Interregional Variation in the prevalence of Tuberculosis: A Study in Madhya Pradesh Using Multilevel Approach

Extended abstract

Introduction

According to WHO TB, with AIDS, is the leading infectious cause of adult mortality in the world, causing between 1.5 and 2 million deaths per year. One-third of the world's population, almost 2 billion people, is infected, and the number of new TB cases each year climbed 6% between 1990 and 1997, from 7.5 million to 8 million cases, currently standing at 8.4 million. India has more new tuberculosis cases annually than any other country. For the World as a whole, the biggest challenge of tuberculosis (TB) is its ability to survive in most countries and to flourish in Southern Countries even in the year 2006 of the Common Era (WHO, 2006). WHO declared TB as a Global Health Emergency (1993) and offered 'DOTS' as the 'mantra' to contain and overcome TB. Availability of DOTS centers in India is not creating an impact on the coverage of TB patients (Vishwanathan, 2006). Overall, the contribution of TB in leading causes of death in India is 6%. Within the different ages tuberculosis contributes 7% of the total death in ages 15-24 while its share increases to 10% in the age 25-69 (RGI, 2001-03). TB kills half a million Indians every year and has a huge economic cost. Drug resistance is of increasing concern with 3.4% of all new cases showing multi-drug resistance. The TB pandemic is further complicated by the spread of HIV/AIDS, with 5.2% of all TB cases related to HIV infection (Metcalfe, 2006).

In India the prevalence of TB in 2002-04 is 326 per 100,000 population and the bigger states like Madhya Pradesh, Uttar Pradesh are above the national prevalence (IIPS, 2002-04). The Madhya Pradesh is the state which had very high infant and maternal mortality and even the prevalence of communicable diseases like TB is also high. Hence one should distinguish the factors interrelated to such a deprived health standing of the state. However within the state there may be some regional variation which may influence the prevalence of the disease. The state specific models fail to appreciate the possible inter-regional variations within the state or similarities between neighboring regions across states. In most of the micro and macro level studies these "pockets" which are at odds with the overall pattern of that region, are overlooked or not captured fully (Guha and Dutta, 2008).Hence the present study is an endeavor to meet the space created by state specific models.

The objectives of this study are to explore the regional variation in the prevalence of tuberculosis and to determine the factors associated with the prevalence of tuberculosis at different levels of hierarchy in Madhya Pradesh.

Data source

The data set utilized in this study is District level Household Survey-2. DLHS -2 is a nationally representative survey conducted during 2002-04 in 593 districts of all the states of India. This dataset provides us an ample opportunity to see the regional variation within the state. Madhya Pradesh data will be utilized to accomplish the rationale of this study. The fieldwork for DLHS-2 was done in two phases in the State of Madhya Pradesh. During Phase I, 23 districts were covered from May 2002 to February 2003 and remaining 22 districts were covered during Phase II from February 2004 to September 2004.

During round-2 of DLHS a total of 46413 thousands households were covered from the state.DLHS-2 collected information on several aspects associated with reproductive and child health. It also captures information concerning occurrence of morbidities like tuberculosis in the members of the household.

Methodology

The present data is structured in a hierarchal manner, with households clustering within districts and districts within regions. Prevalence rates are calculated region wise with respect to certain background characteristics. The multilevel approach allows entangling the hierarchal data induced by the sampling design adopted in DLHS-2. A three-level random effect logit model which has provision to integrate variation in prevalence by regions is adopted for the present study considering households, districts and region as the innermost to outermost levels in the hierarchy of analysis. The model gives us an opportunity is to explore the observed variation in the prevalence explained by the independent variables at each level while the quantification of unobserved variation is facilitated by incorporating random intercept which explore the unobserved heterogeneity at the households, districts and regional level.

The general equation of the three-level random intercept logit model used in the present analysis is

$\ln(y_{ijk}/1-y_{ijk})=\beta_{0jk}\text{const}+\sum\beta_{ijk}x_{ijk}$; where $\beta_{0jk}=\beta_{00k}+u_{0j}+v_{ojk}+e_{ijk}$

$u_{0j} \sim N(0,\sigma_u^2)$, $v_{ojk} \sim N(0,\sigma_v^2)$,$e_{ijk} \sim N(0, \sigma_e^2)$

β_{0jk} is the random intercept which varies over districts and region, β_{ijk} are fixed effect parameters, while u_{0j}, v_{ojk}, e_{ijk} are error terms at the three levels .Dependent variable y_{ijk} signifies the occurrence of tuberculosis in the ith household of the jth district of the kth region .

Preliminary Results

Table 1 shows the regional variation in the prevalence of tuberculosis in Madhya Pradesh. Central region of Madhya Pradesh has the highest prevalence of tuberculosis of 619 per 100,000 population. On the other side lies Malwa Plateau region having lowest prevalence of 233 per 100,000 population. Place of residence also shows same regional variability. Central region had highest prevalence and Malwa Plateau lowest prevalence irrespective of both type of residence. Rural areas had higher prevalence in all regions except Malwa Plateau and South Central where urban areas are on higher edge.

The expected findings associated with the multilevel model analysis are the factors at different levels operate differently on the occurrence of tuberculosis. Region will create a significant impact on the occurrence of the tuberculosis. Place of residence, standard of living, age, sanitation facilities and sex will significantly predict tuberculosis occurrence. The variance at all the three levels of hierarchy had an impact on tuberculosis.

Tables

Table 1.Prevalence of tuberculosis in different regions of Madhya Pradesh in 2002-04

REGION	Prevalence Rate per 100,000 population
VINDHYA	379
CENTRAL	619
MALWAPLATEAU	233
SOUTHCENTRAL	385
SOUTHWESTERN	298
NORTHERN	463

Note: All the rates refer to *de jure* population.

Table 2.Prevalence of tuberculosis in different regions of Madhya Pradesh by sex in 2002-04

REGION	Prevalence Rate per 100,000 population	
	Rural	Urban
VINDHYA	420	253
CENTRAL	626	610
MALWAPLATEAU	220	245
SOUTHCENTRAL	362	437
SOUTHWESTERN	310	269
NORTHERN	516	345

Note: All the rates refer to *de jure* population.