Understanding gendered challenges of noncommunicable diseases in the slums of India

Lumagbas, L.B.

2017

document version
Publisher's PDF, also known as Version of record

Chapter 3

Gendered associations of non-communicable disease risk factors in the slums of India

Abstract

The gap in the burden of non-communicable diseases (NCDs) between high- and low-income countries is closing, with the prevalence of NCDs rising rapidly in poorer countries. There is a growing recognition that slums contribute to this as locales of risk factors prevalence, yet little is known on the patterns of association that NCD risk factors take across demographic characteristics. This cross-sectional study measures the prevalence of sociodemographic, physical, and behavioural NCD risk factors in a slum in Chennai, India. The logistic regression identified patterns of risk factor association, particularly related to gender. Men, for example, were at higher risk of being hypertensive, while women were at higher risk of being obese, overweight and having an unhealthy diet and high waist-hip ratio. These findings suggest that gender can significantly influence the prevalence patterns of behavioural and physical NCD risk factors in slums, suggestive of a distinctive effect of slums on men and women. This may influence interpretations of the social determinants of health and risk factor interactions in slums. This links to the practical implications of the research, specifically that policies and programmes designed to mitigate NCD risk factors must account for gendered-specific risk factors.

3.1 Introduction

The gap in the burden of non-communicable diseases (NCDs) between high- and low-income countries is closing, with the prevalence of NCDs raising rapidly in poorer countries (WHO, 2011). Most of this change can be explained by population growth and longer lives (Mathers & Loncar, 2006), which together with inadequate and weakened healthcare structures in low- and middle-income countries (LMICs) (Agarwal, Satyavada, Kaushik, & Kumar, 2007; De Costa & Diwan, 2007) could paradoxically aggravate the impact of NCDs and their risk factors in slums. In 2010, it was estimated that 32.7% of the world's population was living in slums, with the number of slum dwellers in developing countries increasing from 767 million to 828 million between 2000 and 2010, and a projected increase to 889 million in 2020 in the absence of drastic measures (UN-Habitat, 2010).

Studies have shown that resident slum populations show a high prevalence of NCDs, such as diabetes (Ayah et al., 2013) and hypertension (van de Vijver et al., 2013). This follows from a high prevalence of risks factors associated with an urbanised population living in poor infrastructure, yet health in slums has also been shown to be strongly affected by gender (Anand et al., 2007; Yadav & Krishnan, 2008). While sex pertains to the physiological differences between male and female, gender concerns the cultural and social identities to which individuals are assigned. The complex relation between gender, health and NCDs is still debated, yet it seems that gender alters men's and women's NCD and risk factor associations.

The distinction between gender and sex and its relation to NCDs was illustrated by Wells' et al. (2012) study showing, using mixed methods, that women were more prone to obesity than men – though not due to physiological experiences but rather the different lives they experience in poverty. Connell (2012) posited that the relationship between gender and health must consider the social processes and dynamics that link them, rather than biological differences alone. Dolan (2013) cites the perceived differences between men and women in terms of self-control, societal expectations and hazards of work that yield unique behavioural and psychosocial factors that underpin the gender-differentiated lifestyle. Hence, any attempt to mitigate NCD risk factors must be responsive to gender differences in the population, or risk exacerbating gender or health inequalities further (Malmusi, Artazcoz, Benach, & Borrell, 2012).

Currently, studies regarding NCD patterns between men and women in LMICs are limited (Stroope, 2015). India, a low-middle income country, is burdened with continuing increases in NCD mortality and morbidity (Bloom et al., 2011), unabated slum formation (Kjellstrom & Mercado, 2008) and wide gender inequalities in health (Hausmann, Tyson, Bekhouche, & Zahidi, 2013). Thus, India makes a strong case for understanding the interaction between gender, NCDs and their risk factors in slums. This study intended to minimise the gaps in theoretical

understanding between gender, NCDs and slums as well as to improve the formulation and targeting of policies that relate to minimising NCD risk factors in slums.

