

INTRODUCTION

Risk factors in context

- People residing in the same community or context and sharing the same contextual or environmental exposure violating the statistical assumption of independence usually employed in regression analysis.
- Disregard of this adjustment required and, hence, simplistic analysis of contextual independent variables would bias the result, overestimating the association under study.
- Multilevel modelling provides a solution for simultaneous inclusion of individual and contextual-level variables (Snijders and Bosker, 1999).
- Long-standing research regarding the association between residential area and general health, the role of the neighbourhood environment in the pathogenesis of CVDs remains a relatively less understood research concern though.
- Diez-Roux et al. (1997) also found small but significant neighbourhood effects on CVD risk factors, generally consistent across genders and neighbourhood indicators.

DATA SOURCES AND METHODOLOGY

- The surveys pertaining to Social Consumption related to Health, conducted by the National Sample Survey Office (NSSO) are the principal source of data on basic quantitative information on the health sector like morbidity, hospitalisation, receipt of pre-natal and post-natal care of women, expenditure incurred on treatment received from health services in public and private sectors etc in India. The 60th round (2004) and 71st round (2014) providing information on the public distribution system, health services, educational services and problems of the aged, have been utilised.
- A four-level multilevel model has been fitted to examine the measured individual, household, community, and district factors (fixed effects) on the prevalence of CVDs.
- In addition, the household, community, and district-level random effects using the melogit command in Stata 15 (Stata Corp. Inc., TX, USA) have also been estimated.

RESULTS

Table 1: Empty model for multilevel analysis 60th (2004) and 71st round (2014)

Random effects	60th round	71st round
Household random variance (SE)	3.58E-33 (1.98E-17)	2 (0.27)
HH ICC	0.52	0.42
Community (PSU) random variance (SE)	3.49 (0.39)	0.24 (0.18)
Community (PSU) ICC	0.52	0.06
District random variance (SE)	0.06 (0.04)	0.13 (0.05)
District ICC	0.01	0.02

Table 2: Multilevel model for analysis of CVD prevalence encompassing individual, household, community, and district-level factors for NSSO 71st round (2014)

Fixed Effects	2004 Odds Ratios [95% C.I.]	2014 Odds Ratios [95% C.I.]
Individual variables		
Household variables		
Expenditure quintile		
Poorest	ref	ref
Poorer	0.80 (0.62-1.04)	1.15 (0.93-1.41)
Middle	0.95 (0.74-1.23)	1.03 (0.83-1.27)
Richer	0.75** (0.58-0.97)	0.74** (0.58-0.96)
Richest	0.62*** (0.46-0.82)	0.55*** (0.40-0.75)
Community-level variables		
% of Hindu Households in FSU		
25 percent or less	ref	ref
26 to 50 percent	1.06 (0.75-1.49)	0.21*** (0.14-0.31)
More than 50 percent	1.84*** (1.45-2.33)	0.14*** (0.11-0.17)
Educational attainment in FSU		
Low level of educational attainment	ref	ref
High level of educational attainment	0.38*** (0.29-0.51)	1.53*** (1.25-1.87)
District-level variables		
% of District Urbanicity		
25 percent or less	ref	ref
26 to 50 percent	0.71 (0.47-1.07)	1.42** (1.01-2)
More than 50 percent	0.65 (0.40-1.06)	2.40*** (1.61-3.57)
Educational level attainment of district		
Low level of educational attainment	ref	ref
High level of educational attainment	0.97 (0.76-1.23)	0.85 (0.67-1.07)
% of population engaged in labour-intensive occupations in the district		
Less than 50 percent	ref	ref
50-75 percent	1.45 (0.01-0.04)	0.83 (0.62-1.13)
Random effects		
Household random variance	4.28E-33 (8.21E-18)	3.67 (0.54)
HH ICC	0.39	0.57
Community (PSU) random variance (SE)	2.05 (0.26)	0.51 (0.29)
Community (PSU) ICC	0.39	0.09
District random variance (SE)	0.02 (0.02)	0.17 (0.08)
District ICC	0.01	0.02

