A Needs Assessment of Charnia, Haryana in Rural India Reveals Significant Socioeconomic and Health Disparities in a Local Geographical Area

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Objectives: The authors of this study conducted a needs assessment in rural Haryana, India to compare health-related perceptions and practices between two populations in the same location: migrant brick laborers (BL) and rural non-brick laborers (NBL).

Methods: Data was collected from interviews with 187 households, which were randomly conducted within the Charnia village and three adjacent villages. The survey used in the interview addressed demographics, education, income indicators, hygiene, general health and access to care and reproductive health.

Results: Sixty-six (35%) respondents classified themselves as BL, 102 (55%) as NBL and 19 (10%) did not provide a classification. Most (76%) BL and 41% of NBL reported having no education. Symptoms of illness such as cough, cold and fever were significantly higher in BL children under eight years old.

Conclusions: Socioeconomic, health and educational disparities exist within the same geographic location, as demonstrated by the significant differences between Charnia's BL and NBL, who reside in close proximity. As the BL population is mostly migratory, BL are unable to fully utilize local health and education infrastructure. Targeted health education programs designed to take place during the brick manufacturing season could help BL understand the consequences of any symptoms they may have, prevent chronic and infectious disease and improve the accuracy of self-reported data. Therefore, disparities must be targeted through a community-based approach that recognizes and addresses the varying population dynamics of BL and NBL in Charnia. Overall, health interventions in rural India must consider the characteristics of diverse population sub-groups in order to be effective and sustainable.

Introduction

Despite ongoing progress, widespread poverty persists in India, with 29.5% of the population living below the poverty line.[1] The World Health Organization (WHO) Southeast Asia region, which includes India, bears 40% of the global poor.[2,3] Poverty is especially prevalent in rural areas, where 77% of the Indian poor reside.[4]Social factors such as gender, literacy and disparities in land ownership exacerbate poverty in rural India; females, illiterate individuals and unskilled laborers are at a higher risk for poverty.[4] Studies in different countries have shown a strong association between poverty and ill health, the latter of which perpetuates the cycle of poverty.[5,6] Within a single community, groups with differing education levels and employment statuses may have varying health outcomes.

Household needs assessments can increase knowledge of current health standards and living conditions within a community. Therefore, needs assessments can be used to understand the community's level of health, literacy and perceptions of its own health problems.[7] This information can, in turn, influence policies to minimize health disparities and enhance healthcare infrastructure.[8]

We conducted a needs assessment in the area of Charnia, Haryana, to identify similarities and differences in health-related perceptions and practices between two different populations living in the same geographic location: migrant brick laborers (BL) and non-brick laborers (NBL). The Charnia area is unique in that it contains these two populations within the same geographical area. The overall goal of the needs assessment was not to compare and contrast the

Figure 1 Overview picture of Charnia village.

health practices of people of two different vocations (BL and NBL), but rather the different residence patterns of the two groups. BL are largely migrant workers who travel from Uttar Pradesh and Bihar to Charnia to work at the brick factory and later leave Charnia to return to their homes at the end of the monsoon season. The NBL population is a more permanent population that resides in Charnia year-round. Therefore, the Charnia area is unique in that it offers the opportunity to compare a migrant population subgroup with a stationary subgroup in one specific location. Through this study we hoped to supplement the literature with an analysis of disparities between two different subpopulations living in geographic proximity and to better understand how to design interventions targeting these communities. To our knowledge, this study is the first needs assessment of its kind in the region.

Figure 2 Overview picture of a brick laborer community.

Methods

Population

Charnia is a rural area in the North Indian state of Haryana (Figure 1), which has a population of 25 million. The Charnia region itself has a population of 13,600 people. The region includes the village of Charnia (population: 2,600) as well as several geographically proximal villages such as Kiritpur, Kherawali and Karanpor.[9] The study groups were BL living in informal settlements surrounding the brick factories, known as "brick zones", of 50-100 laborers and NBL living in permanent villages. These groups were chosen because they live in the same geographical area (Figure 2).