The objective of this study was to compare the prevalence of the behavioural and physical risk factor patterns for NCDs in men and women living in Chennai slums. It is expected this will highlight how gender contributes to NCD risk factor patterns and raise questions on the specific life experiences of men and women who perpetuate this.

3.2 Materials and methods

A cross-sectional field study was performed in slum communities in Chennai, Tamil Nadu, India. Residents of the slum were asked to participate if they had lived there for a minimum of three years and were aged over 18. The data-collection instrument used was the WHO STEPWise approach to surveillance (STEPS), which was developed in 2000 to improve data collection on NCD risk factors in low- and middle-income countries (Armstrong & Bonita, 2003; WHO, 2005b) and has been validated in many contexts (Guthold et al., 2011). The instrument comprises a survey questionnaire that was used to collect data on sociodemographic characteristics, health behaviour, self-reported illness and health information. Two field workers fluent in Tamil, the slum community's language, were trained to use the instruments and collect data, following which 20 households were surveyed to pilot test the questionnaire. The first author and two field workers then began conducting face-to-face surveys in the slum communities. Households were visited systematically by soliciting successively all the residents of a particular 'street' of the slum on a given day. Overall, 640 residents participated in the survey from 10 November 2014 to 20 February 2015. For this study, 240 respondents (120 men and 120 women) from the initial 640 residents were selected. Self-reported non-diagnosis of NCDs at the time of data collection and exclusion of respondents who have self-reported existing NCDs are the primary inclusion and exclusion criterion.

The study protocol received ethical approval from the Institutional Review Board of the Balm Institute in Tamil Nadu, India. Community leaders were informed about the research, and data collection only started after their approval was gained. The purpose of the research and the procedures of the survey questionnaires were all verbally explained to the participants. Due to the low education level of the participants, verbal consent was solicited. No identifying information was collected.

3.2.1 Studied Variables

Sociodemographic Variables

One of the sociodemographic characteristics surveyed by the STEPS questionnaire is annual household income. This was aggregated into a measure of poverty, which could take two values: poor and low- or middle-income. This provides a rather crude measure of poverty: Deaton and Drèze (2002) asserted that poverty in India should be understood alongside education, nutrition and crime levels, while Patnaik cautioned against the use of official poverty lines as it was found that a rise in nutritional standards was behind recent declines in poverty in India. Mehta and Bhide (2010) called for the use of measurements not just on the basket of consumption but also geography, sociology, dimension and duration of poverty. Recognising the multifaceted complexity of poverty in India and the methodological difficulty accompanying its measurement, the World Bank's international poverty line (US$ 1.25/day) at the time was used. Preliminary research found that, on average, households comprised four income-generating residents. In this study, the category 'poor' thus corresponds to a household income of 85,000 Indian Rupees (INR) per year (~US$ 1327 per year) to 120, 000 INR (~US$ 1328 – 1874), and low- or middle-income to household incomes of at least 120,0001 INR.

Other sociodemographic variables collected by the STEPS survey that were modified include: marital status (single/widowed or married or in relationship with partner), level of education (no formal education, less than or part of high school, or completed high school), ethnicity (Tamil or other), and employment status of the interviewed residents (employed or unemployed) at the date of enrolment. Unmodified variables reported in the analysis include age in years as reported at the date of enrolment, and number of persons living in the household.

Behavioural Variables

Individuals overweight or obese, with a history of binge drinking, tobacco smoking, physical inactivity, or who have unhealthy diet are recognised at higher risk of developing NCDs (WHO & Food and Agriculture Organization of the United Nations, 2003). In this study, the following NCD risk factors were explored: tobacco consumption, alcohol intake, physical inactivity, and diet. These risk factors were measured using the STEPS survey and re-coded for the analysis as follows: tobacco users were classified as *former/current users*, or *never users*; alcohol intake was considered by distinguishing *non-users* (0 standard drinks/day), *or moderate/binge* (>3 standard drinks/day). Although there was some variation in community, the conception of a standard drink used here equates to 0.5l of beer. Physical inactivity was defined as less than 25 minutes of vigorous activity three times per week (≤ 75 mins/week) or, as less than 60 minutes of moderate activity five times per week (≤ 300 mins/week). Participants who met neither of these thresholds were considered to be physically inactive. Nutritional data were also recoded. The India's National Institute of Nutrition (2011) recommends ≥ 400 grams of fruit and vegetables every day

or an average of five servings per day. While most inhabitants of Chennai are vegetarian, these thresholds of consumption were used to identify participants at risk because of unhealthy diet.

