examine which variables were interacting with each other most strongly.

Ethics: All survey participants consented for their responses to be used for research purposes. No names or demographic details of survey participants have been or will be divulged. The survey was authorised and facilitated by district-level government authorities, and funded by members of DEVI Sansthan, a Lucknow-based non-governmental organisation (NGO), which works to spread literacy through innovative, learner-centred approaches.

Results

Sample demographics: A total of 1.21 million adults participated in the survey, 1.06 million of whom answered all demographic questions and also completed the reading test. The results are given in Appendix 2 (p 71). Table 1 (p 63) presents a demographic profile of the sample (rounded percentage given in

brackets), as well as UP demographic profile, indicating that the sample is reasonably representative of the population of UP, with the exception that our sample had substantially more sc/sr population and fewer from minority communities.

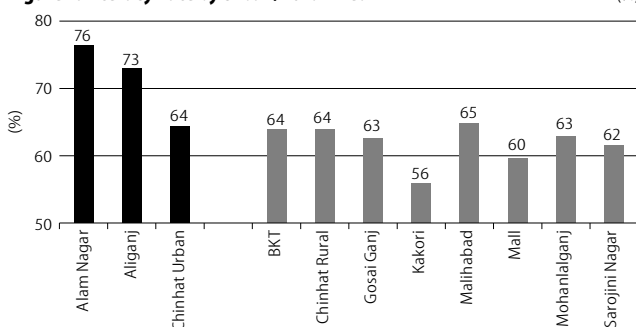
Table 1: Demographic Profile of Survey Participants, 15–60 Years Old

	Global Dream Survey Lucknow, 2015		Census
	Male (%)	Female (%)	Uttar Pradesh, 2011 All 15–60 Years Old (%) ²
Age			
15–35	3,62,960 (64)	3,29,056 (66)	7,26,93,904 (64)
36–50	1,50,572 (27)	1,27,923 (26)	2,99,76,937 (26)
51–60	50,278 (9)	41,340 (8)	1,16,91,976 (10)
Geography			
Rural	4,06,173 (72)	3,47,700 (70)	8,63,65,755 (76)
Urban	1,57,637 (28)	1,50,619 (30)	2,79,96,221 (24)
Caste			
SC/ST	1,96,472 (35)	1,70,478 (34)	2,43,20,097 (21)
OBC	2,10,764 (37)	1,88,208 (38)	4,83,04,517 (42)
Minority	79,919 (14)	70,336 (14)	2,47,91,900 (22)
General	76,655 (14)	69,297 (14)	1,69,45,462 (15)
Grand total	5,63,810 (53)	4,98,319 (47)	11,43,62,817 (100)

Source: Figures for Lucknow are from authors’ survey. Figures for Uttar Pradesh are drawn from census data (Gol 2011c, 2011e).

Rural/urban inequalities in literacy: Our survey found a substantial gap in adult literacy rates between urban and rural areas (Figure 2). Seventy-three percent of adults in the three urban blocks could read, compared to 62% in the eight rural wards.

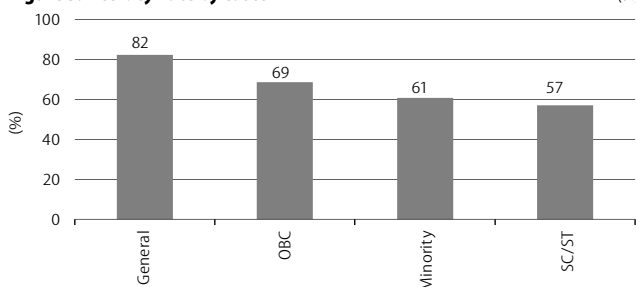
Figure 2: Literacy Rate by Urban/Rural Area (%)



Source: Authors’ survey.

Religio-caste inequalities: General caste respondents were by far the most literate, at 82%, while sc/sr was the least literate group, at just 57% (Figure 3).

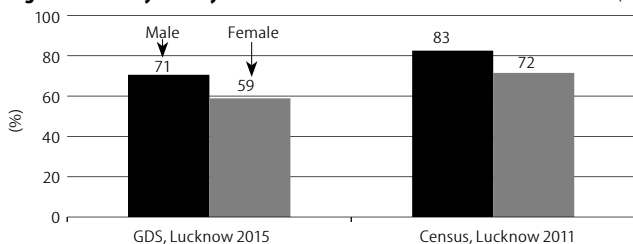
Figure 3: Literacy Rate by Caste (%)



Source: Authors’ survey.

Gender inequalities: A substantial literacy gap between men (71%) and women (59%) was present in the sample (Figure 4).

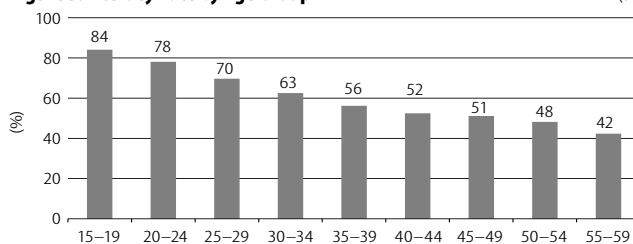
Figure 4: Literacy Rate by Gender (%)



Source: Authors’ survey, Indian Census (Gol 2011b).

Age inequalities in literacy: Large age-based literacy inequalities were also revealed by our survey. While the oldest age bracket surveyed (51–60 year olds) had a literacy rate of just 44%, this rose to 52% for 36–50 year olds and 73% for 15–35 year olds. Using narrower bins of five years, the youngest cohort had double the literacy rate of the oldest (Figure 5).