Survey Development

We designed a survey using the WHO model for needs assessment.[10] The survey included questions on education, literacy, family demographics, material possessions, access to healthcare facilities, income stability, access to food and clean water, sanitation and hygiene, general health of self and family members, chronic and infectious disease prevalence, immunizations, trauma, injury, wound care and reproductive health (Appendix 1). The needs assessment was exempt from the Northwestern University Institutional Review Board.

Sampling Selection and Data Collection

Data was collected from August 19 to September 6, 2012 through household-level interviews. Households were classified into two strata: BL and NBL. Within each stratum, households within the Charnia village and three adjacent villages, Kiritpur,

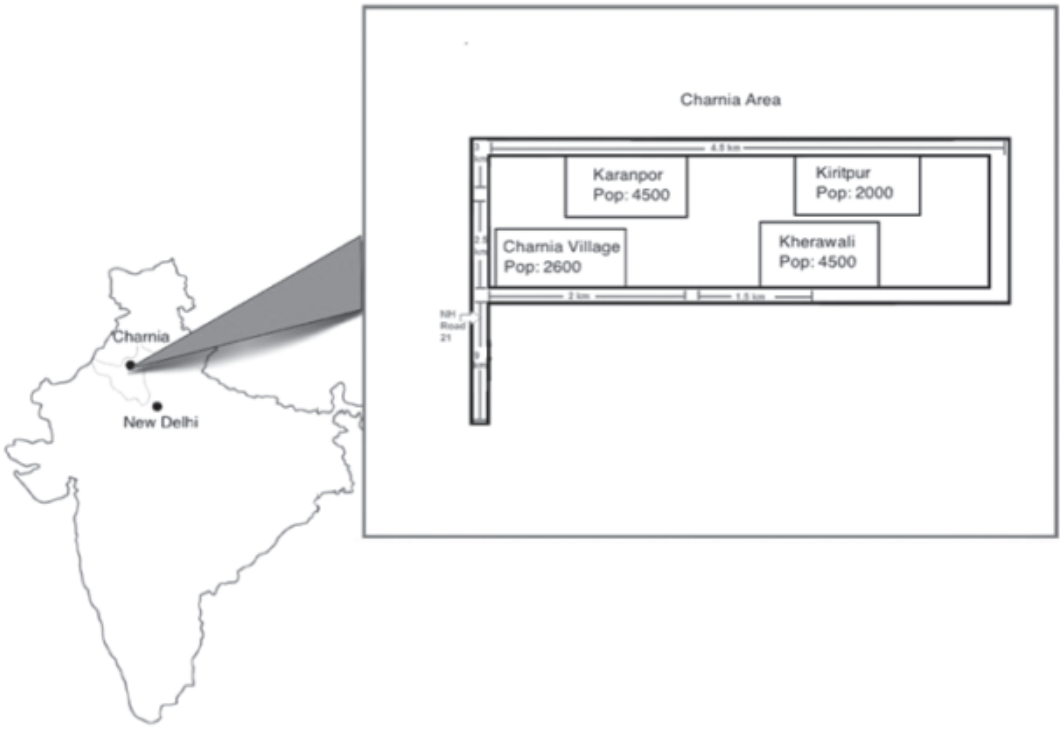

Figure 3 Map of the Charnia village and surrounding areas surveyed. The entire region surveyed shall be referred to as Charnia.

Figure 6 Picture of tube well.

Univariate analysis of categorical data between labor groups was conducted via Fisher's exact test and within groups via the one sample chi-square test. Univariate associations between groups of count data were reported as means and 95% confidence intervals (CI). Multivariate analyses involved Poisson regression when the response was count data and logistic regression when the response was binary. Least-square means and standard errors were obtained from Poisson regression; odds ratios and their 95% CI were reported from logistic regression analyses, where standard errors and CI were presented as measures of variation.

The relationship between the number of children in school and population type was determined by regressing the number of girls and boys in school on population type while controlling for children under five in the household, total number of children in the household and years of the parent's education.