Physical Variables

An additional module (Step 2) of the STEPS survey was used to perform physical assessments of participants. Heart rate and blood pressure measurements were taken using Omron HEM 7124. Two blood pressure measurements were taken across a 15-minute interval. Weight was measured using Omron HN 286. The weight scale was placed on an even and horizontal surface, and participants were asked to remove their slippers. Waist and hip measurements were also taken using a standard tape measure. According to India's National Institute of Nutrition (2011), participants with a body-mass index (BMI) equal to or greater than 25 are classified as overweight, and obese if their BMI is equal to or higher than 30. Participants whose BMI was below 18 were categorised as underweight. To code for hypertensive risk, two categories were used: normal (105-139/60-89 mmHg)/ and hypertensive (≥ 140/90 mmHg) (WHO, 2013).

3.**2.2 Quantitative Data Analysis**

Prior to the analysis, variables were examined using SPPS through various data-management steps. The data were examined for accuracy of entry, missing data and their distribution. Missing data are excluded from the analysis. We based our decision on the randomness of the missing data (or probable likelihood of randomness), the amount of missing values, and the reason behind why it is missing, e.g. lack of information.

Characteristics of male and female residents were described in terms of numbers and proportions for qualitative variables, and in terms of median and InterQuartile Range for quantitative ones. To compare characteristics between groups, exact Chi^2 was used for qualitative variables, and Wilcoxon's test for quantitative ones. A multivariate logistic regression model was used to identify all NCDs risk factors independently associated with gender; results were expressed in terms odds ratios and associated 95% confidence intervals. Data analysis was performed using SPSS version 23.0 (IBM Corp: Armonk, NY).

3.3 Results

A summary of the sociodemographic characteristics of the study population is presented in Table 1. Of the 240 total respondents, 75.1% were aged under 50, 92.9% were Tamil, and 69.4% were married. Lack of formal education appeared more frequent in slum women than men, which was reported in 29.2% and 3.4% respectively. In terms of employment, 77.4% of men were employed

whilst 58.0% of women were homemakers. An overview of the continuous variables for physical and behavioural risk factors is shown in Table 2.

Table 1. Socio-demographic characteristics of study participants (n =240)

Variable	Total (%) n=240	Women (%) n=120	Men (%) n=120	P-value
Sample Characteristic				
Age				
18-33	97 (40.9)	43 (35.8)	54 (46.2)	0.1981
34-49	81 (34.2)	47 (39.2)	34 (29.1)	
50+	59 (24.9)	30 (25.0)	29 (24.8)	
Missing			3	
Education Level				
Primary-Secondary	136 (57.1)	58 (48.3)	78 (66.1)	<0.001
No Formal Education	39 (16.4)	35 (29.2)	4 (3.4)	
Completed High School	63 (26.5)	27 (22.5)	36 (30.5)	
Missing			2	
Ethnicity				
Tamil	223 (92.9)	117 (97.5)	106 (88.3)	<0.01
Other	17 (7.1)	3 (2.5)	14 (11.7)	
Marital Status				
Single or widow	72 (30.6)	30 (25.2)	42 (36.2)	0.09
Married or living together	163 (69.4)	89 (74.8)	74 (63.8)	
Missing		1	4	
Work Status				
Self-employed or salaried	139 (59.4)	50 (42.0)	89 (77.4)	<0.001
Unemployed†/Homemakers†	95 (40.6)	69 (58.0)	26 (22.6)	
Missing		1	5	
Household Members				
≤4	179 (82.5)	93 (82.3)	86 (82.7)	0.95
≥ 5	38 (17.5)	20 (17.7)	18 (17.3)	
Missing		7	16	
Income				
≤ 85,000 INR (BPL)	153 (96.2)	74 (92.5)	79 (100)	0.02
> 85,001	6 (3.8)	6 (2.9)	0 (0)	
Missing		40	41	
Behavioural Risk Factors				
Tobacco use (smoking)				
Never user	197(80.5)	100 (100)	77 (64.2)	<0.001
Former or current	43(19.5)	0	43 (35.8)	
Missing		20	0	
Tobacco use (others)				
Never user	218(90.8)	110 (91.7)	108 (90.0)	0.82
Former, Current	22(9.2)	10 (8.3)	12 (10.0)	

