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Socio-economic Vulnerabilities to COVID-19 in India: Swimming against the Tide

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ABSTRACT

COVID-19 poses an unforeseen challenge to the world. The virus is testing the capacity of public health systems globally and their ability to respond effectively. India is no exception. The country has already witnessed more than 35,000 confirmed positive cases by the end of April 2020 and the number is fast rising despite strict measures by the government. The virus has reached every state and union territory of the country. In the absence of a drug or a vaccine, the only measure available to fight this deadly novel pathogen is to adopt changes in behaviours and lifestyle – physical distancing, frequent hand washing, and proper respiratory etiquette. The government has imposed lockdown to maintain social distance since 24th March 2020 but it cannot continue for long due to the immense loss of economy and livelihood. The country needs to learn to co-exist with the virus and embrace the prescribed measure of physical distancing, and handwashing even after the lockdown is lifted. Using data from the most recent Indian version of DHS, known as National Family Health Survey-4 , the paper examines how feasible for a country like India is to adopt these new norms where nearly half of the households (49%) are overcrowded with three or more people sleeping in a room, 35 percent households need to fetch water from outside for their daily usage and 38 percent have no toilet facility within the household premises. The paper uses multivariate analysis, Wagstaff's Concentration Index and decomposition to find out the extent of vulnerability across different socio-economic strata of the Indian population in adopting these safety measures to fend themselves from the corona infection. The paper acknowledges that widespread inequities and the invisible virus will coexist in India until a vaccine is found. The paper, in its closing recommends adopting focussed interventions with the most vulnerable groups, not only for changing their behaviour but also improving their access to basic services on a war footing with special focus at low income communities, who are socially deprived, and economically marginalized and living in resource poor settings in 53 million plus urban agglomerations of India.

Background and Rationale

The rapidly spreading severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which originated from Wuhan city in China was characterised as a pandemic by the World Health Organisation (WHO) in early March 2020. Initially not much could be said about the virus except for the fact that it was transmitted by direct exposure at the market and was highly infectious. The disease spread fast and engulfed about 185 countries or regions in a short period with countries reporting human-to-human transmission (Cohen and Kupferschmidt, 2020). The entire human population generally lacks immunity to SARS-CoV-2 and hence is susceptible to the novel virus. Even after months, there has been no substantial containment in geographical spread, mortality and economic loss caused due to the virus. Worldwide, the pandemic has engulfed 3,269,667 people and there have been 233,704 reported deaths as of 30th April 2020 (JHU CCSE, 2020). China being the epicentre of the pandemic witnessed the havoc first with a massive number of cases and deaths, later the disease spread to the entire world encasing almost all the major countries of the world US, Italy, Spain, Iran, UK France, India and many more (Khan & Fahad, 2020). Currently, the case-fatality ratio of the pandemic in the world is 7.1 percent. The United States has the maximum number of confirmed cases and deceased people due to the virus (JHU CCSE, 2020). The Indian sub-continent is not aloof to the disease. In India, as of 30th April 2020, a total of 35,043 confirmed cases and 1,154 deaths had taken place with the current case-fatality ratio of 3.3 percent (JHU CCSE, 2020). The Reproduction number is an indication of the transmissibility of a virus, representing the average number of new infections generated by an infectious person in a naïve population. The SARS-CoV-2 infection with its average Reproduction number ($R0$) to be 3.28 is much more infectious than any known virus around (Liu et al, 2020; Ryu et al., 2020). The SARS-CoV-2 infection has been found to affect elderly people with comorbidities and pregnant women more (Yi et al., 2020).

People who have weak immunity and who have been exposed to virus directly or indirectly have been found to have higher chances of being infected. The symptoms of the disease are similar as that of pneumonia, common flu such as fever, malaise, and cough (Guo et al., 2020; Singhal, 2020; Yi et al., 2020). Yet, it is a more severe illness with a greater risk of death particularly among the elderly and especially among those with other chronic underlying conditions (Zhou et al., 2020). The disease has an incubation period of 1-14 days and the advance stage of the disease have people exhibiting symptoms like acute respiratory distress syndrome, respiratory failure, multiple organ failure and eventually death (Guo et al., 2020). However, not all the affected people show symptoms of the disease. There are asymptotic carriers of the disease who do not have any visible symptoms but, they are the possible carriers of the infection (Ryu et al., 2020). For this one way out is testing but again there are constraints such as; only limited availability of testing kits and other health resources. The COVID-19 is contagious during the latency period and is highly transmissible in humans, especially in the elderly and people with underlying diseases. The overall case fatality rate of 2019-nCoV as estimated by international

experts ranges from 3 percent to 14 percent (Ryu et al., 2020). The case-fatality ratio is less than that seen in two recent epidemics due to SARS-CoV-1 and Middle East respiratory syndrome (MERS)-CoV, but it is more concerning because the observed characteristics of this virus are greater transmissibility and rapidity of the spread (Chowell, 2015). Various predictions have been made for the spread of COVID-19 including by a leading Harvard epidemiologist Marc Lipsitch who warned that the coronavirus would infect up to 70 per cent of humanity within a year (HTHC, 2020).