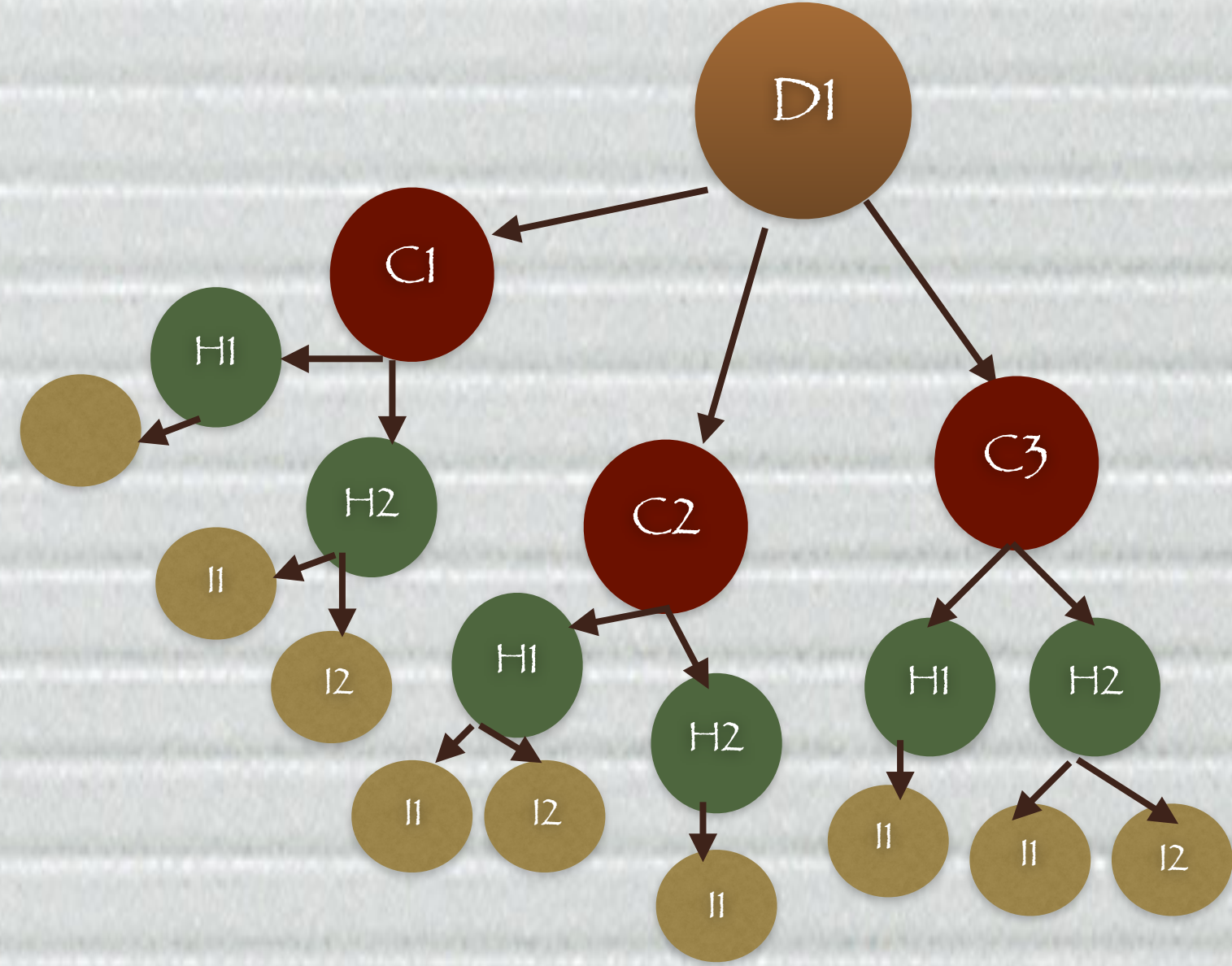
- Table 2 presents the results of the multilevel models with individual, household, community, and district level indicators.
- At the district level, model encompassing all individual, community, household and district-level factors shows urbanicity as an important factor; districts with 26 to 50 percent of their population urbanized 1.4 times more likely (OR=1.42, p<0.05) to have CVDs, as compared to those with 25 percent or less of their population urbanized.
- The FSUs with high educational attainment have been found to be more prone (O.R. = 1.53, p<0.01) to CVDs in 2017-18, as compared FSUs with low level of educational attainment.
- The HH-within-community ICC was found to be 0.57 in 2017-18 and 0.3 in 2004-05 for the last model which encompassed individual, HH, community, and district level factors.