Alcohol				
Never	181(76.1)	118 (98.3)	63 (53.4)	<0.001
Binge or moderate	57(23.9)	2 (1.7)	55 (46.6)	
Missing		0	2	
Diet				
Healthy	67(28.0)	10 (84.0)	57 (47.5)	<0.001
Unhealthy	172(72.0)	109 (91.6)	63 (52.5)	
Missing		0	1	
Physical Activity				
Active	171(73.1)	86 (71.7)	85 (74.6)	0.66
Inactive	63(26.9)	34 (28.3)	29 (25.4)	
Missing		0	6	
Physical Risk Factors				
BMI				
Normal or underweight	138(57.5)	54 (45.0)	84 (70.0)	<0.001
Overweight or obese	102(42.5)	66 (55.0)	36 (30.0)	
Waist-hip Ratio (WHR) *				
Low - Moderate	181(78.4)	23(20.0)	94 (81)	<0.001
High	50(21.6)	92 (80.0)	22 (19)	
Missing		5	4	
Blood pressure				
Normal or pre-hypertension	164(69.2)	89 (74.2)	75 (64.1)	0.12
Hypertension	73(30.8)	31 (25.8)	42 (35.9)	
Missing		0	3	
Heart rate				
≤ 100	212(89.5)	108 (90.8)	104 (88.1)	0.53
≥ 101	25(10.5)	11 (9.2)	14 (11.9)	
Missing		1	2	

Table 2. Continuous variables of behavioural and physical risk factors

Physical activity		n	Median	IQR
Vigorous	F	120	120	0 -4200
	M	120	0	0 - 5400
	T	240	100	0 - 5400
Moderate	F	120	285	0 -3360
	M	120	90	0 - 2100
	T	240	180	0 -3360
Travel	F	120	275	0 -2100
	M	120	420	0 -5040
	T	240	315	0 -5040
Sport Vigorous	F	120	0	0 -90
	M	120	0	0 -1680
	T	240	0	0 -1680

Sport Moderate	F	120	0	0 -360
	M	120	0	0 -1680
	T	240	0	0 -1680
BMI	F	120	26	17 - 37
	M	120	23	15 -37
	T	240	25	15 -37

Smoking was only reported in men, with all female participants stating they had never smoked. Although some of the women used smokeless alternatives, the number was still negligible. Similarly, alcoholism was predominantly observed among male slum dwellers, 46.6% of whom were moderate or binge drinkers compared to the 1.7% of women. There was high prevalence of unhealthy diet according to Indian recommendations that affected both men and women. However, women were significantly more likely to eat unhealthily than men (91.6% vs. 52.5%; $p < 10^{-3}$).

Contrary to general perceptions, the results showed a high prevalence of physical activity among slum residents: 74.6% for men and 71.7% for women although p is not significant at 0.66. However, there was a notable difference in the sources of physical activity between slum men and women. Travel-related activity and sports are the primary sources of physical activity for men while for women work is the main source.