The vaccine remains the only solution that ends the global COVID-19 epidemic. Yet, until now, no vaccine is available for this disease; clinical trials are going on to develop a vaccine for the deadly coronavirus. However, as put forward by the WHO and other experts developing and approving the use of a vaccine is a lengthy process and it will take at least 18 months before such a vaccine is available. Hence, to limit the spread of this disease, it is important to not only treat the infected but also take immediate steps to prevent further spread of it since it is highly infective. And, if the spreading continues, this can lead to stage 3 or 'the community transmission' of the disease which makes it impossible to track and contain the source (Singh & Adhikari 2020). Given, there are no approved treatments for this infection currently; there are various non-pharmaceutical interventions (NPIs) to keep the exponential rise of the disease in check. The measures include maintaining social distancing, repeated hand hygiene, respiratory etiquettes etc. Avoiding contact with those infected with COVID-19, refraining from non-essential use of public transport, working from home and avoiding gatherings, socializing and visiting other places where infections can spread easily. Hand hygiene and respiratory etiquettes are individual-oriented actions. Hence, the health officials and the government have widely propagated these manners (Bhatia, 2020). It is well established that if these measures are promptly and effectively implemented during a pandemic, disease transmission can be reduced. The therapeutic strategies to deal with the infection are only supportive, and prevention aimed at reducing transmission in the community (Singh & Adhikari, 2020).

Flattening the curve of the exponential growth of the COVID-19 cases is important because if the outbreak becomes severe in a country like India then it can prove to be devastating as it will be overwhelming for the health system to handle. It will lead to a huge shortage of health workers and essential supplies like Personal Protective Equipment (PPEs), masks, oxygen, ventilators, testing kits, among others. Considering our population size and existing health facilities the problem can be compounded even further. As per the National Health Profile-2019, there are 713,986 total government hospital beds available in India, which amount to be 0.55 beds per 1000 population and around 915 government allopathic doctors per 10,00,000 population. With a population of 1.35 billion, and with much less number of hospital beds and health care physicians, not overwhelming the hospitals is the first and the foremost crucial step that the country could take and gradually prepare for the emerging cases of the disease (Bedford et al., 2020; Singh at al., 2020). These differentials will be even more glaring in rural areas compared with urban areas. Keeping the directives of the WHO and the healthcare

professionals in view, the Indian government proposed an initial complete lockdown of 21 days from 24th March 2020 and later extended it to two more weeks till 3rd May 2020 (IANS,2020). The government has completely shut its borders, put in place restrictions on inbound travel, suspended all visas except diplomatic visas, and quarantined the travellers who came to the country (Bajpai, 2020). Additionally, tt has been actively trying to make people understand the importance of social distancing and self-quarantining for preventing the spread of the virus and has been creating isolation wards, arranging testing kits, identifying as well as providing fast-track provision of medical facilities to those who have symptoms. All public transport including the rail, inter-state bus services and metro services have also been suspended. The masses have been encouraged to maintain personal hygiene (washing hands frequently with soap and water for 20 seconds or using alcohol based hand sanitizer (WASH practices), mandatory use of facemask in case one has any of the symptoms, covering the face with handkerchief while sneezing and the most important, to follow social distancing (Prem et al., 2020).

The importance of social distancing as a tool to limit disease transmission is well recognized, but there are several difficulties associated with this measure in a country like India. There are challenges in ensuring social distancing, especially in densely populated urban slums in Indian cities where people helplessly occupy and live together in small overcrowded and poorly ventilated homes (Bhatia, 2020). Accessibility to clean water for maintaining proper hygiene, as well as usage of soap as recommended, is also an issue. Given the Indian scenario, it would be worth delving deeper whether the proposed measures could actually be practised in a developing country like India.

Research Questions and Objectives

The COVID-19, which is not randomly distributed in the population but is being transmitted through human contacts, can be contained by ensuring social distancing and hand hygiene practices, which are the two key behavioural interventions in addition to the above-discussed structural and ecological interventions promoted by the Governments and hordes of civil society organizations. The lockdown of a country or some selected states/districts in a country can be treated simply as a pause to shift the severity of the problem by breaking the chain of transmission but it may not be the permanent solution to ensure preventive practices including social distancing. Keeping this in view, the key research question to be addressed in this study is the extent of vulnerability for a substantial proportion of Indians, who are socially deprived, economically marginalized and not been part of inclusive development, in adopting the protective measures against COVID-19. The specific objectives of this paper are to analyse the major barriers in ensuring social distancing and hand hygiene practices, and to examine the socio-economic inequalities in adopting preventive practices for COVID-19 in India.

Data and Methods

The study utilized data from the fourth round of the Indian DHS, popularly known as National Family Health Survey (NFHS), which is a cross-sectional survey conducted during 2015-2016. NFHS is

conducted under the stewardship of the Ministry of Health and Family Welfare (MoHFW), Government of India. The survey provides information on demographic and health indicators at the national, regional, state and district levels from a nationally representative sample. NFHS-4 (2015-16) collected information from a total of 601,509 households and 699,686 women aged between 15-49 years (IIPS and ICF, 2017). Different rounds of NFHS have been a key source of information on household assets, WASH, household environment and other socio-economic and developmental indicators, which are used in evidence based decision making in the country. Other relevant information regarding the study design and response rates in the NFHS-4 can be obtained from Demographic and Health Surveys website (IIPS and ICF, 2017)