Logistic regressions were carried out to determine the effect of availability of electricity and population type on the ownership of television, refrigerator and mobile phones while controlling for self-reported income variability. In order to isolate the effect of the number of years of education and respondent group on the number of children per family, a Poisson regression was applied. The status of BL was treated as a dummy variable; age and gender were controls. Using Poisson regression, the prevalence of diarrhea in children under eight years of age was regressed on respondent type. The researchers controlled for the total number of children in the household and number of years of education of the surveyed parent.

Kherawali and Karanpor, were then randomly sampled. These three villages, which were closest to the Charnia village, were included to obtain a larger sample size within the same geographical region. The entire region surveyed shall be referred to as Charnia (Figure 3).

Surveys were administered by a pair of surveyors: a speaker fluent in Hindi and a recorder to transcribe in English. Assessments were conducted in Hindi after obtaining verbal consent, and queries were directed to the primary caregiver in the household. Responses were transcribed onto a standard data collection form. For the culturally sensitive portions of the survey, including portions regarding reproductive and sexual health, the surveyor spoke with the individual in private.

Data Management and Analysis

Data was entered into a Microsoft Access 2010 (Microsoft Corporation, Redmond, Washington) database. Due to the small BL sample size, differences between the BL and NBL population of 15-20% could be detected at the 5% significance level with 80% power. Pearson Chi-Square analysis was conducted using SPSS Version 21 (IBM Corporation, Endicott, New York) to determine statistical differences in response to proportions between BL and NBL populations. Poisson and logistic regression analyses were conducted in SAS v9.4 (SAS Institute, Cary, North Carolina).

Table 1. Demographic characteristics of households surveyed in Charnia area, Haryana – 2012.

Demographic Characteristic	Total (%) N=187	BL (%) n=66	NBL (%) n=102	P-Value
Female	122(65.2)	-	-	-
Male	65(34.8)	-	-	-
No Education	92(57.5)	50(75.8)	42(41.2)	<0.0001
Completed Secondary Education	30(16.8)	9(11.5)	21(19.3)	0.03
Hindi/ Punjabi Literacy (Reading)	82(43.9)	21(31.8)	50(49.0)	0.04
Hindi/Punjabi Literacy (Writing)	79(42.3)	21(31.8)	48(47.1)	0.09

Table 2. Permanent income indicators of households surveyed in Charnia area, Haryana - 2012.

Material Possession	Total (%) N=187	Brick Laborer (%) n =66	Non-Brick Laborer(%) n=102	P-Value
Stove	92 (49.1)	19 (28.8)	60 (58.8)	<0.001
Refrigerator	80 (42.8)	10 (15.2)	61 (59.8)	<0.001
Television	144 (77.0)	43 (65.2)	84 (82.4)	0.048
Mobile phones	145(77.5)	49 (74.2)	80 (78.4)	0.85

Table 3. General health characteristics of households surveyed in Charnia area, Haryana - 2012.

Characteristic (at least one occurrence)	Total (%) N=187	BL (%) n=66	NBL (%) n=102	P-Value
Anemia	45 (24.1)	10 (15.5)	30 (29.4)	0.04
Hypertension	60 (32.1)	13 (19.7)	38 (37.3)	0.053
Typhoid Fever	44 (23.5)	21 (31.8)	19 (18.6)	0.09
Hypotension	34 (18.2)	7 (10.6)	21 (20.6)	0.13
Malaria	27(14.4)	14 (21.2)	12 (11.8)	0.13
Smoking	46 (24.6)	23 (34.9)	20 (19.6)	0.16

Table 4. Reproductive health characteristics of households surveyed in Charnia area, Haryana - 2012.