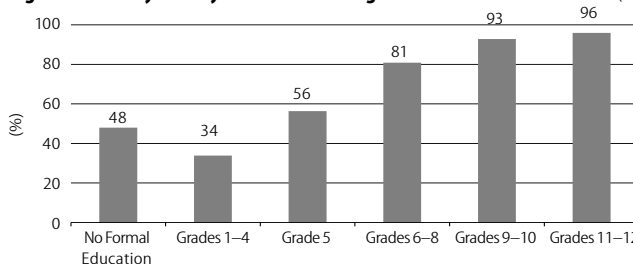
Figure 5: Literacy Rate by Age Group (%)



Source: Authors’ survey.

Literacy by years of schooling completed: One of the strongest predictors of literacy, unsurprisingly, is years of schooling completed. Figure 6 shows that literacy rates double from 48% amongst those without a school education, to 96% for those who have studied at the senior secondary level.⁶

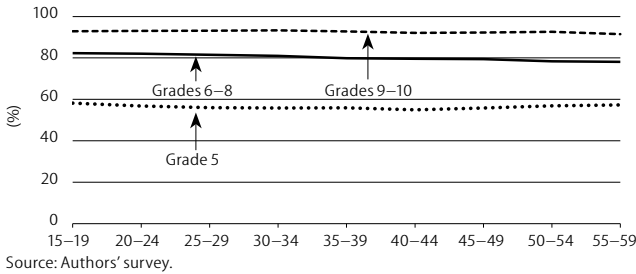
Figure 6: Literacy Rate by Years of Schooling (%)



Source: Authors’ survey.

As we have seen, a primary finding of our survey is that literacy rates are much higher among younger age cohorts. A key question, then, is the extent to which this improvement is driven by an increase in average years of schooling, as opposed to an improvement in the quality of education. A simple comparison of literacy rates among different age cohorts with the same years of schooling provides insight into this question. Figure 7 (p 64) shows that literacy rate is almost independent of age, once years of schooling have been controlled for. This indicates that improvements in literacy rates over time have been driven primarily by an increase in years of schooling attained—not an improvement in the quality of school education.

Figure 7: Literacy Rate by Age Group and Years of Schooling



Other demographic factors discussed in this paper (gender, caste and geography) are also strong determinants of literacy primarily via their impact on years of schooling. For instance, there is a minimal literacy gap between men and women who have attained an equal educational level. Rather, most of the gender literacy gap is attributable to a difference in years of schooling: to take one indicative statistic from our survey, only 19% of women were educated beyond Grade 5 (compared to 28% of men).

Adjusted illiteracy rates: The results of the simple logistic regression are shown in detail in Appendix 3 (p 71), and summarised in Table 2. This regression uses gender, geography, age and caste as independent variables, predictive of illiteracy rate, without any interaction terms.

Table 2: Odds of Illiteracy, Crude and Adjusted⁷

Variable	Factor Level	Illiteracy Rate (Crude %)	Crude Odds Ratio (OR)	Regression (OR)	Adjusted Illiteracy Rate	Adjusted—Crude (percentage points)
Gender	Male	29.3				
	Female	41.1	1.68	1.85	43.5	2.4
Geography	Urban	27.5				
	Rural	37.9	1.61	1.62	38.1	0.2
Age	15–35	26.7				
	36–50	48.3	2.56	2.87	51.1	2.8
	51–60	55.7	3.45	4.05	59.6	3.9
Caste	General	17.8				
	OBC	31.7	2.14	2.19	32.2	0.5
	Minority	39.4	3.01	3.64	44.1	4.7
	SC/ST	43.3	3.52	3.69	44.4	1.1

Source: Authors’ survey, STATA regression.

The logistic regression shows that each factor of disadvantage is more significant than the crude numbers indicate: the adjusted odds ratios, and hence adjusted illiteracy rates, are higher. This is because some of the effects are masked by demographic correlations with the other factors.

The starkest example of this is the “minority” category, which has an adjusted illiteracy rate almost 5 percentage points higher than its crude illiteracy rate. The primary reason is that while 29% of the overall sample lived in urban areas, 51% of the minority population did. Once this over-representation in relatively literate urban areas has been taken into account, the literacy rate of the minority category is no longer statistically significantly different from sc/st groups. The concentration of Muslims in urban areas conceals their extent of disadvantage in census figures, too. While 34% of India’s 15–60 year olds live in urban areas, among Muslims the proportion is 43% (GoI 2011e).

The census gives a literacy rate of 73% for 15–60 year olds overall, and 67.3% for Muslims. Adjusting for urbanity—that is, if the Muslim population had the same rural–urban split as India overall—the literacy rate for Muslims drops to 65.9%.

Compound effects: The simple logistic regression model assumes that there is no interaction between the different factors. However, a comparison of the model’s predictions and the actual literacy rates for various disadvantaged subgroups indicates that there is a strong interaction between the different factors. Table 3 shows the literacy rates for the six subgroups that do not have any of the dimensions of privilege (in contrast to the male, urban, general and 15–35 age subgroups).

