Nexus between Calorie Inequalities and Health among Major Indian States

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This paper aims primarily at making a measurement of calorie inequalities as also at examining nexus, if any, between severity of such inequalities and health status among major Indian states (jointly through significant concomitants of health), so as to come out with suitable corrective measures, particularly for the laggard states.

For measuring calorie inequalities among seventeen major Indian states, data on the distribution of households by calorie intake level for different MPCE classes (for both Rural and Urban regions) of each of the states, as also for the entire country, were culled out from the Reports of 55th (July, 1999 - June, 2000), 61st (July, 2004 - June, 2005) and 68th (July, 2011 - June, 2012) Rounds of National Sample Surveys Organization (NSSO) on Nutritional Intake in India. The states considered were: Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Kerala, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. Measurement of the inequalities was made through the well-known FGT index (with α = 2). In fact, FGT(2) is known to yield squared poverty-gap ratio (thereby measuring relative deprivation). Application of three-way ANOVA technique (with Rounds, States and Regions as the factors) on the computed values of the index revealed that within both rural and urban regions, the averaged inequalities were highly significantly different among the states, as also among the three rounds. However, on an average, the extents of inequalities among rural and urban regions were comparable. Temporally, the inequalities portrayed an inverted-U pattern. Gravity of the situation on calorie inequalities in south Indian states (like Tamil Nadu, Kerala and Karnataka) was alarming whereas, on the other extreme, the same in certain north-Indian hilly states (like Himachal Pradesh and Jammu & Kashmir) was quite manageable.

Further, secondary information was compiled on 16 indicators of health at three points in time: 1999-00, 2004-05, and 2011-12. The points had a close proximity with three Rounds (viz., 55th, 61st and 68th) of NSSO on Nutritional Intake in India. The indicators considered in the study were a mixture of demographic (or endogenous) variables (viz., Birth Rate, Death Rate, Infant Mortality Rate, and Life Expectancy at Birth); exogenous variables on physical and social infrastructure of health (viz., Number of Hospitals per 100 Sq Km, Number of Hospital Beds per Lakh of Population, Number of Sub-Centers per 100 Sq Km, Number of Primary Health Centers per 100 Sq Km, Number of Community Health Centers per 100 Sq Km, Number of Doctors per Lakh of Population, Number of Pharmacists per Lakh of Population, Number of Auxiliary Nursing Midwives per Lakh of Population, Number of Lady Health Visitors per Lakh of

Population, Number of Nurses per Doctor, and Number of Assistants per Doctor); and level of living (viz. Per Capita Income).

Justification of the inclusion of the (four) demographic variables in conjunction with the (eleven) variables of physical & social health infrastructure was explored through canonical correlation analysis; the first-ordered canonical correlation coefficient (= 0.8836) between the two groups of variables was tested (through Wilks' λ) to be highly significant (p ≈0). Furthermore, redundancy measure (= 0.322) of the first group, given the information on the second group, implied that even in the presence of the latter group, more than two-third of the information contained in the former group remained unsqueezed, thereby providing evidence in support of including demographic variables alongwith the other variables.

The task was accomplished through factor analysis (with promax oblique rotation) as applied to the As per the results obtained through factor analysis, the optimum number of factors extracted at each of the three points in time happened to be six. Nevertheless, compositions of the factors (and, consequently, the chief determinants of health status) have undergone voluminous reshuffling during the study span. During 1999-00, the most important factor was constituted primarily by demographic variables, while the next one was made up of the variables on physical infrastructure of health. The picture got reversed during 2004-05. However, during 2011-12, the most important factors happened to be constituted primarily by the variables representing physical and social health infrastructure. We are thus lead to invalidate the hypothesis that relative significance of different dimensions of health among the major Indian states has remained time invariant. As per composite index (constructed from factor loadings), Tamil Nadu, Maharashtra and Kerala have performed well and have undergone perceptible temporal improvements in health status. However, the so-called better-off states like Punjab and Gujarat have slipped fairly sharply in their rankings which, of course, is a matter of serious concern for such states. The bottom positions consistently remained occupied by the BIMARU states (viz., Bihar, Madhya Pradesh, Assam, Rajasthan and Uttar Pradesh).

As regards nexus, if any, between calorie inequalities and health status, the results through panel data estimation (in conjunction with Hausman's test) suggested in favour of random effects modeling. Association between FGT(2) measure of the inequalities and the composite index of health status was indirect (r = -0.3086) and statistically significant (p = 0.0276). Further, there was a feeble indication of an indirect association between the measure of inequalities and per capita income (r = -0.2533; p = 0.0729). However, association between the composite index and per capita income was direct (r = 0.7720) and very robust (p ≈0). Thus, as a policy measure, there is a dire need for shifting priorities in favour of investment on both physical and social health infrastructure, particularly in laggard states and in those states which have undergone a rapid slippage in their ranking. If the state alone cannot shoulder the burden of increased expenditure on this important economic activity, then public-private-partnership model needs be propagated. Improved health conditions would expectedly enhance incomes of the people which, in turn, might bring down the severity of inequalities in calorie intake.