The summary of physical risk factors across men and women showed a significant difference, 30.0% and 55.0% respectively, concerning the prevalence of overweight and obesity. Likewise, 19% of slum men compared with 80.0% of slum women had a high waist-hip ratio (WHR), which is a known risk factor for developing cardiovascular diseases (CVD) (National Institute of Nutrition 2011). Conversely, more men were found with hypertension (35.9%). For women, 25.8% had hypertension with 126/80 as the group's mean blood pressure.

Crude and adjusted results of the comparative analysis are detailed in Table 3. The sociodemographic variables show that men were more likely have completed high school (OR 0.99: 95% CI 0.54, 1.82) and to be from different ethnicity is (OR 5.12: 95% CI 1.38; 28.52) compared to women. And after adjusting to all these variables, AOR for education (AOR 1.97: 95% CI 0.71, 5.64) and ethnicity (AOR 1.02: 95% CI 0.20, 6.02) remains significant respectively. In terms of work status, compared to men, women are more likely to be unemployed/homemakers (OR 0.21: 95% CI 0.11; 0.39) even after adjustments (AOR 0.19: 95% CI 0.07; 0.49).

Under behavioural risk, the odds of being a moderate or binge drinker are (OR 50.78:95%CI 12.68; 443.33) respectively higher among slum men than women even after adjustments (AOR 36.16: 95% CI 8.41; 264.68). Conversely, women are more likely to have unhealthy diet

0.10 (0.04; 0.22) physically inactive (OR0.86:95%CI0.46; 1.60). After adjustments, women remain more likely to have an unhealthy diet 0.14 (0.04; 0.38) compared to men, although men were more likely to be physical active (AOR1.18: 95% CI 0.45; 3.05). It is also noteworthy that concerning physical risk factors, the odds that men were more likely to be hypertensive and burdened with faster heart rate were (OR 1.60:95%CI 0.89; 2.92) and (OR 1.36 95% CI 0.45; 4.15) compared to women. This remained even after adjustments: hypertension (AOR 1.36: 95% CI 0.45; 4.15) and heart rate1.41 (0.35; 5.81). On the other hand, the odds of being overweight or obese were more likely to be observed among women (OR 0.35:95%CI0.20; 0.62) after adjustments (AOR 0.36: 95% CI 0.14; 0.90) than men.

Table 3. Association between demographic characteristics, behavioural and physical risk factors and sex.

Demographics	Crude Odds Ratio (95%CI)	Adjusted Odds Ratio (95%CI)
Age		
18-33	Reference	
34-49	0.58 (0.32; 1.04)	1.01 (0.35; 2.95)
50+	0.77 (0.40; 1.47)	1.26 (0.37; 4.39
Education Level		
Primary - Secondary	Reference	
No Formal Education	0.08 (0.02; 0.23)	0.08 (0.01; 0.36)
Completed High School	0.99 (0.54; 1.82)	1.97 (0.71; 5.64)
Ethnicity		
Tamil	Reference	
Other	5.12 (1.38; 28.52)	1.02 (0.20; 6.03)
Marital Status		
Single or widow	Reference	
Married or living together	0.60 (0.33; 1.08)	0.40 (0.15; 1.05)
Work Status		
Self-employed or salaried	Reference	
Unemployed†/Homemakers†	0.21 (0.11; 0.39)	0.19 (0.07; 0.49)
Behavioural Risk Factors		
Alcohol		
Never	Reference	
Binge or moderate	50.78(12.68; 443.33)	36.16 (8.41; 264.68)
Diet		
Healthy	Reference	
Unhealthy	0.10(0.04; 0.22)	0.14 (0.04; 0.38)
Physical Activity		
Active	Reference	
Inactive	0.86(0.46; 1.60)	1.18 (0.45; 3.05)

Physical Risk Factors		
BMI		
Normal or underweight	Reference	
Overweight or obese	0.35(0.20; 0.62)	0.36 (0.14; 0.90)
Blood pressure		
Normal or pre-hypertension	Reference	
Hypertension	1.60(0.89; 2.92)	1.36 (0.45; 4.15)
Heart rate		
≤ 100	Reference	
≥ 101	1.32(0.53; 3.37)	1.41 (0.35; 5.81)

In general, there is a significant difference between men and women with regard to characteristic profiling their susceptibility NCDs and their risk factors. After adjusting to all these factors, marital status, ethnicity, alcoholism, blood pressure, and work status a slight decrease in AOR. Conversely, a minimal increase in the AOR of BMI, heart rate, blood pressure, and physical activity was observed. Nonetheless, these movements did not alter the significance of the identified important variables, namely, education level, diet, alcohol, BMI, and work status.