Reproductive Health	Total (%) N = 187	BL (%) n=66	NBL (%) n=102	P-Value
Midwife delivery at home	70 (37.4)	34 (51.5)	34 (33.3)	0.005
Hospital delivery	56 (30.0)	12 (18.2)	37 (36.3)	0.004
Iron supplementation during pregnancy	51 (27.3)	12 (18.2)	34 (33.3)	0.02
Regular periods	75 (40.1)	22 (33.3)	45 (44.2)	0.01
Cloth usage during menstruation	67 (35.8)	27 (40.9)	34 (33.3)	0.78

Results

Demographics and Education

One hundred and eighty-seven household-level interviews were conducted. The survey was administered to the individual in the household who obtained the water, cared for the children and assisted any sick family members; 122 (65%) respondents were female, 65 (35%) respondents were male and the median age of respondents was 35 (range 17-80 years). Sixty-six (35%) respondents classified themselves as BL, 102 (55%) as NBL and 19 (10%) did not identify with either group. Of NBL, 25% stated they were farmers (Table 1; Figure 4).

Most (76%) BL reported no education, as compared to 41% of NBL (p<0.0001). There was no statistically significant difference in primary education between BLs and NBLs; however, 12% of BL received a secondary education (10th grade, 12th grade and BA levels) as compared to 27% of NBL (p=0.03). Of BL respondents, 33% reported Hindi or Punjabi literacy versus 49% of NBL (p=0.04).

Female BL reported fewer years of education than NBL females (a 95% CI = [0.575, 3.07] for BL women versus [4.42, 7.06] for NBL women). Similarly, male BL had fewer years of education than male NBL (a 95% CI = [0.910, 5.17] for BL men vs. [3.12, 8.05] for NBL men).

Controlling for age and gender, BL had a significantly higher average number of children than NBL (2.0 vs. 2.8, p = 0.002). Education rates of children (dependents under 18 years) differed between groups. 51 (39%) BL male children were in school compared to 80 (61%) NBL male children (p=0.01); twenty-eight (33%) BL female children were in school compared to 56 (67%) NBL female children (p=0.002).

Permanent Income Indicators

BL were less likely to own stoves (p<0.001), refrigerators (p<0.001) and televisions (p=0.048). Both BL and NBL had simi-

lar access to mobile phones, with 80% of all households owning at least one mobile phone (p=0.85) (Table 2; Figure 5).

In both groups, the availability of electricity was associated with an increase in odds of owning a refrigerator (Odds Ratio (OR) and 95% CI: 11.02, 1.27-95.58, p=0.03) and with an increase in odds of owning a television (OR and 95% CI: 11.98, 2.46-57.40, p=0.002). Adjusting for electricity and fixed income, BL were significantly less likely to own a refrigerator (OR and 95% CI: 0.11, 0.05-0.27, p<0.0001) or television (OR and 95% CI: 0.30, 0.12-0.76, p=0.01) than NBL. However, no statistically significant difference was found between groups for the availability of electricity in correlation with the possession of mobile phones.

Sanitation and hygiene

No significant difference was found in sanitary or hygienic practices between BL and NBL. Teeth brushing and hand washing were found to be similarly prevalent in both groups. However, significantly fewer BL showered daily (33% vs. 57%, p=0.02). In addition, sources of drinking water differed between the two groups. The primary source of drinking water for NBL was municipal tap water (70%), while only 17% of BL had access to tap water (p<0.0001) (Figure 6).

General Health and Access to Care

While chronic disease rates were high in both groups, self-reported rates of anemia and hypertension were higher in NBL. Of all respondents, 24% reported that at least one household member suffered from anemia, 32% from hypertension and 18% from hypotension. Self-reported rates of anemia (16% vs. 29%, p=0.04) and hypertension (20% vs. 37%, p=0.053) were lower in BL.

No significant differences were found for self-reported disease rates of tetanus or tuberculosis between the two groups. Of all respondents, 24% reported at least one household member suffered from typhoid fever. Self-reported malaria rates were higher among BL (21%) compared with NBL (12%) (p=0.13).

Thirty-five percent of BL and 20% of NBL reported smoking unfiltered cigarettes (p=0.16) (Table 3; Figure 7).

