Rejoinder: Need for a data-driven discussion on the socioeconomic patterning of cardiovascular health in India

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Introduction

We thank each of the commentators for their responses1–4 to our review of the evidence underlying the association of socioeconomic status and cardiovascular health in India. To briefly recap, we conducted a systematic review of studies that reported an association between measures of socioeconomic status (SES) (specifically, education, household income, occupation, household assets/standard of living index, or a composite of two or more measures) and seven cardiovascular disease (CVD) and related risk factors (CVRF; smoking, diet, physical inactivity, hypertension, diabetes, abnormal lipids and obesity), and risk factor-associated CVD-related mortality (ischaemic heart disease (IHD) and stroke) in India.5 We found that with the exception of smoking, and low fruit and vegetable intake, CVRF were more prevalent among high SES groups in India than the low SES groups (see Figure 1 and Supplementary Table 1 of our review).5 Regarding risk factor-associated CVD-related mortality, whereas data are available from several studies,6–11 only two of these describe the SES patterning of such mortality, and the current evidence seems to support socioeconomic patterning in both directions. In the largest study,11 the mortality rates appeared to be higher among the lower SES groups for CVD and stroke, whereas the proportion of deaths from CVD and IHD causes was found to be greatest among higher SES groups (see Figure 2 of our review).5

In this rejoinder, we clarify certain misattributions that are made in the commentaries with regard to our paper and highlight three considerations that are necessary to ensure an equitable and informed discourse on the cardiovascular health in India.

Clarifying the misleading or inaccurate statements in commentaries

Narayan and Ali state that our interpretations are biased because our review is unlikely to be thorough as we used only the MEDLINE database for search.2 They however do not bring to attention any unpublished paper, or articles published in the vernacular journals in India that are not indexed in MEDLINE, that challenges the empirical conclusions we draw from published studies. To the extent that publication bias exists it

largely concentrated among higher socioeconomic groups. Although we acknowledge that we may have missed some studies that our search criteria should have identified,12 and new studies will have undoubtedly been published since our review, we are confident that none of the studies suggested by the four commentaries present any data or study that alters our original conclusion. We also concluded, based on the review of the published studies, that there is no evidence to support the claim that any of the outcomes shown in Figure 1 are increasing among the poor. More evidence is required, particularly for mortality, before a definitive conclusion can be reached but there are no new data or studies that are presented in any of the commentaries to alter this claim.

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might be expected that it would favour the publication of studies showing higher rates of cardiovascular disease in the poor, given the current focus on this.

One particular paper,\textsuperscript{12} which was drawn to our attention by Prabhakaran and colleagues,\textsuperscript{3} does describe an inverse association between education and hypertension among an aboriginal tribal population in the Andaman and Nicobar islands. This association, however, was attenuated in multiple regression analyses, which adjusted for age. The omission of this one study would not have altered our original conclusions, and results for hypertension would have been essentially unaltered.

Jones-Smith cautions that our conclusions with regard to published studies displaying substantial discrepancy between authors' own data and interpretations are based on only six instances of misinterpretation of results.\textsuperscript{1} We are not sure what limit Jones-Smith might advocate for tolerating such discrepancies in scientific articles. These six instances of discrepancies were presented as examples; it is our systematic review of the strength and directions of associations of the published studies that provides the basis for our conclusion.

Prabhakaran and colleagues state that our conclusions are based mainly on studies that focus on body mass index.\textsuperscript{3} This is not the case. Readers can examine the evidence presented in Figure 1 and Supplementary Table 1 of our paper\textsuperscript{5} and can arrive at their own interpretation.

Finally, the commentaries,\textsuperscript{1–4} as well as the accompanying editorial,\textsuperscript{13} tend to cast our review as being a statement on the SES patterning of non-communicable diseases (NCDs) in India. This is unfortunate; even a cursory read of our review would reveal that the target of our inference is the socioeconomic distribution of established risk factors for coronary heart disease, stroke and diabetes, and not for the entire array of NCDs.\textsuperscript{5} Indeed, as we discuss later in this rejoinder, there is likely to be a marked heterogeneity in the socioeconomic distributions of diseases which fall under the broad NCD rubric, making any generalizations across NCDs meaningless.

### Does study timing matter?

A useful suggestion that is echoed across all commentaries\textsuperscript{1–4} is whether the patterns we reported in

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**Figure 1** Direction of socioeconomic status (SES) and cardiovascular disease/risk factors associations ($n=353$) extracted from 53 studies conducted in India and stratified according to year of data collection (1980–2001 and 2002–2012)
Figure 1 of our review are being driven by studies that use data prior to 1991, which was the year when India embarked upon the path of economic liberalization, which got further entrenched starting in early 2000s. The commentaries also assert, implicitly or explicitly, that the positive association between CVRF/CVD/CVD-mortality and SES will not hold if we examined studies that used data collected after 1991. The stratification of our findings by year of data collection (comparing studies conducted between 1980 and 1991 with those conducted between 1992 and 2012) indicated findings remarkably similar to the original analyses, which pooled data across all years, although only 11 studies were available prior to 1991 (Supplementary Figure 1, available as Supplementary data at IJE online). Given the small sample size for studies prior to 1991, we conducted further analyses on the most recent studies conducted from 2002–12 and those prior to that (Figure 1). There was an indication to suggest that the positive SES-CVRF/CVD associations have sharpened since 2002 for some outcomes, although caution is required when interpreting these subgroup analyses. For example, in the most recent subset of data, there was an apparent increase in the proportion of positive SES-CVRF/CVD associations for abnormal lipids, diabetes, obesity and CVD, but not for associations between SES and blood pressure and/or hypertension, where negative gradients were observed in slightly more than half of associations since 2001. In short, this additional review of separating studies prior to 1991/2001 and after 1991/2001, by and large, reiterates the original conclusion.

Considerations for the discourse on SES and ‘NCDs’ in India

We wish to make three points about the use of SES terminology in India. First, we advocate caution when using the word “poor” in epidemiological contexts in India. Whereas there are several ways to characterize a household or individual as poor,23 the most dominant is one of income poverty. Most epidemiological surveys rarely measure income and, in the rare circumstances when income is captured, the methods of measurement are inadequate in situations where much of what people receive is in kind. According to the latest available estimates from the World Bank, about one-third of the Indian population makes less than $1.25 per day and nearly 70% makes less than $2 per day.24,25 Further, the 2011 Indian Census revealed that 54.6% of the workforce is still engaged in agriculture with the proportion of agricultural labourers (mostly landless) increasing within this sector.26 It remains unclear whether these households and individuals, who constitute the largest socioeconomic grouping in India, are included in any of the epidemiological cohorts or cross-sectional studies that we reviewed.

Defining SES in India

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Secondly, Narayan and Ali also make an important point about the need to consider the heterogeneity in the SES markers used in India.2 It would also be of benefit to pick indicators that best fit the research question, and not use different markers of SES interchangeably and/or use whatever is available.27 More generally, in a country like India that is marked by tremendous inequalities and where these inequalities tend to fall along different socioeconomic axes, it is important to first ascertain what is an appropriate SES marker (if there is one) and/or evaluate the pattern across key drivers that stratify Indian society whether it is caste, gender, education, wealth, income, occupation and so on.

Finally, several epidemiological surveys equate rural residence as a marker of SES. There is a clear Census...
definition of what constitutes ‘urban’, and the remaining areas become rural. Often epidemiological surveys that characterize themselves as rural never provide a definition of ‘rural’ or compare whether the observed sample is similar to what the Census, by default, defines as rural. It is also be worth noting that despite the oft-repeated claims that India is experiencing “rapid urbanization”, the Indian Census data show a relatively small change; in 1991, at the time when India was embarking on the path of economic liberalization, the percentage of the population living in urban areas was 25.7%, and in 2011 this figure stood at 31.6%. In fact, the annual growth rate in the percentage of the population living in urban areas has been slower since 1991 when compared with the 1971–91 period. A more careful approach to defining urban/rural as well as avoiding the use of urban/rural as a SES marker will be more helpful for appropriate assessments of risk factor patterning in India.