3.4 Discussion

The objective of this study was to compare the prevalence of some behavioural and physical risk factors for NCDs in men and women living in Chennai slums. Within sociodemographic risk factors, the lack of a formal education (29.2% vs. 3.4%) was observed more in women than men, with this difference being significant. This obvious difference heightens the fact that both men and women in slums are living in poverty, 100% and 92.5% respectively.

The survey also identified that an unhealthy diet was a behavioural risk factor common to most slum residents, affecting 91.6% of women and 52.5% of men in the sample. Contrary to common perceptions, there was a high rate of physical activity among slum residents: 74.6% of men and 71.7% of women engaged in vigorous (≥75 mins/week) or moderate (≥300 mins/week) weekly activities. The nature of their physical activity differed however, with travel and sports activities being predominantly male endeavours and physical activities at home being the main source of exertion for women.

WHR was more prevalent in women (80.0% vs. 19%). The higher prevalence of underweight among male participants is noteworthy given the previous studies showing this is more often observed in women (Patel, Narayan, & Cunningham, 2015). While more men were found to have hypertension (35.9%vs. 25.8%), men are also at higher odds of being hypertensive (1.36 OR, 95% CI 0.45, 4.15) and having faster heart rate (1.40 OR, 95% CI .34, 5.81) compared to women.

The observed differences between risk factor patterns for NCDs in men and women showed that gender-related lifestyles in slums could significantly affects the association of NCDs risk factors in individuals. This suggests that men and women face different life-related challenges and social expectations within slums, and thus tailored approaches to mitigate NCD risk factors would be needed for each gender. The literature provides some useful contributions to interpret these findings.

The high prevalence of risk factors for NCDs in urban slums has been reported in literature previously (Anand et al., 2007; Yadav & Krishnan, 2008). Studies have shown the association between low education and CVD (Yusuf et al., 2011), yet the lack of formal education amongst slum women observed in this study may be due to the lower priority attached to girls' education in some sectors of Indian society. In a qualitative study of girls' education in Delhi slums, Chugh (2011) inferred that the parents' and community's expectation of girls' primary role as a spouse, and subsequently, family caregiver led them to believe that educating girls is unnecessary. The finding that nearly 75% of women engaged in physical activities during the week contradicts previous literature, which suggests that men in urban poor communities were more likely than women to engage in physical activity (Anand et al., 2007; Kulkarni, 2012). Kulkarni (2013) suggests this was driven by the absence of cultural pressure for women to exercise in lower socioeconomic communities. In our study over half (58.0 %) of women identified themselves as homemakers, and that household chores comprise the majority, if not all, of the physical activity reported. The STEPS survey, however, does not capture this activity and link it to physical exercise, which is a criticism repeated in the literature (Anand et al., 2007). In a quantitative study assessing the connection between built environment and physical activities across social classes in Chennai, Adlakha, Hipp, and Brownson (2016) noted that travel activities were the major source of physical activity for people from lower classes. This study expands or qualifies this point by showing travel as a predominantly male activity. The long-term ethnographic study performed by Mandelbaum (1993) attributed this reduced physical activity via travel to the greater social seclusion experienced by Indian women.

Since the issue of overweight and obesity in slum women cannot be primarily attributed to a lack of physical activity, an unhealthy diet might constitute a better explanation. Similar findings have been observed by Alves, Figueiroa, & Alves (2011) in slums in Brazil. They quantitatively inferred that the kinds of food slum people eat is a significant factor contributing to obesity. The high WHR of slum women (80.0%) might be thus partly attributed to unhealthy diet.