Common symptoms of illness in children younger than eight years (such as cough, cold and fever) were significantly higher in BL (6.0 ± 0.3 in BL vs. 4.5 ± 0.3 in NBL, p = 0.001). For frequency of diarrhea in children under eight years of age, a positive, albeit insignificant, effect of BL status was observed (1.49 + 0.18 in BL vs. 1.14 + 0.15 in NBL, p = 0.15). The level of education of the parents had a significant impact on the prevalence of diarrhea

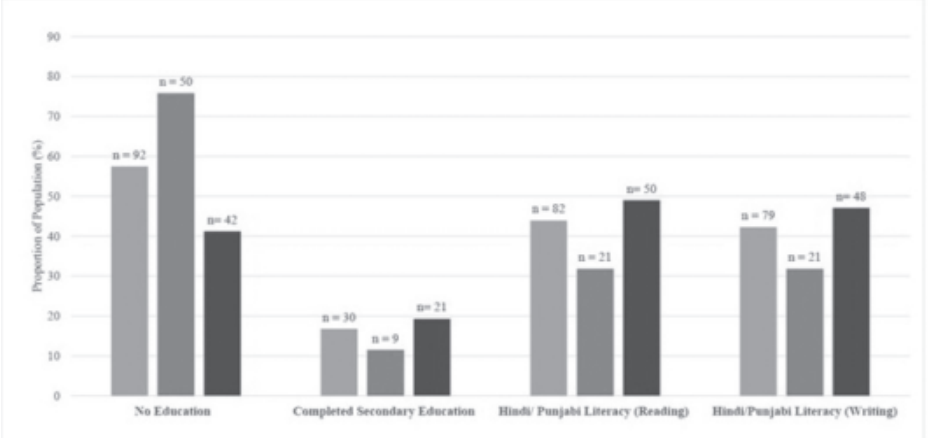

Figure 4. Demographic characteristics of households surveyed in Charnia area, Haryana – 2012.

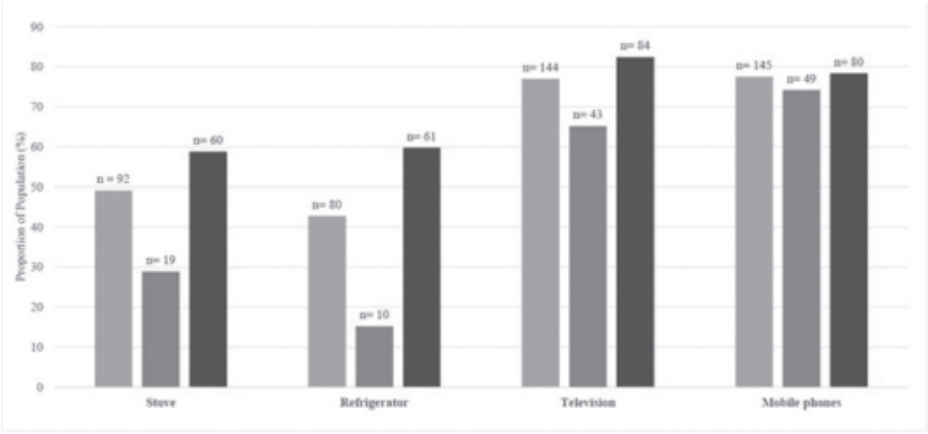

Figure 5. Permanent income indicators of households surveyed in Charnia area, Haryana - 2012.