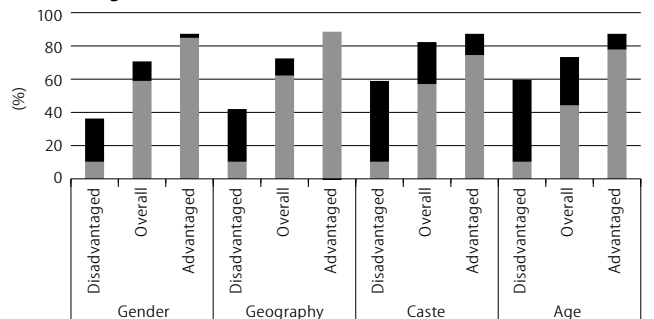
Table 3: Literacy Rates for Most Disadvantaged Subgroups, Expected vs Actual

Gender	Geography	Caste	Age	Population	Expected Literacy Rate (%)	Actual Literacy Rate (%)	Difference (percentage points)
Female	Rural	SC/ST	36–50	35,040	31.2	19.1	12.0
Female	Rural	SC/ST	51–60	10,988	24.3	10.2	14.1
Female	Rural	Minority	36–50	8,099	31.5	28.6	2.9
Female	Rural	Minority	51–60	2,487	24.5	19.9	4.6
Female	Rural	OBC	36–50	34,132	43.3	32.2	11.1
Female	Rural	OBC	51–60	10,961	35.1	24.0	11.1

Source: Authors’ survey, STATA regression.

While each of these groups suffers compounding disadvantage, the starkest example is found in the most disadvantaged group: female, rural, sc/st, 51–60 year olds. The logistic regression model, simply adding together these factors of disadvantage, predicts that a quarter of this group will be able to read. The reality is far worse: just one-tenth are literate. The large difference between the expected and actual literacy rates show that the various factors of socio-demographic disadvantage do not simply function independently, they compound each other.

Figure 8: Differing Literacy Gaps as an Indicator of Compounding Disadvantage



For each of the four variables, gaps are much larger among groups facing other factors of disadvantage.

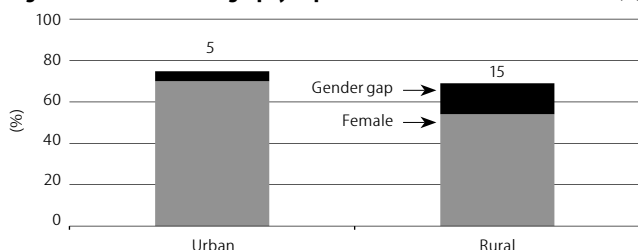
Source: Authors’ survey.

The difference in literacy rates between two socio-demographic groups, which we term “literacy gaps,” is a useful concept to explore the notion of compounding disadvantage. As seen above in the discussions on rural/urban, religio-caste, gender and age inequalities, there are substantial literacy gaps in each of the four dimensions considered. However, these literacy gaps in each dimension tend to be greater among groups already disadvantaged in other dimensions. For instance, the gender gap overall is 12% (male: 71%, female: 59%). Among the privileged subgroups (urban, general, 15–35 year olds), not only are literacy

rates higher, but the gender gap is much smaller, at 2 percentage points (male: 87%, female: 85%). In contrast, the underprivileged (rural, SC/ST, 51–60 year olds) have a much larger gender gap of 26 percentage points (male: 36%, female: 10%). This compounding literacy disadvantage is highlighted in Figure 8 (p 64).

Interactions between pairs of variables: The much larger gaps among disadvantaged groups indicate strong interactions between the different variables. There is a simple metric that enables us to quantify the interactions between pairs of variables, which we term “gaps squared.” Figure 9 shows how this metric works for the intersection of gender and geography, which is calculated by subtracting the urban from the rural gender gap, yielding 10%.⁸ Essentially, the larger geographical gap for females compared to males—equivalently, the larger gender gap for rural areas compared to urban areas—shows that the two variables interact.

Figure 9: The Gender–Geography Gap (%)



Source: Authors' survey.

Table 4: Intersectionality between Pairs of Variables

Two-factor Combinations	Gaps Squared (percentage points)	Logistic Regression (interaction coefficient)
SC/ST, 51–60	22.8	0.67
51–60, rural	17.1	0.63
Female, 51–60	12.8	0.52
SC/ST, rural	10.4	0.47
Female, rural	10.2	0.42
SC/ST, female	9.1	0.21

Source: Authors' survey; STATA regression.

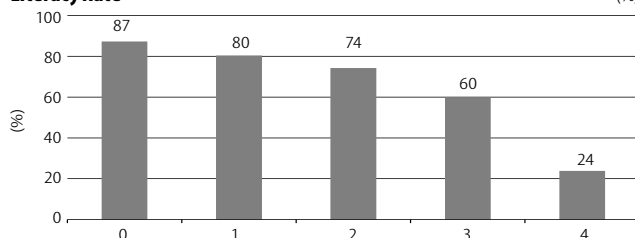
The metrics indicate that the strongest interaction is age–caste, followed by age–geography. That is, older generations have greater caste and geographical inequality in literacy rates. Both metrics also show substantial interaction between all of the variable pairs.

Another way to represent this intersectionality is to group together people who have the same number of factors of disadvantage, as shown in Figure 10. Here a “factor of disadvantage” is counted as anything apart from the privileged reference group. For instance, SC/ST, OBC and minority categories are all counted as factors of disadvantage.⁹ A person with three factors of disadvantage has a 60% chance of being literate, whereas a person disadvantaged in all four of the dimensions has just a 24% chance.

Discussion

This study directly tested the literacy of over one million people in Lucknow, finding significant literacy inequity along socio-demographic lines. These dimensions interact with each

Figure 10: Compounding Impact of Number of ‘Factors of Disadvantage’ on Literacy Rate (%)



Source: Authors' survey.

other such that those who experience multiple factors of disadvantage have very low literacy rates. Encouragingly, most of these inequalities are diminished among younger cohorts. We now compare our finding to census data, consider the factors that lead to literacy inequality, and discuss mechanisms that compound disadvantage.