**Is the call for national health surveillance data a distraction?**

If there is one clear implication of our review, it is the urgent need for India to establish nationally representative surveillance of all diseases measured objectively or using validated methods and, crucially, make such data available publicly and freely for independent scrutiny. Yet, it is remarkable that a majority of the commentaries do not strongly and explicitly support the need for more data. In fact, Prabhakaran and colleagues go on to state that ‘paucity of reliable hard outcome data and their social patterning should not delay or curtail public health efforts to limit the impact of CVDs in the Indian population’. Is the suggestion that current epidemiological surveys (often not publicly available) adequately represent individuals and households who live on less than $1/day or $2/day or agricultural labourers, and are a sufficient evidence base to launch public health programmes and policies for all Indians? Indeed, whereas there is clearly a case for addressing issues such as hypertension or diabetes in India, at the least such policies and programmes should undergo an ‘equity audit’, in particular related to the resource allocation to prevention of CVRF, and the effect they would have on socioeconomic inequalities.

The three rounds of Indian National Family Health Surveys (NFHSs) provide an exemplary model of national data collection, with inferences possible to Indian states, and data dissemination, with the data made available for public use and scrutiny in a free and open manner. It is not an exaggeration to state that discussions related to child undernutrition, maternal and child mortality, and HIV in India were substantially more informed as a consequence of such high quality public use data and, importantly, several public policies were triggered as a consequence of the findings derived from these data. In fact, when news circulated that the Government of India was going to discontinue these surveys, immediate outcry by several sections of the civil society forced the Indian government to rethink, and initiate efforts to conduct a fourth round of data collection, starting in early 2014. This will be the grandest effort yet, covering all districts in all states, and will expand its focus to include objective measures of anthropometry not just among children and mothers but also among men (continuing the men’s survey which began in NFHS-3), as well as measures of blood pressure and glucose (personal communication with Professor Faujdar Ram, Director, Indian Institute of Population Sciences). In short, if our esteemed colleagues, who champion the cause of NCDs in India, are serious about addressing NCDs in a coherent and equitable manner, then the case for prioritizing national data collection on a comprehensive range of diseases and risk factors with markers of SES, and importantly, ensuring a public access to such data, cannot be overemphasized.

**Concluding remarks**

Several commentators have emphasized the need for the Indian public health system to simultaneously focus on NCDs and communicable diseases; essentially to focus on all disease burdens that afflict Indians. The underlying argument is that action on one health issue is not ‘mutually competitive’ with action on the other. While we too concur with this sentiment, such a utopian argument ignores the political and economic constraints that shape resource allocation. Our goal was not to downplay the importance of the CVRF/CVDs, and certainly not NCDs more generally, in India, but to initiate and facilitate an open debate and informed discussion. These we believe can be advanced only through national surveillance of the distribution of various diseases that afflict Indian populations and with every proposed intervention undergoing an equity audit, especially when there is a risk of entrenching the inverse health care law. We thank Gwatkin, who 14 years ago raised the issues we revisited in our review (which we apologise for not citing), for capturing the spirit and motivation behind our review in the concluding paragraph of his insightful editorial, reiterating the importance of equity as a metric for informed discussions of disease control policies in India.

As Jean Dreze and Amartya Sen in their just released book on India forcefully demonstrate, public discussions in India are powerfully biased not just towards the highly privileged but also the ‘relatively privileged’ who are not at the top but are far better-off than the large majority of Indian people, whose lives and issues sadly tend to receive little attention. We hope that the discussion of public health in India will not, even if unintentionally, assume the ‘pro-middle class bias’ that Dreze and...
Sen eloquently decry, and considerations of equity based on robust national data will remain central.

**Supplementary Data**

Supplementary data are available at IJE online.

**Conflict of interest:** None declared.

**References**