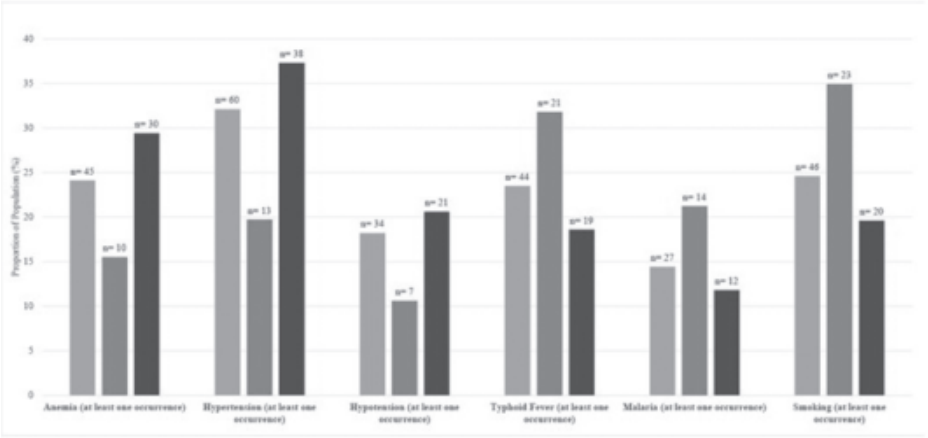

Figure 7. General health characteristics of households surveyed in Charnia area, Haryana - 2012.

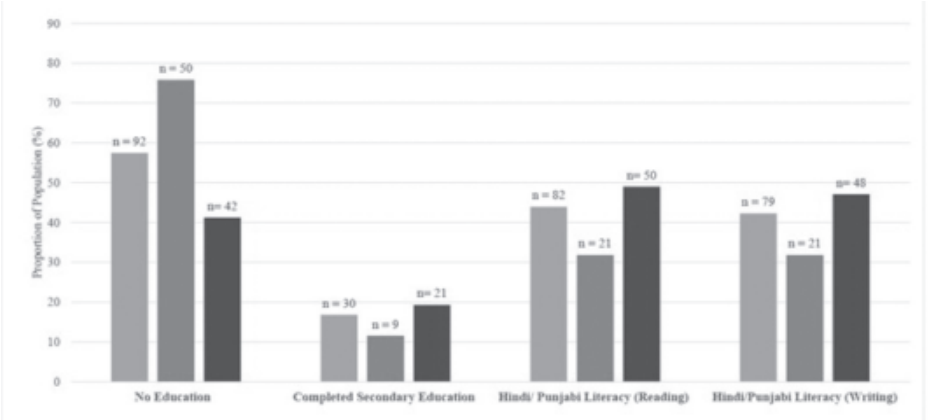

Figure 8. Reproductive health characteristics of households surveyed in Charnia area, Haryana - 2012.

in the children (p=0.045). Put simply, the population type did not have a significant effect on the frequency for diarrhea in children, but children whose parents had lower education levels demonstrated a higher frequency of diarrhea.

Reproductive Health

Females from the two groups demonstrated different prenatal care and delivery practices. Female BL (18%) were less likely to take iron supplementation during their pregnancies than NBL (33%) (p=0.02). Female BL (52%) were also more likely to deliver at home with a traditional birth attendant (33%) (p=0.005), while female NBL (36%) were found to be more likely to deliver in a hospital (18%) (p=0.004) (Table 4; Figure 8).

Menstruation cycle regularity differed between the respondent groups as well; 33% of female BL reported regular menstrual cycles versus 44% of female NBL (p=0.01). Cloth usage was regressed on respondent type while controlling for age and years of education; a 20% decrease was evident with every year increase in education (OR and 95%, CI: 0.80, 0.70-0.92, p=0.001).

Contraception use varied by group. Sixty percent of male BL were aware of condoms compared to 78% of male NBL. Twenty percent of male BL who were aware of condoms had used them versus 21% of male NBL (p =0.99). Of the female BL, 77% were aware of copper-T IUD and 7% of the total female BL population had used it. Of the female NBL, 86% knew of this contraceptive and 22% of all female NBL had used it (p=0.04).

Discussion

This household-level needs assessment offers a cross-sectional perspective regarding the demographics and health of two different groups within the same geographic location. Despite geographic proximity, the data indicate disparities in education, health and socioeconomic status corresponding to various classes of employment. The study strongly suggests that long-term and consistent access to education and healthcare play a role in the disparities that exist between BL and NBL.

Individuals were surveyed from multiple brick zones and residential villages within the Charnia area; the three adjacent villages had similar population compositions as the Charnia village. Accordingly, the needs assessment provided a representative cross-sectional perspective of the Charnia area's population subgroups of BL and NBL.