Self-reporting versus direct-testing: Our methodology of directly testing participants' literacy is likely to be more accurate than the census, which relies on self-reporting. The 2011 Census reports a literacy rate of 82% in urban Lucknow, substantially higher than our finding of 73%. In rural Lucknow, the census reports 68%, compared to our finding of 63% (GoI 2011b).

These differences are likely due to generous self-reporting bias. Many people who report to census officials that they can read do not pass standard literacy tests. A study of 20 countries, primarily in sub-Saharan Africa, found that the literacy rate calculated from direct testing was, on average, 8 percentage points lower than the official self-estimation-based literacy rate (UNESCO 2015). Similar results have been found in Bangladesh (Nath 2007). In India, an older National Sample Survey (NSS) study found that an astonishing one-third of those who claim to be literate failed a literacy test, corresponding to a gap of almost 20 percentage points between the official and actual literacy rates (Govinda and Biswal 2005). It is now widely recognised that direct testing is more accurate than self-reporting (UIS 2008).

Explaining literacy inequalities: There are substantial geographical, gender, caste and age inequalities in literacy rates. Various explanations can be posited for these socio-demographic inequalities. The urban–rural literacy gap has been well-documented (Agarwal 2014). Our survey found rural areas to have a literacy rate of 62%, compared to urban areas' 73%. The NSS (2015) found an even larger gap, of 20 percentage points, at the national level. Rural areas have lower literacy rates than urban areas for several reasons. Access to education is lower, with schools less resourced and further away. The NSS (2015) found that only 37% of rural households had a secondary school within one kilometre, compared to 73% of urban households. Further, lack of job opportunities in the formal sector may reduce the economic utility of education, potentially curbing motivation. In general, greater poverty in rural areas is both a cause and a result of lower educational opportunities.

Our survey revealed substantial gender inequality in literacy rates (male: 71%, female: 59%). The census found a similar gap

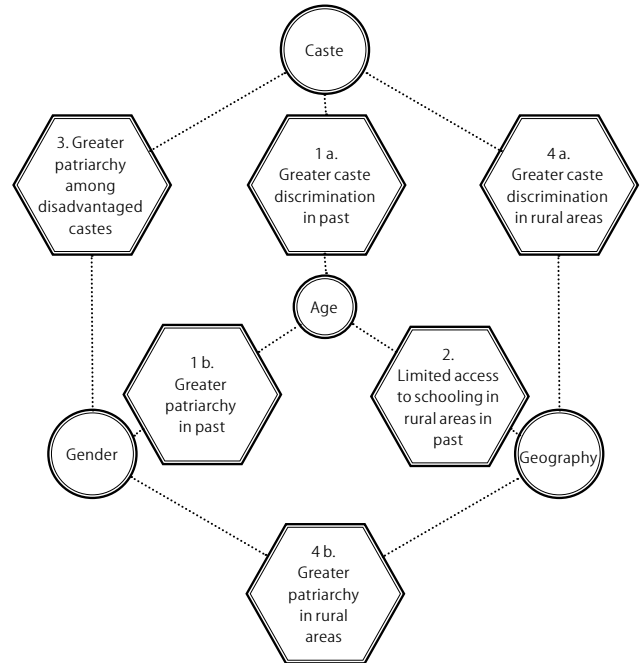
in Lucknow: 83% (male) versus 72% (female) (Figure 4). This gap is smaller than the national average, which according to the census was 17 percentage points (with the literacy rate as follows: male: 82%, female: 65%). This is in keeping with the general finding that gender inequality in literacy is smaller in urban and peri-urban areas (Mukunthan 2015). The marked gender disadvantage is primarily caused by intra-household gender discrimination in educational investment (Kingdon 2010). Families are more likely to enrol their sons in fee-paying private schools, while girls are under-represented in private education (Azam and Kingdon 2013). This patriarchal cultural norm is rationalised in a setting where a newly married woman will typically join her husband's family after marriage, meaning that any gains from investing in education will not accrue to the girl's parents (Jana 2017).

Our survey revealed a gap of 25 percentage points between the most disadvantaged caste group (sc/st: 57%) and the most advantaged (general: 82%), and an 8 percentage points gap between the sc/st group and the overall mean (65%). This is similar to the census data for UP, which puts sc literacy rates at 57%, compared to 66% for the overall population (GOI 2011d, 2011e). We found the literacy rate of religious minorities (primarily Muslims) to be 61%, though, as discussed above, they are as disadvantaged as sc/st when urbanity is controlled for. There are several factors contributing to the lower literacy rates among disadvantaged castes and minority religions. There are ongoing instances of active caste-based and religious discrimination in schools in India (HRW 2014; Bajoria 2015; *National Herald* 2018). Entrenched economic inequalities ensure people from a disadvantaged caste or minority religion have fewer educational opportunities, even without direct discrimination (Sen 2013).

Older people have lower literacy rates compared to the younger generation. The 2011 Census, using different age brackets, found literacy rates ranging from 89% for 15–19 year olds, to 61% for 35–59 year olds and 36% for those above 60 (GOI 2011d). Unlike the other dimensions of socio-demographic disadvantage discussed in this paper, this inequality could be viewed positively, as higher literacy rates for young people are indicative of improvements in access to education over the past several decades. However, the positive trend of younger generations becoming more literate should not lead us to neglect the literacy of millions of older adults.