NEED FOR THE STUDY

- Discrimination of effects of contextual from individual variables is an important facet of research in public health.
- India is a country with huge disparities in socioeconomic development and ethnicity among communities.
- The CVD risk is different among the population and varies by regions. Under this circumstance, the purpose of the current study is to test the independent effects of contextual socioeconomic variables, while adjusting for individual socioeconomic and behavioural factors.
- Understanding characteristics of communities or districts and their pathways of linkages with CVD risk can assist in appropriate health planning and resource allocation to those areas requiring them.

Level Structure of the Data

Levels		Variables
4	Districts (D)	Proportion of Hindu population, District urbanicity, Proportion of population engaged in labour-intensive occupation, Proportion of SC/ST population, Educational attainment
3	Communities (C)	Proportion of Hindu HH, Proportion of population engaged in labour-intensive occupation, Proportion of SC/ST population, Educational attainment
2	Households (H)	Occupation, Religion, Ethnicity, Expenditure quintile
1	Individuals (I)	Sex, Age, Highest level of education attained



SUMMARY AND CONCLUSION

- In the 60th and 71st round of NSSO, there were a plethora of significant factors affecting CVD occurrence, vis-a-vis, a higher proportion of district urbanicity, a higher proportion of Scheduled caste or Scheduled Tribe households in communities, and households engaged in labour-intensive occupations found to be positively associated with a higher likelihood of CVD occurrence.
- On the contrary, households with higher expenditure quintiles, higher proportion of households practising Hinduism in communities, and a higher proportion of Scheduled caste or Scheduled Tribe households in districts associated with lower likelihood of CVD occurrence.
- Need for interventions to reduce social inequalities, which combine both individual (e.g. information campaigns and behavioural change communication strategy about benefits of physical activity), as well as structural prevention (e.g. local activity centers) in communities, aimed at community health improvement.

DISCUSSION

- These findings throw light on how strengthening policy measures, while keeping these factors in consideration, can ease the transition of the nation into better health in terms of cardiovascular disease management.
- Religious and ethnic composition of the communities and districts has been found to have an impact, too; so, there must be some pathways of action stemming from these compositional differences which need to be explored further in this regard.
- Western studies have previously demonstrated the association of deprivation in low-income communities and the increase in various CVD factors, e.g., SBP (Winkleby et al., 1992), overweight (King et al., 2006), and diabetes (CDC, 2002). The results of our study agree with the protective effect of household expenditure quintile against the CVD risk.

POLICY IMPLICATIONS

- If inequality is proven to have a lasting impact on health, minimization of inequality instead of only focusing on policies correcting differences in outcomes may be instrumental and hugely beneficial for the overall population health. Target areas coming up in studies of this sort should direct the next course of action to be undertaken in terms of morbidity combat. Region-specific steps are another area of action which can help in addressing the issue.
- The risk factors, aiming which can control the disease prevalence in one area, might not be effective in combatting an increased CVD prevalence in another area.
- The most important questions in research on socioeconomic CVD determinants relate to how the evidence is translated into CVD reductions. Hence, causal and non-causal correlates need to be segregated in further research, effecting successful design interventions.