The study was limited by several factors. The absence of pre-existing literature meant that there was no data to which the results of this study can be compared. In addition, the survey had to be revised several times during fieldwork to remove inapplicable questions and reword questions for better phrasing. Some questions had variable response rates, particularly when the male or female head of the household was not present to answer gender-specific reproductive health questions. Future studies may attempt to decrease respondent recall bias (systemic error due to differences in how survey respondents remember information) by reorganizing questions and including fewer questions in the survey. Finally, because the study was not conducted during the brick-manufacturing season, the population sample size was limited by the relatively small BL population. The majority of the BL population comes from the surrounding states of Uttar Pradesh and Bihar. The BL population is highly migratory; individuals travel to the brick factories during the start of the brick-manufacturing season and leave during the monsoon season. The same BL may or may not return to Charnia during the next season. The high BL population turnover could affect the results, as the health indicators measured could vary from year to year as the population changes.

Data from Charnia are consistent with existing studies describing poor socioeconomic status in populations with lower education.[11,12] The results of this study indicate that BL are in general less educated than NBL; both BL children and adults had fewer years of attendance of formal schooling than NBL children, contributing to lower literacy rates. In addition, BL have fewer material possessions, indicating a difference in wealth.

Charnia's BL demonstrated a need for health education. Many of the BLs are from Uttar Pradesh and Bihar, which have the highest rates of health and education disparities in India.[13] As the BL population is mostly migratory, BL are also unable to fully utilize the health and education infrastructure in either their home or work states. Rates of chronic disease and infectious disease were similar between BL and NBL, but BL reported more symptoms of illness. Thus, BL may not be as knowledgeable about which diseases arise from those symptoms. Targeted health education programs designed to be completed before the end of the brick-manufacturing season could help BL understand the consequences of various symptoms, prevent chronic and infectious disease and improve the accuracy of self-reported data.

Community-based health education, with a focus on available prenatal resources, may also encourage and increase utilization of existing resources.[13] Although governmental programs exist to subsidize hospital deliveries and provide prenatal care by distributing iron and folic-acid supplements, few BL participate. This may be due to distrust in the public health system as well as their migratory lifestyle.[14] These governmental programs rely on following up with patients in person and on a regular basis; however, there is currently no centralized record of each follow-up visit. With the migrant BL population, continuous follow-up is difficult as the population moves. This issue can be alleviated through mobile health technologies and electronic medical record systems, which would allow government health workers to track patients and their health history as they change locations. In order to design an effective educational curriculum, follow-up studies should be designed to assess specific illnesses or conditions. For instance, a detailed survey on maternal/child health and nutritional behavior should include objective biomarkers like hemoglobin measurements, blood pressure and anthropometrics.

Studies have indicated the potential benefits of community health worker (CHW) programs, which can target educational and health disparitises.[15,16] CHW programs work by recruiting, training and educating community members to advocate for behavior change in their own communities. These studies have shown that CHW programs can increase the effectiveness of health interventions, especially those that target behavior change. For example, in Charnia, community members could advocate for preventive care and increase awareness, especially for programs targeting prenatal care in both the BL and NBL. Community-level interventions, such as increasing the rate of BL children attending school, may also help reduce other lifestyle disparities between BL and NBL.

Moreover, mobile health technology can enable health workers to assess and track prevalent conditions such as cardiovascular disease, malnutrition and anemia.[17,18,19] Mobile health technology has already been implemented in government health worker systems in India to help track patient health information and help improve communication between health workers in the field and government primary health centers. In this way, mobile technology can be used to connect government health

facilities and underserved rural areas. In Charnia, there was no difference in the possession of mobile phones between BL and NBL despite differences in income. Research on technology usage has shown that mobile phones are ubiquitous throughout India regardless of socioeconomic status.[20] Although further research must be conducted to analyze the reasons for this trend in Charnia, it may be hypothesized that BL utilize mobile phones to remain in contact with their family members in other parts of India. As such, interventions that specifically utilize mobile phones could be successful in reducing the health disparities in Charnia. For example, SMS reminders for medication adherence could be implemented. Follow-up research should further explore the feasibility of mobile health technology and CHW programs in Charnia.