Explaining compounding disadvantage: We have seen above that the socio-demographic determinants of literacy act not just in isolation, but also in concert. Several mechanisms contribute to this compounding effect: (i) Schooling opportunities were more culturally restricted in the past, making it particularly disadvantageous to be an older woman or an older sc/st person. (ii) Rural areas had lower school availability in the past, meaning that geographical and age disadvantage compound each other. (iii) Lower castes tend to be more culturally conservative, meaning that caste and gender disadvantages interact synergistically.¹⁰ (iv) Rural areas tend to have harsher caste and gender inequalities, making it

Figure 11: Interconnections between Different Dimensions of Socio-demographic Disadvantage



Interconnections are given in hexagons; socio-demographic disadvantages in circles.

particularly disadvantageous to be a rural woman or a rural sc/st person.

These potential interconnections between different forms of socio-demographic disadvantage are represented by the simple schematic in Figure 11. Does the data shed much light on which are the most powerful interactions? While our study cannot draw causal connections, it does examine correlations linked to the outcome of literacy. As analysed in the subsection on “interactions between pairs of variables” above, there is substantial evidence for each of these mechanisms of interaction.

Policy Implications

Measuring illiteracy accurately: Despite progress in improving literacy rates, India still faces severe literacy inequalities. Moreover, those in positions of power are likely to be privileged on several dimensions outlined above: male, urban, high-caste Hindus. In this context, there is substantial danger that the problems faced by disadvantaged groups, including low literacy rates, may remain invisible to policymakers. The inflation of literacy rates due to self-reporting in the census exacerbates the potential for complacency and downplaying of the illiteracy crisis. It is vital that accurate information is collected nationwide on literacy rates, through direct testing, so that policy can be informed accordingly.

Quality and equality in schools: As our study shows, literacy rates are much higher among younger cohorts than older ones. This increase has been driven by an increase in mean years of schooling among younger cohorts. While this improvement in schooling quantity is to be celebrated, unfortunately, our results indicate that school quality remains

unacceptably low. Only 56% of adults who completed five years of schooling can read and write—and this figure remains roughly the same across age cohorts. The primary long-term solution to low literacy rates, and to socio-demographic educational disadvantage, is ensuring quality and equality in school education.

Efforts over the past decade have increased nationwide enrolment rates to 96% (MHRD 2016). However, educational quality remains a major concern. Our survey found a literacy rate of just 70% among 10 year olds in government schools. This is somewhat more encouraging than the Annual Status of Education Report's (ASER 2018) finding that in the nation's villages, just half of Grade 5 students can read a Grade 2 text. Whatever the precise figures, public schools are clearly failing to teach a large proportion of students basic reading skills. The COVID-19 pandemic has further weakened and disrupted the education system, increasing the severity of the learning crisis particularly for those on the wrong side of the "digital divide" (EPW Engage 2021). Globally, the COVID-19 pandemic has pushed hundreds of millions of children into learning poverty (World Bank 2021).

Given the overall low performance of public schools, many parents and policymakers place their hope in private schools. Private schools are experiencing rapid growth, such that 49% of urban and 21% of rural 6–10-year-old children attend private schools (Kingdon 2016). In our study, private school students did fare slightly better than their public school counterparts, with 78% of 10 year olds able to read versus 70% in government schools. However, a substantial portion of this difference can be explained by the over-representation of urban, high-caste children in private schools; once this has been taken into account, much of the perceived privateschool advantage disappears. Furthermore, issues of affordability mean private schools remain beyond the reach of precisely those disadvantaged groups most needing to close their literacy gaps.

To improve the long-term literacy rates of disadvantaged groups, we must reform the public education system. Policy solutions must include a combination of top-down and bottom-up approaches driven by greater political will at all levels (Masino and Nino-Zarazua 2016). Possible ways forward include: (i) increasing government spending on education, rising from the current 3.1% of gross domestic product (GDP) (Khaitan 2021); (ii) developing localised supervisory systems and pay scales that increase teacher attendance and effort (Pritchett and Murgai 2007); (iii) and shifting away from rote learning, towards interactive, learner-centred approaches (Global Dream 2021).

Active approaches to adult literacy: Improving school education is vital for India's future, but the present reality of hundreds of millions of illiterate adults must also be addressed through adult literacy programmes (Shukla and Mishra 2019). An attritional approach to adult illiteracy, that the problem will gradually reduce as new generations of well-educated children become adults, is naïve, given the large number of teenagers who remain illiterate and are becoming adults. Further, there are tremendous benefits of literacy across multiple spheres of life.

Income: Adult literacy programmes can be very time and cost-efficient in imparting literacy (Barakat 2016). In contrast, the costs of remaining illiterate are tremendous. Illiterate people earn an estimated 30%–42% less than their literate counterparts around the world (WLF 2015).

Health: Numerous studies have demonstrated the significant positive effects of literacy on public health and in lowering infant mortality (University of Cambridge 2013; Shetty and Shetty 2014). In developing countries, a child born to a literate mother is 50% more likely to survive past age five, relative to a child born to an illiterate mother (WLF 2015).

Human rights: Everyone has the right to earn a living wage, to participate in democratic society, and to access good health-care. Illiteracy deprives many people of these rights, leading some to suggest that literacy itself is a human right (UIS 2008). An attritional approach to reducing illiteracy fails to grant people their human rights.

Education benefits for children: Improvements in adult literacy tend to lead to better educational outcomes for children (Taylor et al 2016). Our survey shows a strong positive correlation between child and adult literacy rates at the block level. A large body of literature suggests that increasing adult literacy rates boosts school enrolment (Chudgar 2009). Investing in adult literacy thus has intergenerational benefits, as helping adults become literate also catalyses literacy improvement for the next generation.

This study shows the urgent need for programmes to increase adult literacy, with a focus on underprivileged populations, and particularly those with multiple disadvantages: minorities, oppressed castes, older and rural women. To successfully reach people facing multiple factors of disadvantage, we need to first understand the constraints they experience. For instance, women's mobility may be restricted by patriarchal norms, making it vital for any literacy programme to be decentralised enough that it reaches learners in or near their homes. Rural labourers may face seasonal time constraints around agricultural work: literacy campaigns could be best conducted during months without planting or harvesting. While the Saakshar Bharat Mission has been a commendable effort to increase adult literacy rates, its 300-hour duration is a daunting time commitment for many illiterate people (Hanneman 2015). The more recent Padhna Likhna Abhiyan aims to make people literate in 120 instructional hours, though this is yet to be implemented on a large scale (Chukath 2020). Any literacy programme must identify reasons for its target population which is currently illiterate, and tailor its content, location and timings to make it as convenient and attractive as possible for those it is trying to serve, as well as incorporate the best possible pedagogy to accelerate literacy learning.

As the National Education Policy (NEP) states, volunteerism and community mobilisation are key success factors of adult literacy programmes. It is imperative that we inspire and equip

large numbers of people to teach literacy locally, within their own communities. In the words of the NEP 2020, a powerful solution to India's illiteracy problem is that "every literate member of the community could commit to teaching one student/person how to read" (MHRD 2020). Indeed, as Shukla and Mishra (2019) note, only 9.6% of households do not have any literate people. A substantial proportion of illiterate people have at least one literate family member; if these family members can be encouraged, trained and equipped to teach literacy within their household, India will make rapid strides towards literacy for all.

Need to empower minority communities: There is a conception in Indian politics that middle-class, upper-caste Hindus are being squeezed by reservationist policies and unable to get ahead (Asher et al 2018). However, as our study documents, minorities and sc/st people face ongoing severe educational disadvantage. Indeed, others have shown that Muslims have the lowest rates of upward mobility in the nation as well as the lowest rates of enrolments in higher education, even lower than sc/st groups (Asher et al 2018; Bahri 2016). Furthermore, religious minorities (particularly Muslims) seem to be falling further behind the rest of society in terms of literacy rates: among the oldest age cohort (55–59 year olds), there is no literacy gap between minorities and the rest, whereas for 15–19 year olds, there is an 8 percentage points gap. This is part of a broader system of political, economic and social disadvantage and discrimination that Muslims face in the so-called "New India" (HRW 2018).

How can policymakers create educational systems that are more inclusive of disadvantaged groups, particularly religious minorities? Our survey revealed that Muslims suffer from high dropout rates in upper primary and lower secondary school: 18% of 14 year olds in the minority category are not in school, compared to 10% of 14 year olds overall. Furthermore, 61% of minority children not in school cited poverty as the primary reason for non-enrolment. The COVID-19 pandemic is causing millions more to drop out of education (*New Indian Express* 2021). In this context, a targeted conditional cash transfer (CCT) scheme could be worth trialling. Cash transfers conditional on school attendance and/or a minimal performance bar have been successful in improving educational outcomes in numerous nations, including Bangladesh and Pakistan (Fiszbein et al 2009; Schurmann 2009; UNGEI 2014). A CCT could be a potentially powerful tool to reduce child labour and increase school completion rates for disadvantaged groups. Another aspect of increasing schools' attractiveness to Muslims would be to reverse the "saffronisation" of textbooks and stop

attempting to cast India's Muslims as foreigners and invaders (Arafath 2016).

Methodological Considerations

A primary strength of this study is its sample size of 1.06 million respondents. As discussed above, direct-testing of literacy is more accurate than self-reporting. The lack of data validation mechanisms meant that there may have been heterogeneity in the data collectors' understanding of what reading level was required to be termed "literate;" however, the large sample size reduces the potential impact of individual differences between the data collectors. A further limitation is that approximately 12% of households in the survey zones did not take part in the study, either due to not being at home or refusing consent. We assume that there is negligible systematic bias, such that the set of households that participated is demographically very similar to those which did not participate. This assumption is strengthened by the observation that our sample's demographics are very similar to those of the UP population (Table 1). The limited socio-demographic variables restrict the complexity of our analysis. Data on the employment status, income, parental years of education and house size of respondents may have contributed substantial explanatory power to the dependent variable of literacy. Future qualitative research is needed to explore and unpack the mechanisms that lead to compounding educational disadvantage.

Conclusions

Demographic factors like age, gender, caste and geography have substantial impact on literacy, and also interact strongly: people who experience multiple factors of disadvantage have disturbingly low literacy rates. Thus, rural, 51–60 year olds sc/st women in Lucknow district have a literacy rate of just 10%, far lower than we would expect if the dimensions of disadvantage operated independently. High rates of illiteracy, and persistent socio-demographic inequalities, have been further exacerbated by the COVID-19 crisis.

Literacy is vital at multiple levels, from the health and well-being of the individual, to the social and economic strength of the nation. Yet, inflated literacy estimates from the census and the marginalisation of disadvantaged groups can conceal the inconvenient truth of illiteracy in modern India. However, a relatively modest investment in active, targeted adult literacy programmes could bring massive economic, social and health returns. Government, NGOs, CSR funds and ordinary individuals collectively have an opportunity and a responsibility to rapidly work towards universal literacy, thereby building a foundation for a more educated and equitable India.