Among the various analytical approaches used in this paper, the first one is descriptive statistics to analyse the variation in household crowding as an indicator of vulnerability to maintain social distance and availability of soap or detergent at the place designated for hand washing in a household as an indicator of hand hygiene by some selected background characteristics. In addition, multivariate logistic regression technique has been used to analyse the adjusted effects of various predictors on the response variables. The study further calculated the Wagstaff's Concentration Index and decomposition to investigate the inequalities in the prevalence of preventive practices for COVID-19 measured in terms household crowing, water source outside household premises and not having toilet within household as the barrier to maintain social distancing. Socio-economic inequalities in barriers and preventive practices for COVID-19 were quantified with the concentration index and subsequently decomposed into associated factors using Decomposition Analysis. A concentration index (CI) provides a measure of socioeconomic inequality in the variables under study. It ranges from -1 to +1: a value close to zero indicates near equality, a value near -1 shows a greater concentration of the study variable among the poor (pro-poor) while a value increasing to +1 indicates greater concentration amongst the wealthier groups (pro-rich). The CI is calculated as twice the area between the concentration curve and the line of perfect equality, or as twice the weighted covariance between the outcome variables and the fractional rank in the wealth distribution divided by the mean of study variable. The present study used the concentration index to access the socio-economic inequality in vulnerability to protection from COVID-19 measured in terms of household crowding and presence of soap or detergent for hand washing at the place designated for hand washing in a household. The concentration index can be defined merely as twice the covariance between the study variables, (y: let household crowding) of individual i and the ranking of the socioeconomic status, r, divided by the mean of the study variable (μ):

$$CI = \frac{2}{\mu} \mathrm{cov}(y_i, r_i) \qquad \ldots\ldots\ldots\ldots (1)$$

This is the widely used measure because it ranks the individual across SES, sensitive to changes in population distribution across SES and they can assess relative and absolute socioeconomic inequality (Kakwani et al., 1997; Wagstaff et al., 1991).

Even though concentration indices are relevant to show the extent of socioeconomic-related inequalities in variables under study, but it cannot explain the factors that contributed to observed disparities. Therefore, the study used the regression-based-decomposition methodology to decompose the concentration index to explain the socio-economic inequality as vulnerability to protection from COVID-19. As the outcome variable of this study is continuous; therefore, study used linear probability model to decompose the concentration index. Thus, the expression of the model is- -

$$y_i = \alpha + \sum_j \beta_j \, x_{ji} + u_i$$

Here β_j is the probability of protection from COVID, associated with j determinants. The CI_y can be decomposed as follow-

$$CI_y = \sum_j \left(\beta_j \bar{x}_j / \mu_y\right) CI_{x_j} + \frac{CI_u}{\mu_y}$$

where the second term on the right-hand side represents income-related socio-economic inequality in outcome variable that is not explained by systematic variation in x's by income. However, we are interested in the first term on the right-hand side of the equation, which represents the contribution of each determinant to CI(y)

Results and Discussion

It is needless to mention that maintaining social distancing, constant use of mask at public places and hand hygiene are some of the means to curtail the spread of COVID-19 and protect the general population. However, the most recent demographic and health data of the country paints a complex and discouraging picture to ensure these behavioural changes. It is evident from Table 1 that nearly half of the households in the country (49%) suffer with problem of overcrowding with three or more people per room used for sleeping. Proportions of such households were significantly higher in rural areas (51%), and in the socially deprived and economically marginalized communities, (53%-56% scheduled caste/tribe households; 55% Muslim households, and 62% poorest households). Other two indicators adversely affecting social distancing in these communities are location of the source of drinking water outside household/dwelling/yard (35%) and no toilet facility within the household premises (38%). Despite all the structural interventions, people will move out for using these two facilities and hence, would be more vulnerable to adhere to the protocols of social distancing as the means of protection

from COVID-19. The pattern in this vulnerability to protection through social distancing is not uniform across different Indian states (Fig.1). The proportion of households with household crowding was the highest in Uttar Pradesh (61%) followed by Maharashtra (58%), Bihar and Gujarat (56% each), Telangana (55%), Madhya Pradesh (54%), Andhra Pradesh (53%), Mizoram (51%), Delhi (48%), Odisha (47%) and Chhattisgarh (45%). Similarly, the proportion of households with source of water located outside household/yard/plot was the maximum in Odisha (68%) followed by Chhattisgarh (65%) Jharkhand (64%), Madhya Pradesh and West Bengal (55% each) and Telangana (45%). Most of these states have significant proportion of tribal population living in remote rural areas, who are socially deprived, economically marginalized, have poor or no access to healthcare, and hence, may require special focus particularly in the later stages of community transmission of COVID-19 in India.

The second important means of protection from COVID-19 is the hand hygiene with well-defined guidelines about frequency and modalities to wash hands with soap or detergent and sanitize with alcohol based sanitizers. NFHS-4 (2015-16) data, however, portrays that despite over 96 percent of households having a designated place for hand wash, almost one-in-seven households did not have water available and over one-in-three households did not have soap or detergent at the place designated for hand wash. Proportion of such households were significantly higher in rural areas (18% and 49%), scheduled tribe households (30% and 58%) and those coming from the poorer households (20% and 53%) and poorest households (32% and 73%) respectively. Regional variation in the proportion of households lagging in the basic facilities to ensure hand hygiene by its members demonstrate comparatively larger concentration of such households in the eastern part of the country (23% and 57%), comprising of Bihar, Chhattisgarh, Jharkhand, Odisha and West Bengal. Fig.2 presents the percent of households whose members are highly vulnerable to ensuring hand hygiene as a means of protection from COVID-19 in different States/UTs. It portrays that people in Odisha (43%), Jharkhand (41%), Chhattisgarh (29%), Tripura (25%) and West Bengal (22%) were the highly vulnerable to hand hygiene due to non-availability of water in their houses. Further, a substantial proportion of households in Odisha (65%), Jharkhand (64%), Tripura (51%), West Bengal (50%), Tamil Nadu (48%) and Madhya Pradesh (40%) did not have soap or detergent at the place designated for hand wash in their houses. Therefore, members of these households may be highly vulnerable in adopting hand hygiene practices to protect themselves from COVID-19 in the third stage of transmission at community level. Thus, all the agencies engaged in curtailing the chain of transmission and protecting people from COVID-19, especially in the third stage of transmission, should adopt suitable strategies to address the vulnerability of socially deprived and economically marginalized communities in protecting themselves. This can be done by motivating them to adopt micro level social distancing even within their households to the extent possible and developing a support system and creating an enabling environment to practice hand hygiene.