Conclusion

Notable disparities can exist in the same geographical location, as demonstrated by the differences between Charnia's BL and NBL. Overall, BL had fewer material possessions, lower rates of education and lower rates of literacy compared to NBL. BL were also more likely to have a home birth delivery and less likely to have access to IFA supplementation during their pregnancies. Disparities such as these are linked to socioeconomic, health and educational differences, which can largely be associated with the BL population's migratory nature. BL's migratory lifestyle may pose challenges in obtaining medical care provided by the government, accessing continual health education, enrolling in schools and maintaining a stable income. These disparities must be targeted through a sustainable community-based approach that recognizes and addresses the varying population dynamics of BL and NBL in Charnia. Interventions targeting migrant populations specifically must be designed and implemented differently than interventions targeting more stable, permanent populations.

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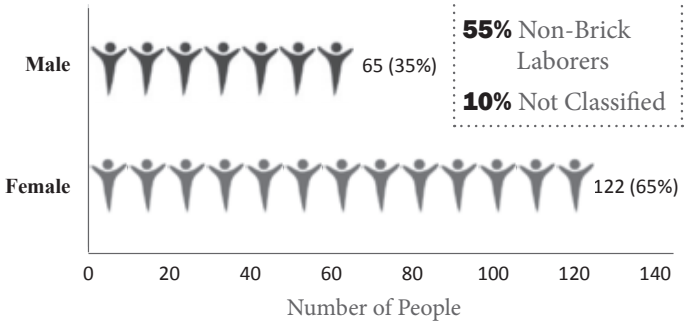
1 Population



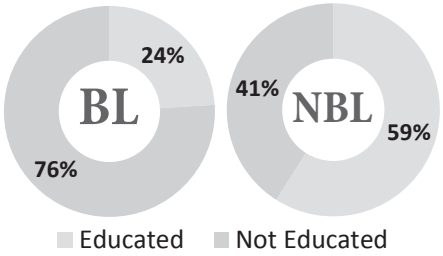
35% Brick Laborers

55% Non-Brick Laborers

10% Not Classified

2 Education

Fewer Brick Laborers are educated:



...and are less likely to have their children in school:

BL Boys **39%**
NBL Boys **61%**

BL Girls **33%**
NBL Girls **67%**

3 Possessions

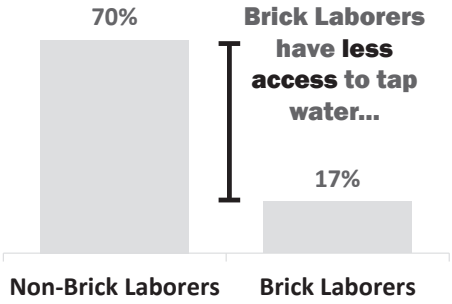
Non-Brick Laborers:

...after adjusting for electricity and fixed income, were...

3x MORE LIKELY to own a television

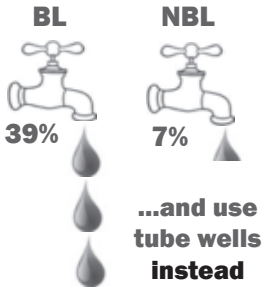
10x MORE LIKELY to own a refrigerator

4 Tap Water Access



Brick Laborers have less access to tap water...

Tube Well Usage:



...and use tube wells instead

5 Health Education

More Non-Brick Laborers self reported an illness:

24% Anemia → **16%** of BL **vs.** **29%** of NBL

32% Hypertension → **20%** of BL **vs.** **37%** of NBL

18% Hypotension

...but more Brick Laborer children had symptoms of illness:

BL 6 Common Symptoms of Illness

NBL 4.5 Common Symptoms of Illness

6 Women's Health

More Brick Laborers had irregular menstrual cycles:

67% BL Reported an IRREGULAR menstrual cycle

vs.

56% NBL Reported an IRREGULAR menstrual cycle

...and fewer took iron supplementation during pregnancy: