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A Methodology to Analyse the Intersections of Social Inequalities in Health

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Abstract An important issue for health policy and planning is the way in which multiple sources of disadvantage, such as class, gender, caste, race, ethnicity, and so forth, work together to influence health. Although 'intersectionality' is a topic for which there is growing interest and evidence, several questions as yet remain unanswered. These gaps partly reflect limitations in the quantitative methods used to study intersectionality in health, even though the techniques used to analyse health inequalities as separable processes can be sophisticated. In this paper, we discuss a method we developed to analyse the intersections between different social inequalities, including a technique to test for differences along the entire span of the social spectrum, not just between the extremes. We show how this method can be applied to the analysis of intersectionality in access to healthcare, using cross-sectional data in Koppal, one of the poorest districts in Karnataka, India.

Key words: Intersectionality, Social inequalities, Gender, Economic class, Methodology, Health, Karnataka, India

Introduction

Importance of intersectionality

Considerable evidence exists in high-income and low-income country settings about the importance of different axes of social power and inequality, and the pathways through which they influence health and healthcare. In the traditional and still highly influential literature on the impact of social inequality on health, different dimensions of inequality tend to be viewed as separable processes. If we consider gender[1] and economic class, for instance, those who work on class often do not acknowledge the importance

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of gender, and *vice versa*. However, a growing research literature (Schulz and Mullings, 2005; Weber and Parra-Medina, 2003) has found that gender and economic class, as well as race, ethnicity, caste and other social inequalities, often work together and interact with each other. These interactive processes or intersections can have important effects that are not uniform but depend on contexts and settings (Iyer *et al.*, 2008).

A lively literature exists on the concept of intersectionality, and how it works to determine individual and group identities, systems of power, and processes of interaction and change (Dhamoon, 2008). Coined by Crenshaw (1989, 1991), the idea of intersectionality has caught the imagination of those from different disciplines who are interested in understanding the interplay between different kinds of social inequality (for example, Brewer *et al.*, 2002; Burman, 2004; Phoenix and Pattynama, 2006).

Despite this, empirical evidence of how these intersections operate and what they imply for both theory and practice is as yet relatively thin. Because of the paucity of research, we still do not know with a lot of empirical backing how gender affects class inequalities, for instance, or how gender relations are modified by class, let alone how these intersections influence health inequalities. Consequently, we do not know what such intersections may imply for the design of health policy. Systematic research on the health intersectional implications of other social markers of difference, identity and inequality such as sexual orientation or disability also tends to be thin despite the richness of the politics around these. These gaps in the research and knowledge base at least partly reflect limitations in the methods used to study intersectionality, even though the techniques developed to measure health inequalities as separable processes can be sophisticated (O'Donnell *et al.*, 2008). The paucity of adequate *quantitative* methods is especially acute, and has led to an imbalance in the literature in favour of qualitative approaches to the problem (Weber and Parra-Medina, 2003).[2]

In this paper, we use the idea of intersectionality to develop analysis that examines how different dimensions of social inequality interact with each other. This requires going beyond uni-dimensional analysis based on only economic class, or gender, or caste or ethnicity, for example. It also proposes that these multiple dimensions cannot be presumed to operate independently of each other. In this paper, we focus in particular on economic class and gender for illustrative purposes. Intersectional analysis can be as simple as examining whether class differences operate in the same way for women versus men; it can also become quite complex as multiple dimensions of social inequality are analysed together. We outline a simple approach to measuring and testing for the effects of intersectionality, and the relative importance of different social determinants for health outcomes, using existing quantitative techniques. We believe our approach provides a useful tool for deepening the analysis that is applicable not only to health, but also to education and to other capabilities (Iyer, 2007).

A select scanning of the literature

According to Weber and Parra-Medina (2003, p. 222), "intersectional approaches … provide a powerful alternative way of addressing questions about health disparities that traditional approaches have been unsuccessful in answering". Much depends, however, on what questions are asked, and what methodological approaches are used to address them. In order to illustrate the kinds of empirical studies that have been undertaken to date, we scanned the literature on the impact of economic class and gender on health.

The simplest way of combining gender and class is to measure gender differences within class, and/or class differences by gender. A number of studies examine how economic class differences in health vary by gender (or other dimensions of inequality such as race or ethnicity). Some of these studies examine whether economic variables (together with other factors) account for differences in health between women and men overall (Artazcoz *et al.*, 2004); between poor and non-poor women (Lahelma *et al.*, 2002; Walters, 1993; Walters *et al.*, 2002); between ethnic/race groups (Cooper, 2002; Farmer and Ferraro, 2005; Kahn and Fazio, 2005). To what extent do gender differences persist after adjusting for economic differences among ethnic groups (Cooper, 2002)? Other studies attempt to deepen existing work on health gradients[3] and gaps by asking whether class-based health inequalities (as measured through socio-economic gradients in health, or the likelihood of specific health outcomes) are the same among women and men (Drever *et al.*, 2004; Macintyre and Hunt, 1997); among racial groups (Krieger *et al.*, 1999, 2006); and across castes (Mohindra *et al.*, 2006)? Does gender, as experienced on a daily basis, explain part of the social gradient in health (Borrell *et al.*, 2004; Chandola *et al.*, 2004; Matthews and Power, 2002)? Do the social determinants of specific health outcomes vary differently by socio-economic positions for women and men (Griffin *et al.*, 2002)?