More refined effects of these predictors on response variable, which are related to various guidelines to follow for containing the spread of COVID-19 can be obtained only after computing the adjusted effects of these predictors on response variables. Table 2 portrays the Logistic regression odds ratios for the adjusted effects of some selected socio-economic characteristics on the vulnerability to infection from COVID-19, India. As far as social distancing is concerned, people from the richest wealth quintile (OR=0.14; 95% CI= [1.141-1.148]) were much less likely to live in a crowded home compared to people from poorest wealth quintile. Compared to Urban area, rural people (OR=0.67; 95%CI= [0.666-0.685]) were less likely to live in a crowded home. People from non-SC/ST and non OBC caste category (OR=0.65; 95%CI= [0.643-0.667]) and other backward caste (OR=0.86; 95%CI= [0.850-0.876]) were 35 percent and 14 percent, less likely to live in crowded setup respectively as compared to those from Scheduled Caste. In comparison to Hindu family, Muslim family (OR=1.63; 95%CI= [1.609-1.670]) were more likely to live in a crowded setting. In addition, people from other religion (OR=1.09; 95%CI= [1.072-1.117]) were 9 percent more likely to live in crowded space. The people from northern region (OR=0.58; 95%CI= [0.571-0.598]) were 42 percent less likely to live in a crowded setting as compared to people from eastern region and people from western region (OR=2.00; 95%CI= [1.962-2.040]) were twice more likely to live in a crowded setting as compared to eastern people. These findings are consistent with the reported number of CORONA positive cases in India, in the absence of population based testing, which are disproportionately higher in million plus cities in the country with larger concentration in Mumbai, Delhi, Ahmedabad, Indore, Bhopal, Jaipur, Agra, Lucknow etc. The situation is further threatening with larger number of CORONA hotspots centred on slum pockets in these million plus cities.

Availability of water at place of hand wash is an important predictor of protecting from the vulnerability to infection. The richer people (OR=7.77; 95% CI= [7.34-7.56]) had more water available at place of hand wash in comparison to the poorest. The rural people had 18 percent less likelihood of water available to them at place of hand wash. The people from other caste (OR=1.42; 95%CI= [1.110-1.174]) were likely to face the problem of water unavailability at the place of hand wash in comparison to people from scheduled caste. In comparison to Hindus, Muslims (OR=1.24 95% CI= [1.207-1.282]) were 1.2 times more likely to have water available at place of hand wash and the people from other religion (OR=1.34; 95%CI= [1.304-1.391]) were more likely to have water available at place of hand wash too. The central region people (OR=1.33; 95% CI= [1.300-1.366]) were more likely to have water available at their place of hand wash as compared to people from eastern region. Similar was the case for people from southern region (OR=1.31; 95%CI= [1.282-1.357]). The people from north east region (OR=2.06; 95%CI= [1.999-2.128]) too had water available to them more in comparison to people from eastern region.

Availability of soap or detergent at the place of hand wash as an indicator of hand hygiene portrays that the richer people were more likely to maintain hand hygiene (OR=10.64; 95% CI= [10.410-10.880]),

as compared to the poorest. The rural people (OR=0.71; 95% CI= [0.703-0.728]) were 29 percent less likely to maintain hand hygiene as compared to urban people. In comparison to people from scheduled caste, people from other caste (OR=1.22; 95%CI= [1.196-1.248]) were more likely to maintain proper hand hygiene. In comparison to Hindus, Muslims (OR=1.13; 95% CI= [1.114-1.164]) were more likely to maintain hand hygiene. The northern region people (OR= 2.24; 95% CI= [2.187-2.298]) were more likely to maintain hand hygiene as compared to the eastern region people. The people from the southern region (OR=0.90; 95%CI= [0.888-1.928]) were 10 percent less likely to maintain hand hygiene as compared to people from eastern region. Those from north-eastern region (OR=2.24; 95%CI= [2.187-2.298]) were more likely to maintain hand hygiene as compared to people from eastern region.

Further, it is evident from Figure-3 that household crowding was concentrated mostly among poor households [CI: -0.14], whereas, hand wash with use of soap or detergent was concentrated among rich households [CI: 0.23]. Therefore, it is essential to decompose the contribution of different predictors in the overall value of CIs. Table 3 provides the results of decomposition analysis for the estimated contribution of selected background characteristics in the economic inequalities of household crowding, as a proxy of vulnerability to social distancing and availability of soap or detergent for hand-wash as a proxy of maintaining hand hygiene. The value of absolute contribution indicates the extent of inequality contributed by the explanatory variable. A negative value of CI indicates that the households with the characteristics in question were highly represented among poor. In case of household crowding, it is evident that crowding was more concentrated in poor than in rich households. Urban place of residence explained about 35 percent of the gap for economic inequality in terms of household crowding, whereas Scheduled Caste/Scheduled Tribe explained about 28 percent of the gap pertained by economic inequality between rich and poor. Additionally, possession of Below Poverty Line (BPL) card explained about bout 28 percent of inequality. About 17 percent of gap for economic inequality for household crowding was explained by location of water source outside the house/plot/yard. Western region of India narrowed down the gap between rich and poor i.e. -14 percent of gap was explained by western region to explain the inequality for household crowding.

On the other hand**,** availability of soap or detergent for handwashing, which is an essential component of maintaining hand hygiene was much more concentrated in richer households than among poorer households. Around 47 percent of inequality was explained by urban place of residence, whereas Scheduled caste/Scheduled tribe explained 11 percent of gap. About 11 percent of gap in economic inequality for availability of soap or detergent for handwashing was explained by location of water source outside the house. About 12 percent and 9 percent of inequality were explained by southern and western region of India to explain the gap between rich and poor in terms of use of soap and detergent for handwashing. These findings indicate that all the efforts to curtail the COVID-19 transmission chain may not be effective once the period of lockdown is over, which is not possible to be extended for an indefinite period. However, these structural barriers will restrain people in following the stringent

measures of social distancing, which is mandatory in the absence of any vaccination or other forms of proper treatment.

Conclusions and Recommendations

Today the world is facing unprecedented crisis many countries were taken unaware and have failed terribly in containing the spread of the COVID-19. Initially, these countries did not recognize the gravity of the situation and ended up not only suffering from huge economic losses but also witnessed the loss of human lives. India is a vast and diverse country both demographically and geographically and hence, handling such a crisis is a challenge in itself. This deadly virus has no boundaries and transmits from one human to another and the carriers may not necessarily show any symptom indicating of its presence. Hence, India should educate and make the masses aware of the preventive measures and ensure that each one should religiously follow those before it goes completely out of our hands. This pandemic has been an eye opener and has taught us many lessons. An important one being that we should learn to coexist with nature and not exploit it to the extent that we end up paying a huge price that may be no less than our own existence. Despite all the efforts to curtail the chain of transmission of COVID-19, the socio-economic vulnerability of people to protection strategies is enormous and hence may demand for decentralized planning to protect people from being infected. A sincere focus should be on the 53 million plus urban agglomerations in India that has substantial proportion of population living in slums, known for lack of basic infrastructure, poor social fabrics and various forms of social exclusions.

There is an urgent need to adopt suitable strategies to address the vulnerability of socially deprived and economically marginalized communities to protect themselves by motivating them to adopt micro level social distancing even within their households to the extent possible, developing a support system and creating enabling environment to practice hand hygiene. Another strategy to curtail the chain of transmission may be decongesting urban slums in all the 53 million plus urban agglomerations by arranging temporary shelter homes outside cities and developing adequate quarantine facilities. Further, increasing use of technology to track the mobile population suffering with COVID-19, putting them in quarantine and strengthening testing facilities adopting a community based randomised sampling design may be some of the key strategies to minimize the vulnerability of Indians to COVID-19

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Table 1: Percent of households (HHs) whose members are highly vulnerable to ensure social distance and hand hygiene as the means of protection from COVID-19 in India, NFHS-4

Background Characteristics	Vulnerability to maintain Social Distance			Vulnerability to maintain Hand Hygiene		
	% of HHs with three or more members per room used for sleeping	% of HHs having water source located outside HH/ dwelling plot	% of HHs having no toilet facility within HH	% of HHs not having any designated place for hand wash	% of HHs with non-availability of water at the place of hand wash	% of HHs not having soap or detergent at the place of hand wash
Place of Residence						
Urban	43.5	20.4	10.5	2.4	6.3	17.5
Rural	51.3	42.9	54.1	3.7	18.0	47.8
Caste/Tribe						
SC	55.7	41.9	50.5	3.8	17.8	44.9
ST	53.4	59.9	65.6	4.6	29.7	58.2
OBC	49.3	33.1	40.4	2.9	12.2	37.0
Others	41.2	24.6	19.8	2.6	8.0	23.3
Religion						
Hindu	48.3	37.0	42.5	3.2	14.7	38.5
Muslim	55.2	25.7	24.1	3.8	9.9	32.5
Others	39.0	27.8	20.9	2.4	11.2	27.5
Wealth Quintile						
Poorest	62.2	56.9	88.1	5.8	32.1	72.5
Poorer	56.8	47.4	62.7	4.0	19.6	53.3
Middle	52.6	37.7	35.4	2.9	11.9	36.2
Richer	44.6	23.7	7.8	2.1	5.4	19.5
Richest	27.1	9.7	0.4	1.4	1.3	5.9
Region						
North	52.7	25.8	37.8	2.0	8.9	24.0
Central	51.7	39.3	57.6	2.6	21.2	44.4
East	48.1	43.8	51.5	5.1	23.4	57.3
North East	27.5	21.0	8.7	6.5	13.8	42.2
West	55.9	22.4	33.1	2.4	10.1	25.4
South	41.3	38.0	31.3	3.1	10.6	37.5
India	**48.6**	**35.1**	**38.9**	**3.2**	**13.9**	**37.1**

Table 2. Logistic regression odds ratios for the adjusted effects of some selected socio-economic characteristics on the vulnerability to infection from COVID-19, India.

Covariates	Household crowding as barrier in ensuring social distancing			Availability of water at place of hand wash			Likelihood of hand hygiene		
	OR	CI with 95%		OR	CI with 95%		OR	CI with 95%	
Wealth Index									
Poorest®									
Poorer	0.71*	0.70	0.73	1.82*	1.79	1.86	2.36*	2.32	2.41
Middle	0.52*	0.51	0.53	3.39*	3.32	3.48	4.98*	4.89	5.08
Richer	0.34*	0.34	0.35	7.77*	7.52	8.03	10.64*	10.41	10.88
Richest	0.14*	0.14	0.15	33.75*	31.66	35.9	28.50*	27.63	29.40
Place Of residence									
Urban®									
Rural	0.67*	0.67	0.69	0.82*	0.86	0.90	0.71*	0.70	0.73
Caste									
SC®									
ST	0.76*	0.75	0.78	0.72*	0.70	0.74	0.93*	0.91	0.95
OBC	0.86*	0.85	0.88	1.22*	1.19	1.24	1.12*	1.11	1.15
Others	0.65*	0.64	0.67	1.42*	1.11	1.17	1.22*	1.19	1.25
Religion									
Hindu®									
Muslim	1.63*	1.61	1.67	1.24*	1.21	1.28	1.13*	1.11	1.16
Others	1.09*	1.07	1.12	1.34*	1.30	1.39	1.61*	1.57	1.65
Region									
East®									
West	2.00*	1.96	2.04	1.60*	1.56	1.65	2.021*	1.98	2.07
North	1.67*	1.64	1.70	2.01*	1.97	2.07	2.805*	2.75	2.86
South	1.22*	1.19	1.25	1.31*	1.28	1.36	0.90*	0.89	0.93
North East	0.58*	0.57	0.60	2.06*	1.99	2.13	2.24*	2.19	2.29
Central	1.39*	1.37	1.43	1.33*	1.30	1.37	1.71*	1.67	1.75
Constant	2.00	1.96	2.05	1.47	1.42	1.52	0.26	0.25	0.27

Note: Log likely- Social Distancing -366965.64; Availability of water at place of hand wash -202114.78; Hand Hygiene -297336.45; *P<0.01

Figure 1: Percent of households whose members are highly vulnerable to ensure social distance as a means of protection from COVID-19 in different States/UTs of India, NFHS-4

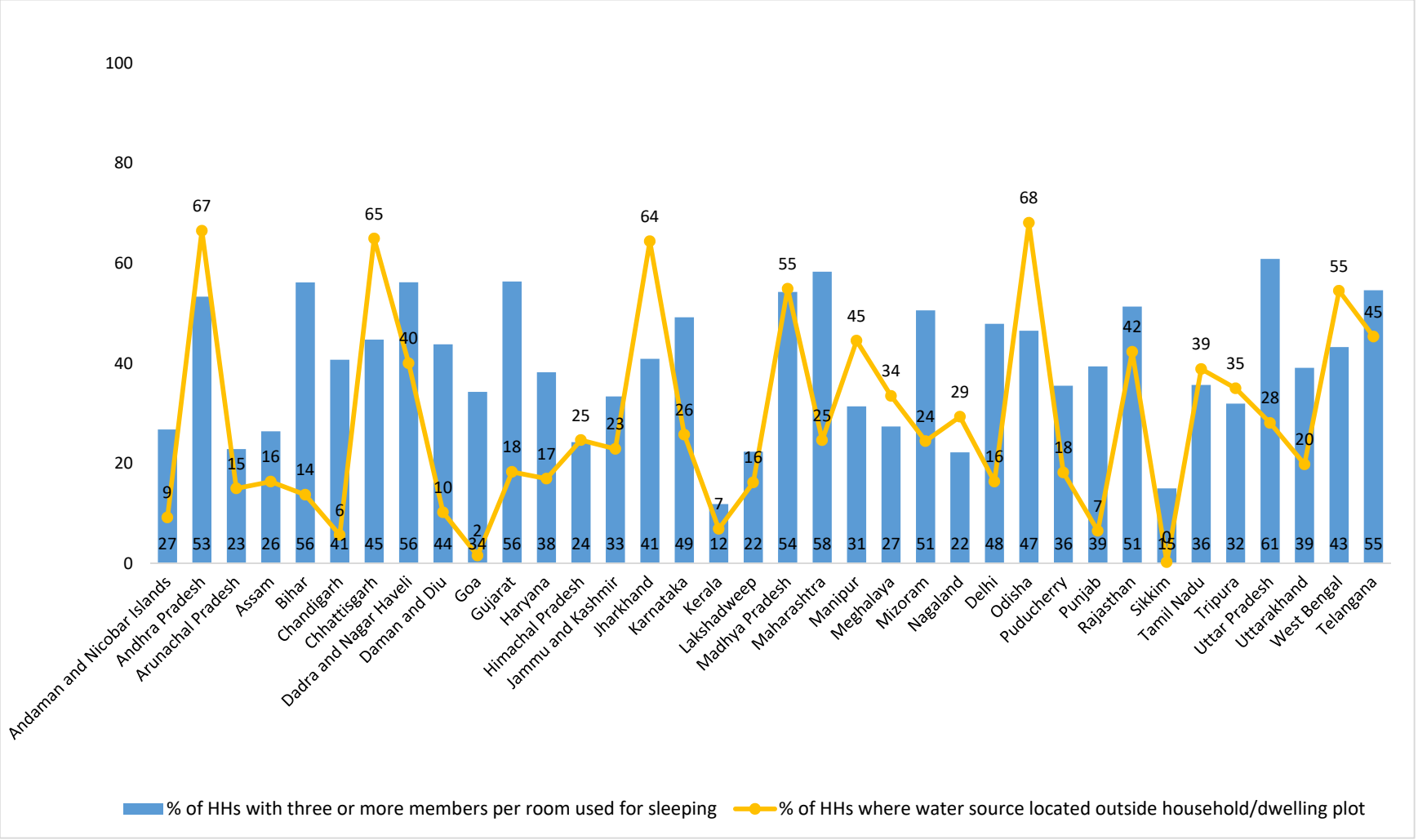

Figure 2: Percent of households whose members are highly vulnerable to ensure hand hygiene as a means of protection from COVID-19 in different States/UTs of India, NFHS-4

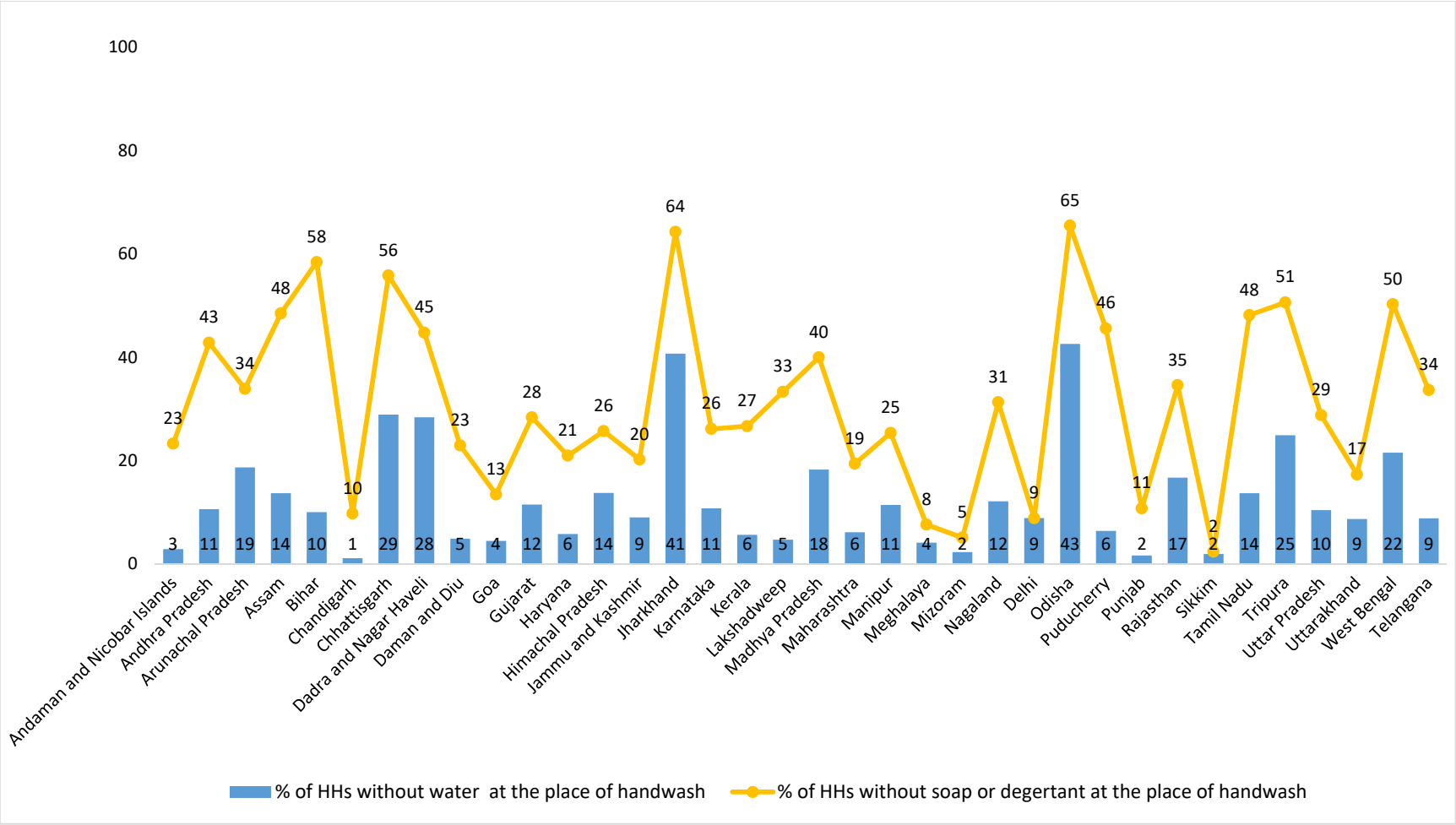

Figure 3: Concentration curve for Household crowding and Hand wash from soap or detergent among Households in India (NFHS-4)