Slum men however, more frequently experience smoking and alcoholism risks. Dolan (2013) highlighted the social pressure of 'being a man' in a patriarchal society, which acts to push men towards smoking and alcohol consumption. These social expectations act as a constraint for men to make healthy choices. In a qualitative study of the relation between hypertension and social seclusion of Indian women, Stroope (2015) observed that the more secluded the woman is, the

lower the risk of the husband being hypertensive. However, it should be borne in mind that high blood pressure is multifactorial. Unhealthy diet, just like stress, may influence it. Since men's role in India relates to protecting the family, women's mobility causes anxiety and stress. Stroope (2015) concluded that the weaving of gendered social practices and expectations can be damaging the health of Indian people.

The patterns of association of risk factors for NCDs by gender in Indian slums hold important theoretical and practical implications. It is suggestive of the possible distinctive effect of the slums on men and women. The understanding that this difference could create niches for social, behavioural and physical risk factors to arise enriches the comprehension of the social determinants of health, and supports the notion that the slum context contributes to the interactions of the social determinants of health. Hence, it may influence interpretations of risk factor interactions in the slums. This directly links to the practical implications of this research, namely that policies or programmes designed to mitigate NCD risk factors must account for the gender-specific risk factors or the potential gender-specific determinants of risk factors. For example, a smoking cessation programme in a slum would only apply to men. The same holds for a programme aimed at promoting healthy diet, which would primarily pertain to women. Consequently, policy makers are recommended to combine multiple intervention or health promotion programmes in order to deal structurally with the gender-specific and general risk factors in slums. There is added value for decision makers, since our quantitative data showed both the indexing and characterization of the distribution and profile of risk factors in the slums without masking the practical material conditions of the residents of the slums.

3.4.1 Strengths and limitations of the study

A key limitation of the study is anchored on the constraints of the STEPS questionnaire, particularly the variable of physical activity. Since the activities of homemakers do not fall within the categories of the STEPS questionnaire, it makes the measurement of these activities impossible. Inclusion of their activities is necessary to give a better picture of the lifestyle in the slums. Also, gender, social expectations and demands are loose concepts that need to be narrowed down to get a better understanding of the relationships between NCDs and their risk factors. Gender has been broadly adapted in the study gendered social structures on NCDs and their risk factors has been broad When the importance of intersectionality for health risks is recognised in the literature (Hankivsky, 2012), comparison of the characteristics between respondents and non-respondents is a possible future direction of study. The priority assigned to gender in this study understates the importance of other factors that comprise social identity and power. Another limitation comprises the definitions used for risk factors: the categories we used were adapted to the context of a Chennai slum (for diet, alcohol use, or income for instance), they are thus not fully exportable and should be considered only in the Indian context. However, if

these measures are quite specific to this context, the differences highlighted between men and women depend less on these definitions; they should thus be more generalizable to the context of other slums and countries.

3.5 Conclusion

Gender can significantly influence the prevalence patterns of behavioural and physical NCD risk factors in slums. As well as the stereotypical differences in risk factor prevalence across both genders – such as, a higher prevalence of smoking, alcohol consumption and hypertension in men or higher hip-waist ratio in women – the results of the study show that risk factors such as physical activity and diet are also related to gender. The STEPS survey was able to identify the sources of high physical activity among male slum residents (sport and travel activities), but was unable to capture the source of similarly high physical activity among females, which was presumed to be (mainly house-) work activities. The survey also makes it hard to explain how the high prevalence of unhealthy diet across women and men yields a high prevalence of underweight among men and high obesity among women. The analysis contributes to developing and implementing gender-specific health strategies to counter the impact of NCDs in slum settlements. Similarly, the findings suggest that the social determinants of health for men and women arise and cluster in different ways due to the slum context. Future research will look to refine the results of this study by delineating the linkages between gender and gendered structures in slums, NCDs and their risk factors.

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