Other studies explore whether gender differences in health vary across the economic spectrum (from poor to non-poor households), and how household economic status affects health differentially for women and men within the household. For instance, are women versus men (girls versus boys) equally vulnerable to ill health in poor households? Are they equally at risk in non-poor households (Artazcoz *et al.*, 2001; Rousham, 1996)? Ahnquist *et al.* (2007) ask whether economic hardship impacts differently on the health of women versus men, and what explains such variation. Banks *et al.* (2006) examine whether racial discrimination has similar effects on men's and women's health.

A number of questions that are currently insufficiently addressed could be examined with such an approach. For instance, are women and men equally trapped by medical poverty in different classes of households? Are all members of the household treated alike in the event of catastrophic illness or injury and does this vary by the economic status of the household? When

healthcare costs go up significantly, as they have done in recent years, do households tighten the belt equally for women versus men (girls versus boys)? Are these patterns similar across different income groups? Does the recognition of and response to class inequalities by policy-makers or powerful groups differ depending on who bears the burden: women or men? Some of these questions have been tackled in Iyer (2007).

More complex questions that are missing in the literature are about the relative magnitudes of economic class, gender, caste, and so forth, in determining health inequalities. These unanswered (and all too often unasked) questions reflect limitations in the conceptualization of intersectionality in health and of the paucity of quantitative methods used to study it. Yet, such questions may be essential to understanding changes in the health of different groups over time, and the impact of policies or programmes intended to mitigate the effects of different social inequalities.

Towards a more adequate quantitative approach

This section uses a simple 2 × 2 matrix as a heuristic device to explore the quantitative dimension of intersectionality. It then proceeds to the kind of approach that would be appropriate for the analysis of larger data-sets.

For illustrative purposes, if we categorize gender into male (M) and female (F) and economic class into non-poor (NP) and poor (P), we have four possible groups, as depicted in the heuristic matrix in Figure 1: male non-poor (MNP), male poor (MP), female non-poor (FNP) and female poor (FP).

On a continuum in terms of any beneficial outcome in, say education or health-seeking, we usually expect male non-poor and female poor to lie at the two extremes, and we also expect to find a significant difference between these extremes. We can be much less certain, however, about the categories in the middle of the social spectrum; that is, male poor and female non-poor. In general, these categories may be well off along some dimensions of social inequality but badly off in terms of others. They differ from the extremes that are well off or badly off along both (or all) dimensions, gender and class. It is difficult to predict *a priori* where the middle categories might lie relative to

Gender	**Class**		**Class differences within gender**
	Non-poor	***Poor***	
Male	MNP	MP	MNP vs MP
Female	FNP	FP	FNP vs FP
Gender differences within class	MNP vs FNP	MP vs FP	

FIGURE 1. Heuristic matrix of the intersections of gender and class inequalities.

each other, or what might be the magnitudes of the differences among them, and between them and the extremes.

While the absolute magnitudes of class and gender differences depend on the positions of all four categories — poor women, poor men, non-poor women and non-poor men — the *relative importance and magnitudes* of class and gender inequalities depend on where poor men are relative to non-poor women. This can be seen by using a simple additive model to measure differences. Let C be the total class difference, and G be the gender difference. We assume plausibly that, for a positive outcome, the non-poor will be no worse off than the poor, and that men will be no worse off than women. The basic result is not affected by this assumption. Then,

$$\text{Class difference}, C = (\text{MNP} + \text{FNP}) - (\text{MP} + \text{FP})$$
$$= (\text{MNP} - \text{MP}) + (\text{FNP} - \text{FP})$$

$$\text{Gender difference}, G = (\text{MNP} - \text{FNP}) + (\text{MP} - \text{FP})$$
$$= (\text{MNP} + \text{MP}) - (\text{FNP} + \text{FP})$$
$$= (\text{MNP} - \text{MP}) + 2\text{MP} + (\text{FNP} - \text{FP}) - 2\text{FNP}$$
$$= (\text{MNP} - \text{MP}) + (\text{FNP} - \text{FP}) + 2(\text{MP} - \text{FNP})$$

$$\text{Thus G} = \text{C} + 2(\text{MP} - \text{FMP})$$

Clearly, if MP = FNP (i.e. the positions of male poor and female non-poor are the same), then class and gender differences are identical. Hence, while the absolute magnitudes of class and gender depend on the positions of all four (FP, MP, FNP, MNP), their relative magnitudes are independent of the positions of FP and MNP; and depend only on where MP is in relation to FNP. That is, $G > C$, $G = C$, or $G < C$ accordingly as MP > FNP, MP = FNP, or MP < FNP, the positions of the groups in the middle.

Because much analysis to date has focused on the extremes, it does not sort out the relative effects and magnitudes of different dimensions of inequality. Nor has it developed adequate methods to do so. These limitations point to the need to develop a methodology that can help us understand the processes of interaction better.