NOTES

- 1 An anganwadi is a government-sponsored crèche for children aged three to six years, which provides nutritious food and some basic pre-school education.
- 2 We used four categories for religio-caste: Scheduled Caste (SC) or Scheduled Tribe (ST), Other Backward Classes (OBCs), minority (this is primarily Muslims, but also includes Christians,

Sikhs, etc), and General (those who do not fit in any of the other categories, hence generally of advantaged castes). These categories are based on the census classification; except that we have introduced "minority" as a category, since many Muslims face disadvantage similar to oppressed castes. However, some Muslims identify as OBC; respondents were asked to self-declare which category they most identified with.

- 3 Hindi is the mother tongue of the vast majority of Lucknow residents. Vowels in Hindi have two different forms: when they follow a consonant, the "matra" form is used.
- 4 See Appendix 2 for this raw meta-level data.
- 5 Figures for geography and age are drawn from census data for UP (GoI 2011c). Caste estimates are drawn from census data (GoI 2011).

- 6 It is somewhat surprising that the literacy rate of those who attained between one and four years of education is lower than that of those who received no schooling at all. One can only assume that this is due to negative correlations between factors that lead to children dropping out of school at a young age (such as learning difficulties, extreme poverty and child labour), and their ability to learn to read and write at a later age.
- 7 Of the four variables discussed in this paper, two are binary (gender, geography), one is quaternary (caste), and one is continuous, but has been reduced to three bins for purposes of analysis (age). This $2^*2^*3^*4$ structure means that there are $1^*1^*2^*3^*3$ categories, which will be considered in the regression, as the most privileged category is the reference group (first row of each variable). Adjusted illiteracy rate is calculated using the crude illiteracy rate of the reference group and the odds ratio found in the regression (OR).
- 8 Of course, comparing the gender gap in rural versus urban areas yields the same score. The Gap squared metric can be calculated easily: $Gap^2 = (Y-y) - X(Y-y) = (xY + yX) - (XY + xy)$. Here, the small letters indicate a disadvantage; and the capital letters, an advantage. That is, for the Gender–Geography Gap squared score, x indicates female, X indicates male; y indicates rural, Y indicates urban. xy indicates male rural people, xY indicates female urban people, and so forth. To calculate this metric for non-binary variables, we simply took the most and least privileged groups.
- 9 Here, “o” represents the privileged reference group used in the logistic regression: 15–35 year old urban males of the general caste; “i” represents populations who differ from this reference group in only one dimension (for example, 36–50 year old urban males of general caste); and so on.
- 10 For instance, Alcott and Rose (2017) find that gender makes a bigger difference among socio-economically disadvantaged children. Women from disadvantaged castes are doubly burdened by patriarchy and caste hierarchy; this compounding disadvantage has been the subject of academic research for decades (Dunn 1993). Interestingly, while many would expect gender and religion to also act synergistically—specifically, for there to be greater gender inequality within the Muslim community—our study found the converse. The gender gap for Muslims was 6 percentage points (male: 63%, female: 57%), compared to an overall gender gap of 12 percentage points; in our second logistic regression the interaction term between minority and female was a remarkable -0.258 . Other studies have found, similarly, that there is a smaller gender gap among Muslims (Asadullah et al 2014).
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Appendix 1: Survey Form

Cell ID _____ S. No. _____

Target Population Survey (TPS) (TPS अभियान प्रपत्र)

To identify persons who are illiterate and enrol them for literacy.

GLOBAL DREAM
LIFE FOR EVERY BODY

Section A

1. परिवार के मुखिया का नाम _____ 2. पिता/पति का नाम _____

3. ग्राम पंचायत का नाम _____ 4. राजस्व गाँव/मजरा/वाई का नाम _____ 5. मकान नं. _____

6. विकास खण्ड _____ 7. जनपद _____ 8. सर्वे की तिथि _____

Section B

1. परिवार में कुल सदस्यों की संख्या 2. परिवार में (6-80) वय वर्ग के सदस्यों की संख्या

3. नाम (सिर्फ 6-80 वय वर्ग) सदस्य 1 सदस्य 2 सदस्य 3 सदस्य 4 सदस्य 5 सदस्य 6

4. आगु लिंग (महिला/पुरुष)

5. दिए गए सैमल को पढ़ने का स्तर (A, B या C)

6. क्या आप वर्तमान समय में अध्ययनरत हैं? यदि हाँ, तो किस कक्षा में हैं? हाँ/नहीं कक्षा _____

7. आप किस प्रकार के विद्यालय में अध्ययनरत हैं? (1 से 6)

8. यदि 14 वर्ष से बड़े हैं तो क्या आप पूर्व में कभी पढ़े हैं? यदि हाँ, तो किस कक्षा तक? हाँ/नहीं कक्षा _____

9. यदि स्कूल नहीं जा रहे हैं तो क्या स्कूल जाना चाहेंगे? यदि निश्चय है तो क्या आप साक्षर बनना चाहते हैं? हाँ/नहीं यदि नहीं, तो कारण _____ (1 से 3)

10. आपके लिए पढ़ने का सबसे उत्तम समय कौन सा है? सुबह दोपहर शाम

11. यदि आप 6-14 वय वर्ग के हैं और विद्यालय नहीं जाते हैं तो कारण? (1 से 17)

12. यदि आप हाईस्कूल जतीर्ण हैं तो क्या आप निम्नलिखित को पढ़ाने हेतु वॉलन्टीयर बनना चाहेंगे। हाँ/नहीं

13. व्यवसाय (1 से 9)

Section C

1. परिवार का प्रकार श्याई धर्मतु ईंट मट्टे पर काम करने वाला फेरीवाला अन्य _____

2. मातृभाषा (घर का भाषा) हिन्दी उर्दू बँगला अन्य _____

3. धर्म हिन्दू मुस्लिम सिक्ख इंसार्इ अन्य _____

4. समुदाय सामान्य अन्य पिछड़ा वर्ग अनुसूचित जाति/जन जाति (SC/ST) अन्यसंख्यक

5. मोबाइल नं.