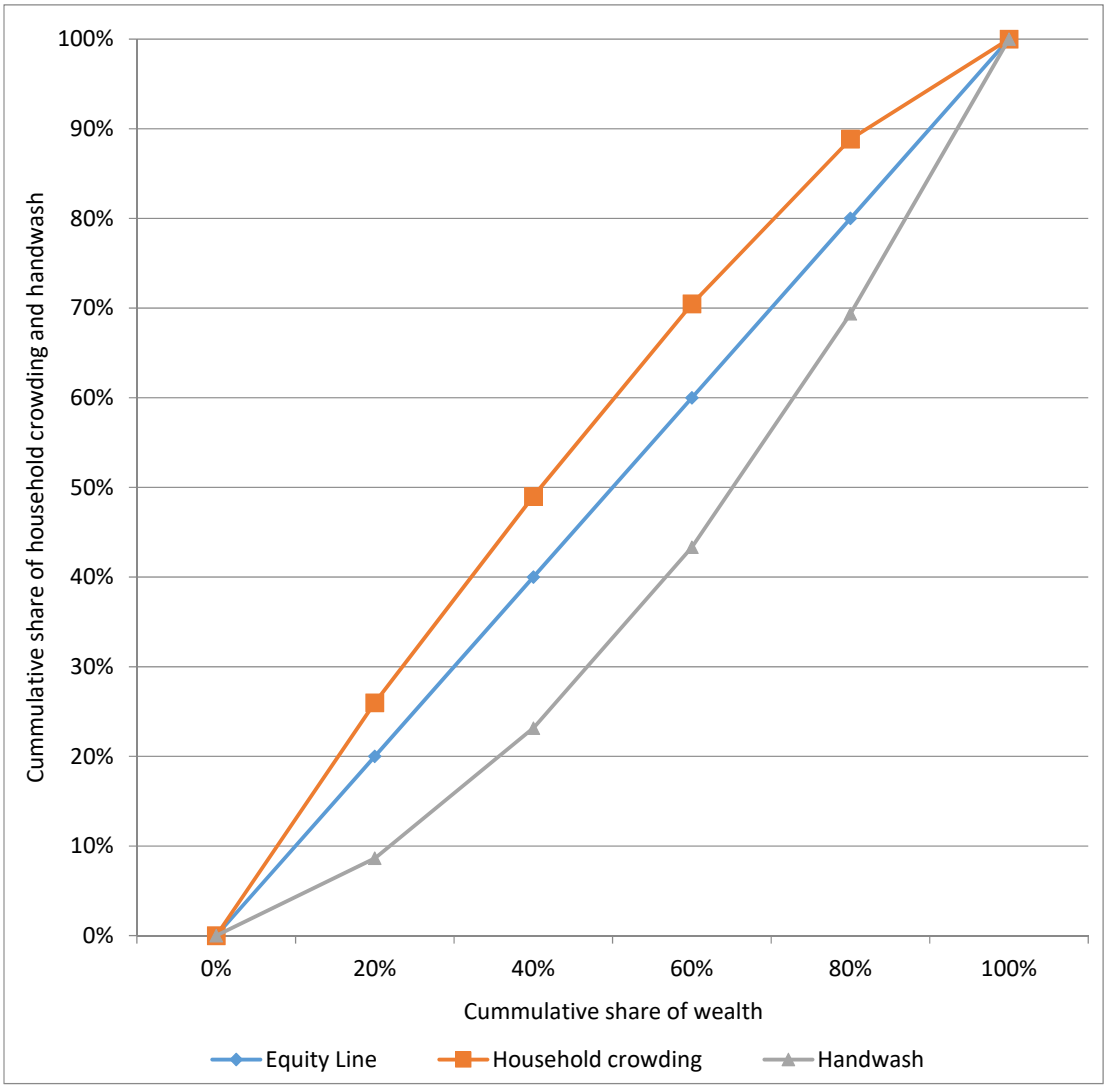

Table 3. Decomposition analysis for the contribution of selected background characteristics in the economic inequality in household crowding and availability of soap and detergent for Handwashing (NFHS-4)

Variables	Household Crowding				Use of soap and detergent for Hand-wash			
	Elasticity	CI	Absolute contribution to CI	Percent contribution to CI	Elasticity	CI	Absolute contribution to CI	Percent contribution to CI
Urban place of residence	-0.032	0.427	-0.014	34.7	0.125	0.427	0.053	47.3
SC/ST caste group	0.047	-0.236	-0.011	27.6	-0.054	-0.236	0.013	11.4
Muslim religion	0.028	0.001	0.000	0.0	0.002	0.001	0.000	0.0
Non-Hindu/non-Muslim religion	-0.011	0.239	-0.003	6.8	0.008	0.239	0.002	1.7
Possession of BPL card	0.053	-0.213	-0.011	28.1	-0.034	-0.213	0.007	6.3
Water source outside house/plot	0.061	-0.114	-0.007	17.3	-0.108	-0.114	0.012	10.9
Western Region	0.044	0.132	0.006	-14.3	0.079	0.132	0.010	9.3
Northern Region	0.054	0.067	0.004	-9.0	0.095	0.067	0.006	5.6
Southern Region	-0.025	0.215	-0.006	13.8	0.060	0.215	0.013	11.6
North-eastern Region	-0.015	-0.192	0.003	-7.0	0.006	-0.192	-0.001	-1.1
Central Region	0.004	-0.185	-0.001	2.0	0.019	-0.185	-0.003	-3.0
Explained CI			-0.040	100			0.112	
Actual CI			-0.145				0.230	
Residual			-0.105				0.118	