When analysing large data-sets, the simplest method is to group data that depict gender, class and caste into categories and then compare group-wise statistical results (Artazcoz *et al.*, 2001; Chandola *et al.*, 2004; Mohindra *et al.*, 2006). This would be equivalent to directly comparing the information in the four main cells of our heuristic matrix above, but the value of such comparisons will depend on whether and what statistical tests are applied. In the literature, although the within-group analysis can on occasion be sophisticated, the comparison across groups is sometimes based simply on the estimated group-wise coefficients without testing the significance of the

differences between categories. This leaves the final conclusions statistically unsatisfactory.

Furthermore, since there are likely to be other variables that are correlated with both gender and class, appropriate regression analysis would generate more rigorous conclusions. As a general approach, therefore, studies that test the differences between categories do so by incorporating them in multiple regressions, along with other relevant correlated variables. As many health outcomes are categorical, studies use binomial as well as multinomial logit regression models (Artazcoz *et al.*, 2001, 2004; Borrell *et al.*, 2004; Chandola *et al.*, 2004; Cooper, 2002; Griffin *et al.*, 2002; Lahelma *et al.*, 2002; Matthews and Power, 2002), as well as multilevel logistic regressions (Mohindra *et al.*, 2006). The interaction between two variables can be analysed, depending on the questions being asked, in a number of ways. One approach to test for the presence of intersections includes stratifying variables by one particular type of inequality, and then running a number of separate regressions in order to assess the impact of other types of inequality or variables of interest (Artazcoz *et al.*, 2001, 2004; Borrell *et al.*, 2004; Chandola *et al.*, 2004; Griffin *et al.*, 2002; Mohindra *et al.*, 2006). For instance, one could run a separate regression for men only and incorporate class as an independent variable, and similarly for women. While this approach provides some insights, one is left with a number of separate regressions, and no real way to compare across them in any meaningful way.

Another approach is to test for the significance of the interactions by incorporating a product (or interaction) term in the regression (Cummings and Jackson, 2008), but this approach also has limitations. It cannot specifically distinguish between each intersecting category, because all intersecting categories taken together are assigned the value of one *vis-à-vis* the reference pair. For example, analyses that take the product of two 'dummy' variables, say gender (male: female) and economic class (non-poor: poor) in a regression set up, end up analysing the difference between one reference pair (say, female-poor) *vis-à-vis* all other pairs (namely, male poor, male non-poor, female non-poor) taken together. Consequently, studies that use this type of analysis cannot make meaningful comparisons between different intersecting categories.

Quantitative methodology to analyse intersections

In this section we describe the quantitative method we developed to study intersectionality. In our method, we suggest creating a set of dummy variables for each intersecting category. Thus, if the intersections of gender and class inequalities are being analysed, wherein class is dichotomized as non-poor versus poor, and gender into men and women, there would be four categories as in our heuristic matrix: d1 = non-poor men; d2 = non-poor women, d3 = poor men; d4 = poor women. Treating d1 (non-poor men) as the reference category, each of the dummies (d2–d4) is treated as a separate

variable and assigned a unique identity. For example, d2 = 1 if non-poor and women, and 0 otherwise; d3 = 1 if poor and men, and 0 otherwise; d4 = 1 if poor and women, and 0 otherwise.[4]

Using these dummies, logit regressions (both binomial and multinomial) are run and differences between them are tested for statistical significance. The simplicity and power of the approach is that three types of differences can be tested. First, going beyond the standard approach, the significance of each dummy (d2–d4) can be tested relative to the reference group (d1). Second, pair-wise chi-square tests for the significance of differences among d2, d3 and d4 allows us to test for differences between all other categories, including those at the extremes and in the middle of the social scale. Thus, for example, poor men can be compared not only against poor women or non-poor men, but also against non-poor women. Third is the ability to test for the significance of differences in the magnitudes of social gaps; for example, the significance of differences in the gender gap between the poor and the non-poor; or the significance of differences in the class gap between women and men. Such tests are almost never conducted in standard analyses.

The method allows us to create as many dummies as needed, depending on the intersections being analysed. For instance, gender versus class, gender versus caste versus class, and so forth. That is, there is no limit, in principle, to the number of intersections that can be studied simultaneously, although the number of tests of significance would obviously also increase.

By ranking the odds ratios for each intersecting category and plotting them using a log scale, it is also possible to obtain a visual assessment of the relative positions of different categories on the social scale.

In sum, our method has three features: first, unique identities to each intersecting category; second, tests of significance of differences along the entire social scale; and three, visual recreation of the social scale. And this can be done without having to run large numbers of regressions whose comparability is limited.

We have applied this method to both education and health (Iyer *et al.*, 2007; Iyer, 2007; Sen *et al.*, 2007). In this paper, we illustrate the method for an analysis of inequalities in access to health treatment for long-term illness in Koppal, one of the poorest districts in the southern Indian state of Karnataka.

Illustration: the intersections of gender and class inequalities in access to healthcare

The objective of our analysis was to examine the intersections of gender and class inequalities in access to healthcare for long-term ailments, and to draw inferences for the types of gender bias that underpin non-treatment, discontinued treatment and continued treatment (Iyer, 2007; Iyer *et al.*, 2007; Sen *et al.*, 2007).[5]

Survey design. We drew upon household survey data gathered in 2002 for the Gender and Health Equity Project. The survey was designed to

enable analyses of gender-based, class-based, caste-based, age-based and lifestage-based inequalities in access to preventive care during pregnancy, and curative care during short-term and long-term illnesses, apart from that to schooling. A household census preceding the survey in 60 villages enumerated 15 358 households, which formed the sample units in a unistage-stratified sampling frame. The villages affiliated to the same Primary Health Centre constituted a stratum. Within each stratum, households were first grouped by religion–caste and then by a measure of economic class. A sample of 12.5% of all households was drawn from each of the strata in a circular systematic manner after a random start. The survey thus enumerated 1920 households, and within them 12 328 individuals.

All sick or pregnant members of the household were interviewed on a one-to-one basis by locally recruited and trained investigators of the same sex. The investigators, who worked in man–woman pairs, had to manage household dynamics and deal with the presence of outsiders while conducting interviews. They also had to negotiate privacy for their respondents and confidentiality of information exchanged during the interview with curious neighbours and domineering husbands.

Definitions. The survey used the notions of duration and severity to differentiate among illnesses. The cut-off used to separate short-term from long-term illness was three months. *Severity* for long-term ailments was measured in terms of difficulty in going to school, doing housework or other work, and earning income. The definition of *treatment* included all actions taken to alleviate illness symptoms, including self-care and medication by relatives, friends or unqualified providers. Therefore, *non-treatment* refers to no attempt whatsoever to reduce symptoms.

The proxy used for *economic class* was average per-capita monthly consumption expenditure, as incomes are difficult to estimate in an agrarian context and are often under-reported. Such expenditures included imputed values of subsistence agricultural produce. Given that economic class differences are not sharp in Koppal (in common with other similar agro-ecological zones in India), we used a standard classification in the regression analysis: poorest (bottom quintile), poor (next two quintiles) and non-poor (top two quintiles). As Quintiles 2 and 3 showed no significant differences, they are clubbed together in the data presented here, as are Quintiles 4 and 5 at the upper end. Since we were interested in, among other things, testing whether the economic status of one's household had differential effects on women's and men's access to treatment, our economic measure was for the household, not for the individual.

The *head of household* was anyone who made major decisions, either solely or in consultation with other members. *Earners* were defined as members who engaged in wage work or self-employment for the greatest part of a year prior to the date of the survey. *Age* of the sick person was measured in completed years.

Statistical analysis. Model 1 tested the independent effects of gender, class and other relevant explanatory variables on treatment seeking for long-term illness. However, Model 1 does not tell us how they interact. To study the intersections of gender and class inequalities, we used Model 2 with non-poor men as the reference category and separate dummies for non-poor women, poor men, poor women, poorest men and poorest women.

Separate multinomial logit regressions were run to estimate differences in the likelihood of non-treatment and discontinued treatment *vis-à-vis* continued treatment. Three types of tests were carried out for differences between each of the dummies *vis-à-vis* the reference category, differences among the dummies pair-wise using chi-square tests, and differences between class gaps and gender gaps.

Population estimates were used in the cross-tables and regressions, rather than sample totals, as the survey had a stratified random sample. The estimates were computed by weighting the data for each household by the probability of its selection. The robust standard error was used to correct for any heteroscedasticity while calculating *P* values. The estimates were generated using the Newton–Raphson method for maximum likelihood estimation in STATA (version 7) with logit and mlogit commands.

Key findings. Tables 1 and 2 present the results for non-treatment of long-term illness, and discontinuation of treatment (for reasons other than being cured), respectively. These results are not only different from each other, but in each case there are striking differences between Model 1 (where class and gender are treated as independent of each other) and Model 2, which allows estimation and tests for the significance of intersections using our method.

Non-treatment. Model 1 tells us that gender is important, with women more than three times as likely to not be treated as men. Class, however, appears only to be relevant for the poorest households.

An examination of Model 2, however, shows us that such conclusions are not only incomplete but could be misleading, as we see below. Not only are all women worse off than the reference group (non-poor men), but there are strong gender differences in non-treatment within every household category — non-poor, poor, and poorest. While these gender results are not drastically different from Model 1, what is striking is that class is not relevant at all for men — non-poor, poor and even the poorest men are not significantly different from each other in the likelihood of non-treatment. The class difference between the poorest and the non-poor that was picked up by Model 1 is entirely due to the weak position of the poorest women, not the poorest men.

Left to itself, Model 1 could lead to the mistaken conclusion that everyone in the poorest households is in the same boat, but this is clearly not the case. The ability of both the poor and poorest men to parlay their gender advantage into treatment likelihoods that are no different from non-poor men is striking, and is sharply evident in Model 2.

TABLE 1. Likelihood of non-treatment for long-term ailments: estimates of odds ratios and significance of differences (Models 1 and 2)

Independent variable	Multinomial logit regression[a]			
	Model 1		Model 2	
	Odds ratio	*p* value	Odds ratio	*p* value
Age	1.00		1.00	
Severity	0.78	***	0.78	***
Income earning status				
Income earner	1.00		1.00	
Non-earner	0.66	*	0.66	*
Household headship				
Household head	1.00		1.00	
Non-head	0.60	*	0.61	*
Gender				
Men	1.00			
Women	3.36	***		
Economic class				
Non-poor	1.00			
Poor	1.45			
Poorest	1.75	**		
Gender–class sub-groups				
Non-poor men			1.00	
Poor men (pm)			1.39	
Poorest men ($p^{st}m$)			0.92	
Non-poor women (npw)			2.62	**
Poor women (pw)			3.99	***
Poorest women ($p^{st}w$)			5.47	***

TABLE 1. Continued.

Independent variable	Multinomial logit regression[a]			
	Model 1		Model 2	
	Odds ratio	*p* value	Odds ratio	*p* value
Tests of significance				
Class differences among girls/women				
Non-poor and poor: Coeff.(pw) = Coeff.(npw)				
Non-poor and poorest: Coeff.($p^{st}w$) = Coeff.(npw)				**
Poor and poorest: Coeff.($p^{st}w$) = Coeff.(pw)				
Class differences among boys/men				
Non-poor and poor: Coeff.(pm) = 0				
Non-poor and poorest: Coeff.($p^{st}m$) = 0				
Poor and poorest: Coeff.($p^{st}m$) = Coeff.(pm)				
Gender differences within economic class				
Non-poor: Coeff (npw) = 0				**
Poor: Coeff (pw) = Coeff.(pm)				***
Poorest: Coeff.($p^{st}w$) = Coeff.($p^{st}m$)				***
Gender differences between class groups[2]				
Non-poor and poor: Coeff.(pw–pm) = Coeff.(npw)				
Non-poor and poorest: Coeff.($p^{st}w$–$p^{st}m$) = Coeff.(npw)				
Poor and poorest: Coeff.(pstw–pstm) = Coeff.(pw-pm)				
Tests between groups in the middle				
Non-poor women and poor men: Coeff.(npw) = Coeff.(pm)				*
Non-poor women and poorest men: Coeff.(npw) = Coeff.($p^{st}m$)				*
Poor women and poorest men: Coeff.(pw) = Coeff.($p^{st}m$)				***
Test between poorest women and poor men: Coeff.($p^{st}w$) = Coeff.(pm)				***
Sample size (unweighted)	1290		1290	

Note: [a]Continued treatment = 1, discontinued treatment = 2, non-treatment = 3. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

TABLE 2. Likelihood of discontinued treatment for long-term ailments: estimates of odds ratios and significance of differences (Models 1 and 2)

ndependent variable	Multinomial logit regression[a]			
	Model 1		Model 2	
I	Odds ratio	*p* value	Odds ratio	*p* value
Age	1.00		1.00	
Severity	0.94		0.94	
Income earning status				
Income earner	1.00		1.00	
Non-earner	0.68	***	0.69	***
Household headship				
Household head	1.00		1.00	
Non-head	1.59	**	1.60	**
Gender				
Men	1.00			
Women	1.20			
Economic class				
Non-poor	1.00			
Poor	1.31	*		
Poorest	1.92	***		
Gender–class sub-groups				
Non-poor men			1.00	
Poor men (pm)			0.86	
Poorest men ($p^{st}m$)			1.74	**
Non-poor women (npw)			0.86	
Poor women (pw)			1.46	*
Poorest women ($p^{st}w$)			1.76	**

TABLE 2. Continued.

Independent variable	Multinomial logit regression[a]			
	Model 1		Model 2	
	Odds ratio	*p* value	Odds ratio	*p* value
Tests of significance				
Class differences among girls/women				
Non-poor and poor: Coeff.(pw) = Coeff.(npw)				***
Non-poor and poorest: Coeff.(p^{st}w) = Coeff.(npw)				***
Poor and poorest: Coeff.(p^{st}w) = Coeff.(pw)				
Class differences among boys/men				
Non-poor and poor: Coeff.(pm) = 0				
Non-poor and poorest: Coeff.(p^{st}m) = 0				**
Poor and poorest: Coeff.(p^{st}m) = Coeff.(pm)				***
Gender differences within economic class				
Non-poor: Coeff (npw) = 0				
Poor: Coeff (pw) = Coeff.(pm)				**
Poorest: Coeff.(p^{st}w) = Coeff.(p^{st}m)				
Gender differences between class groups[2]				
Non-poor and poor: Coeff.(pw–pm) = Coeff.(npw)				**
Non-poor and poorest: Coeff.(p^{st}w–p^{st}m) = Coeff.(npw)				
Poor and poorest: Coeff.(p^{st}w–p^{st}m) = Coeff.(pw–pm)				
Tests between groups in the middle				
Non-poor women and poor men: Coeff.(npw) = Coeff.(pm)				
Non-poor women and poorest men: Coeff.(npw) = Coeff.(p^{st}m)				**
Poor women and poorest men: Coeff.(pw) = Coeff.(p^{st}m)				
Test between poorest women and poor men: Coeff.(p^{st}w) = Coeff.(pm)				***
Sample size (unweighted)	1290		1290	

Note: [a]Continued treatment = 1, discontinued treatment = 2, non-treatment = 3. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

This conclusion is reinforced by looking at the relative positions of the so-called middle groups — poor men, poorest men, non-poor women, and poor women. (All groups that are not at the extremes are considered as being in the middle). Poor and poorest men were actually somewhat better off than non-poor women (although the significance level was only 10%) because of the strength of gender differences that pulled non-poor women closer to poor and poorest women, and pulled poor and poorest men above all women and closer to non-poor men. The poorest men were also significantly better off than poor women. Far from being independent of gender as Model 1 assumes, class in this case operates *through* gender.

Discontinued treatment. In this case, Model 1 implies that there are no gender differences at all, with women as a whole being only 20% more likely to discontinue treatment, and this is not a statistically significant difference. Class differences exist as before, but principally for the poorest households.

Model 2 tells us another story. There are no significant gender differences among the non-poor or the poorest, but significant differences exist between women and men in poor households (the second and third quintiles from below). Once non-poor women get past the hurdle of not being treated at all, their discontinuation likelihoods are no different from the men in their households. The position of the poorest men, on the other hand, has slipped drastically. Even though their likelihood of not being treated at all is no different from that of other men, the odds of discontinuation are much worse and more akin to the women from the poorest households, a kind of perverse 'catching up' with the worst off. However, poor men continue to be much better off than the women of their households.

Are class differences confined to the poorest alone as predicted by Model 1? This is true for men but not for women. The poorest men are worse off than both poor and non-poor men. However, for women, the poorest and the poor are both worse off than the non-poor but not different from each other.

Comparing the groups in the middle corroborates this; poor men and non-poor women are similar, while poor women, and the poorest women and men, are more like each other. If affordability is an important reason for discontinuation,[6] then the slippage of the poorest men and the improved status of non-poor women become plausible.

Putting the results for non-treatment and discontinuation together provides useful insights into how gender and class operate together. Treatment versus non-treatment is strongly governed by gender bias, with all women being affected by it, while class differences at this level only operate to distinguish the poorest women from non-poor women. Even the poorest men, and certainly poor men in the next two quintiles, are not at any greater risk of non-treatment than non-poor men. (Of course, the *quality* of treatment may vary between poorest, poor and non-poor men; but in terms of crossing the very first hurdle of being treated at all, they are equal.) Once the hurdle of non-treatment is crossed, however, class differences become more important

for both women and men. Non-poor women improve their relative position and move closer to non-poor men, while the poorest men worsen drastically. The poorest women and even poor women remain at the bottom. However, poor men are able to hold on to their gender advantage, are not as badly affected by discontinuation, and are significantly better off than poor women.

In sum, our method gives us a richer, more accurate and more nuanced understanding of how any one of these inequalities functions through its interaction with other inequalities. Second, it helps us understand how groups in the middle are placed relative to each other, and consequently allows us to assess the relative weights of different bases of inequality for specific outcomes and in different contexts. In doing so, it can help us understand processes operating within households, and within class, caste and racial or other groups. The attractiveness of the method comes from its simplicity and its transparency, which in studies of intersectionality can be of primary importance.

Research implications

Those interested in getting a quantitative handle on the interactions among different kinds of social and economic inequality have, hitherto, been hampered by a lack of simple yet powerful techniques. This has limited the kinds of questions that can be asked and the hypotheses that can be tested. In particular, it has been difficult to compare effectively across different sub-categories, or to assess the relative importance of different types of inequality.

Our data on healthcare for long-term illness illustrates the value of being able to make such comparisons across sub-categories. While class and gender are both clearly important, as can be seen from the results of the Model 1 regressions, how exactly do they work, and for which group is which social factor more important? For those used to thinking mainly about economic class as a determinant of health, or of class and gender as independent factors, the results of the model 2 tests can be striking. Clearly both class and gender matter. But this is not all. Not only must gender be studied in addition to class, but being able to study the intersections in detail shows, in this example, not only how looking at class alone can mask how gender works, *but also masks how class itself works.* Class appears to work *through* gender in this case.

The method can help answer the questions that have either not been asked in the literature or have been only lightly touched upon. The methods used hitherto to study interactions tend to become cumbersome and/or difficult to interpret in the presence of multiple dimensions of inequality. This has limited the number of dimensions of inequality that can be studied at the same time in terms of their interactions. In principle, our method does not appear to have any intrinsic limits to the number of interactions that can be studied (although the numbers of tests will obviously increase) provided one has a large enough data-set. It would, for example, be possible to

rigorously compare how poor men from a particular ethnic group or caste fare relative to non-poor women from a different ethnic group or caste. Obviously, what intersections one tests for depend on one's hypotheses. But that is a matter for one's theory; testing that theory will not, however, be limited by the statistical methods available.

One important, if politically challenging, set of questions that is rarely asked is which social inequalities may be more important in different settings. The absence of rigorous testing methods has permitted *ad hoc*, *a priori* and potentially biased assumptions to be made about the relative importance of, say, economic class versus caste or ethnicity versus gender. Our approach allows us to go beyond this melange of bias and *ad hoc* assumptions to test hypotheses about relative magnitudes that may have crucial policy and political implications. Importantly, it does not assume that any particular social inequality is uniformly large or small relative to others, but allows for tests that may well give varied answers for different settings.[7]

Policy implications

In addition to the obvious benefit of deepening our insights into social inequalities and how they interact, the study of intersectionality using our approach has the potential to provide critical guidance for policies and programmes. By giving precise insights into who is affected and how in different settings, it provides a scalpel for policies rather than the current hatchet. It enables policies and programmes to identify whom to focus on, whom to protect, what exactly to promote and why. It also provides a simple way to monitor and evaluate the impact of policies and programmes on different sub-groups from the most disadvantaged through the middle layers to those with particular advantages.

In Koppal, our analysis tells us that poor men (at least above the bottom-most 20%) actually managed to obtain healthcare; the gender gap is greater than the class gap among men. Even the poorest men were not less likely to obtain treatment than other men were, although their likelihood of having to discontinue treatment was greater. Targeting programmes or policies with a focus mainly on economic class — poor versus non-poor households — may completely miss the way in which gender discrimination operates within households. It shows how valuable it is to understand what is happening to the middle categories — those with a mix of social advantages and disadvantages — because crucial politics of accommodation, negotiation, or cooptation often happens with groups in the middle.

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Notes

1 There has been considerable discussion about the appropriateness of the terms 'sex' and 'gender'. It has been argued that sex should be used whenever the reference is simply to male–female distinctions, for example, in data; and that 'gender' should be used only to refer to social processes and social relations. However, this can sometimes be cumbersome and potentially confusing for readers who are not aware of the differences in usage, especially when discussion of data and processes is intermingled. In this paper, therefore, we use the term 'gender' to refer to both the data and the processes.

2 This is not to suggest that qualitative approaches are not important to our understanding of intersectionality, but they need to be balanced and their evidence corroborated by quantitative results.

3 The gradients (slopes) of fitted lines across cross-sectional data relating health outcomes to economic or social status are used in the health field as a simple measure of inequality (Anand *et al.*, 2001).

4 A recently published study for the USA (Cummings and Jackson, 2008) attempted a similar approach to estimate the effects of sex, race, and socio-economic status changes in perceptions of health over time. Although the study poses an interesting research question, there are grounds for reservation about the conclusions drawn from the model specification and estimation. First, the dependent variable (namely, self-assessed health status) is an ordinal variable on a discrete scale of one to four. However, the model treats it as a continuous variable in order to apply the classical ordinary least-square method of estimation. Although the sample size is reasonably large (n = 1500), it does not ensure that the model assumption of normal distribution of the error term is valid, which is required for the subsequent tests of significance. Second, the conclusions are drawn from simple comparisons of the estimated coefficients without testing. Standard tests of significance could be applied for the purpose, provided of course the residuals passed the diagnostics tests for the assumption as stated earlier.

5 Although we included caste as a possible explanatory variable initially, it did not have explanatory power for the health data, as its effects seemed to be overwhelmed by economic class differences.

6 Our data (Iyer, 2007) suggest that treatment being too expensive was the reason why nearly 49% of the poorest men discontinued treatment (versus 30% of poor men and 13% of non-poor men).

7 Research using data for education provided rather different answers to such questions than the results for health (Iyer, 2007).

References

Ahnquist, J., Fredlund, P. and Wamala, S. P. (2007) 'Is cumulative exposure to economic hardships more hazardous to women's health than men's? A 16-year follow-up study of the

Swedish Survey of Living Conditions', *Journal of Epidemiology and Community Health,* 61, pp. 331–336.
Anand, S., Diderichsen, F., Evans, T., Shkolnikov, V. M. and Wirth, M. (2001) 'Measuring disparities in health: methods and indicators', in T. Evans, M. Whitehead, F. Diderichsen, A. Bhuiya and M. Wirth (Eds), *Challenging Inequalities in Health: From Ethics to Action,* Oxford University Press, New York, pp. 49–67.
Artazcoz, L., Borrell, C. and Benach, J. (2001) 'Gender inequalities in health among workers: the relation with family demands', *Journal of Epidemiology and Community Health,* 55(9), pp. 639–647.
Artazcoz, L., Benach, J., Borrell, C. and Cortes, I. (2004) 'Unemployment and mental health: understanding the interactions among gender, family roles and social class', *American Journal of Public Health,* 94(1), pp. 82–88.
Banks, K. H., Kohn-Wood, L. P. and Spencer, M. (2006) 'An examination of the African American experience of everyday discrimination and symptoms of psychological distress', *Community Mental Health Journal,* 42(6), pp. 555–570.
Borrell, C., Muntaner, C., Benach, J. and Artazcoz, L. (2004) 'Social class and self-reported health status among men and women: what is the role of work organisation, household material standards and household labour?', *Social Science & Medicine,* 58(10), pp. 1869–1887.
Brewer, R. M., Conrad, C. A. and King, M. C. (2002) 'The complexities and potential of theorizing gender, caste, race, and class', *Feminist Economist,* 8(2), pp. 3–17.
Burman, E. (2004) 'From difference to intersectionality: challenges and resources', *European Journal of Psychotheraphy, Counselling and Health,* 6(4), pp. 293–308.
Chandola, T., Kuper, H., Singh-Manoux, A., Bartley, M. and Marmot, M. (2004) 'The effect of control at home on CHD events in the Whitehall II study: gender differences in psychosocial domestic pathways to social inequalities in CHD', *Social Science & Medicine,* 58, pp. 1501–1509.
Cooper, H. (2002) 'Investigating socio-economic explanations for gender and ethnic inequalities in health', *Social Science & Medicine,* 54(5), pp. 693–706.
Crenshaw, K. (1989) 'Demarginalizing the intersection of race and sex: a black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics', *University of Chicago Legal Forum,* 14, pp. 538–554.
Crenshaw, K. (1991) 'Mapping the margins: intersectionality, identity politics, and violence against women of color', *Stanford Law Review,* 43(6), pp. 1241–1299.
Cummings, J. L. and Jackson, P. B. (2008) 'Race, gender, and SES disparities in self-assessed health, 1974–2004', *Research on Aging,* 30(2), pp. 137–168.
Dhamoon, R. (2008) 'Considerations in mainstreaming intersectionality as an analytic approach', paper presented at the Workshop on Intersectionality in Theory and Practice: an Interdisciplinary Dialogue, Simon Fraser University, Vancouver, 17–18 April.
Drever, F., Doran, T. and Whitehead, M. (2004). 'Exploring the relation between class, gender, and self rated general health using the new socioeconomic classification. A study using data from the 2001 census', *Journal of Epidemiology and Community Health,* 58(7), pp.590–596.
Farmer, M. M. and Ferraro, K. F. (2005) 'Are racial disparities in health conditional on socioeconomic status?', *Social Science & Medicine,* 60(1), pp. 191–204.
Griffin, J. M., Fuhrer, R., Stansfeld, S. A. and Marmot, M. (2002) 'The importance of low control at work and home on depression and anxiety: do these effects vary by gender and social class?', *Social Science & Medicine,* 54(5), pp. 783–798.
Iyer, A. (2007) *Gender, caste and class in health: Compounding and competing inequalities in rural Karnataka, India,* Ph.D. thesis, Division of Public Health, University of Liverpool, Liverpool.
Iyer, A., Sen, G. and George, A. (2007) 'The dynamics of gender and class in access to health care: Evidence from rural Karnataka, India', *International Journal of Health Services,* 37(3), pp. 537–554.
Iyer, A., Sen, G. and Ostlin, P. (2008) 'The intersections of gender and class in health status and health care', *Global Public Health,* 3(1), pp. 13–24.

Kahn, J. R. and Fazio, E. M. (2005) 'Economic status over the life course and racial disparities in Health', *Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* 60(Suppl 2), pp. S76–S84.

Krieger, N., Quesenberry, C., Peng, T., Horn-Ross, P., Stewart, S., Brown, S., *et al.* (1999) 'Social class, race/ethnicity, and incidence of breast, cervix, colon, lung, and prostate cancer among Asian, black, Hispanic, and white residents of the San Francisco Bay Area, 1988–92 (United States)', *Cancer Causes and Control,* 10(6), pp. 525–537.

Krieger, N., Chen, J. T., Waterman, P. D., Rehkopf, D. H., Yin, R. and Coull, B. A. (2006) 'Race/ethnicity and changing US socioeconomic gradients in breast cancer incidence: California and Massachusetts, 1978–2002 (United States)', *Cancer Causes and Control,* 17, pp. 217–226.

Lahelma, E., Arber, S., Kivela, K. and Roos, E. (2002) 'Multiple roles and health among British and Finnish women: the influence of socioeconomic circumstances', *Social Science & Medicine,* 54(5), pp. 727–740.

Macintyre, S. and Hunt, K. (1997) 'Socio-economic position, gender and health: how do they interact?', *Journal of Health Psychology,* 2(3), pp. 315–334.

Matthews, S. and Power, C. (2002) 'Socio-economic gradients in psychological distress: a focus on women, social roles and work-home characteristics', *Social Science & Medicine,* 54(5), pp. 799–810.

Mohindra, K. S., Haddad, S. and Narayana, D. (2006) 'Women's health in a rural community in Kerala, India: do caste and socioeconomic position matter?', *Journal of Epidemiology and Community Health,* 60(12), pp. 1020–1026.

O'Donnell, O., van Doorslaer, E., Wagstaff, A. and Lindelow, M. (2008) *Analysing Health Equity using household Survey Data: A Guide to Techniques and their Implementation,* The International Bank for Reconstruction and Development/The World Bank, Washington, D.C.

Phoenix, A. and Pattynama, P. (2006) 'Intersectionality', *European Journal of Women's Studies,* 13(3), pp. 187–192.

Rousham, E. K. (1996) 'Socio-economic influences on gender inequalities in child health in rural Bangladesh', *European Journal of Clinical Nutrition,* 50, pp. 560–564.

Schulz, A. J. and Mullings, L. (Eds) (2005) *Gender, Race, Class and Health: Intersectional Approaches,* Jossey-Bass, San Francisco.

Sen, G., Iyer, A. and George, A. (2007) 'Systematic hierarchies and systemic failures: gender and health inequities in Koppal District', *Economic and Political Weekly,* XLII(8), pp. 682–690.

Walters, V. (1993) 'Stress, anxiety and depression: Women's accounts of their health problems', *Social Science & Medicine,* 36(4), pp. 393–402.

Walters, V., McDonough, P. and Strohschein, L. (2002) 'The influence of work, household structure, and social, personal and material resources on gender differences in health: an analysis of the 1994 Canadian National Population Health Survey', *Social Science & Medicine,* 54(5), pp. 677–692.

Weber, L. and Parra-Medina, D. (2003) 'Intersectionality and women's health: charting a path to eliminating health disparities,' in M. T. Segal, V. Demos and J. J. Kronenfeld (Eds), *Gender Perspectives on Health and Medicine: Key Themes,* Elsevier, Amsterdam, pp. 181–230.