6. घर के मुखिया से पूछें कि क्या वह साक्षरता ड्रैमलेब खोलने के लिए इच्छुक है (3 से 6 महीने तक)? यदि हाँ तो कहां पर? हाँ नहीं परा _____

Section D

1. सर्वेक्षकर्ता का नाम _____ 2. पद _____ 3. विद्यालय _____

4. परिवार के मुखिया/सदस्य का इस्ताखर/अंगूठा निशान _____ 5. सर्वेक्षकर्ता का हस्ताक्षर _____

6. सर्वेक्षकर्ता का मो. नं.

Appendix 2: Raw Data

			Literate			Illiterate			Total		
			15–35	36–50	51–60	15–35	36–50	51–60	15–35	36–50	51–60
SC/ST	F	Rural	56,390	6,705	1,124	38,240	28,335	9,864	94,630	35,040	10,988
SC/ST	F	Urban	13,726	3,613	1,097	5,746	4,124	1,514	19,472	7,737	2,611
OBC	F	Rural	63,641	10,979	2,627	26,494	23,153	8,334	90,135	34,132	10,961
OBC	F	Urban	25,947	9,313	3,202	7,063	5,467	1,988	33,010	14,780	5,190
Minority	F	Rural	14,221	2,315	495	9,276	5,784	1,992	23,497	8,099	2,487
Minority	F	Urban	17,621	4,729	984	7,053	4,458	1,408	24,674	9,187	2,392
General	F	Rural	20,473	6,889	2,068	3,497	3,364	1,440	23,970	10,253	3,508
General	F	Urban	16,678	6,403	2,152	2,990	2,292	1,051	19,668	8,695	3,203
SC/ST	M	Rural	78,530	20,517	5,134	31,259	21,160	9,015	1,09,789	41,677	14,149
SC/ST	M	Urban	14,485	5,375	1,452	4,978	3,302	1,265	19,463	8,677	2,717
OBC	M	Rural	82,178	25,744	7,514	20,774	15,076	6,422	1,02,952	40,820	13,936
OBC	M	Urban	27,048	11,217	3,174	5,846	4,070	1,701	32,894	15,287	4,875
Minority	M	Rural	17,626	4,849	1,398	8,712	5,230	1,954	26,338	10,079	3,352
Minority	M	Urban	17,476	7,305	2,004	7,368	4,559	1,438	24,844	11,864	3,442
General	M	Rural	23,898	9,686	3,318	3,105	2,198	876	27,003	11,884	4,194
General	M	Urban	17,172	8,425	2,810	2,505	1,859	803	19,677	10,284	3,613

Appendix 3: Logistic Regression without Interaction

Literacy_assign	Coefficient	Std Err	z	F>z	[95% Conf Interval]	
Gender_assign	.6169965	.0043606	141.49	0.000	06084498	.06255431
Rurality_assign	.4830995	.05510591	93.64	0.000	.4729878	.4932112
Cast_assign						
SC_ST	1.305756	.0080416	162.37	0.000	1.289995	1.321518
OBC	.7836592	.0079878	98.11	0.000	1.7680034	.799315
Minority	1.293251	.0090612	142.72	0.000	1.275491	1.31101
Age_assign						
51–60	1.39798	.0075393	185.43	0.000	1.383204	1.412757
36–50	1.053222	.0448844	215.63	0.000	1.043649	1.062796
_Cons	-2.667582	.0086812	-307.28	0.000	-2.684597	-2.650567

Appendix 4: Logistic Regressions with Variable-pair Interaction Terms

	Without interaction	Gende–Geography	Gender–Caste	Gender–Age	Geography–Caste	Geography–Age	Age–Caste
Variables							
Female	0.62	0.30	0.49	0.4	0.62	0.62	0.62
Rural	0.48	0.26	0.48	0.49	0.06	0.25	0.48
SC/ST	1.31	1.31	1.19	1.32	1.01	1.31	1.01
OBC	0.78	0.79	0.68	0.80	0.47	0.78	0.73
Minority	1.29	1.29	1.36	1.31	1.04	1.28	1.07
51–60	1.40	1.40	1.40	1.15	1.40	0.95	0.61
36–50	1.05	1.05	1.05	0.78	1.06	0.70	1.20
Interactions							
Female*rural		0.42					
Female*SC/ST			0.21				
Female*OBC			0.19				
Female*minority			-0.16				
Female*51–60				0.52			
Female*36–50				0.56			
Rural*SC/ST					0.47		
Rural*OBC					0.52		
Rural*minority					0.44		
Rural*51–60						0.63	
Rural*36–50						0.5	
51–60*SC/ST							0.67
51–60*OBC							0.36
51–60*minority							0.13
36–50*SC/ST							0.48
36–50*OBC							0.33
36–50*minority							0.11