Relationship between urbanization and health outcomes in Indian states

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Abstract:

The present study assesses the impact of urbanization on health outcomes in Indian states from the period 1971 to 2011. Urbanization is measured by the total urban population, percentage of urban population, and urban population growth rate. Health outcomes are measured by total fertility rates (TFR), crude birth rates (CBR), infant mortality rates (IMR), and life expectancy at birth (LEB). The fixed effect panel data models suggest that urbanization has a strong positive effect on health outcomes by reducing TFR, CBR, IMR, and by increasing LEB. Therefore, we suggest that the increasing urbanization in India is not only beneficial for higher economic growth and development but also for a higher level of health outcomes. The positive urban health outcomes may also be able to control the population growth in India. Therefore, urbanization is essential for holistic development in India.

Keywords: Urbanization, total fertility rate, crude birth rate, infant mortality rate, India

Introduction

India is going through a transformation from its rural-based agriculture economy to urban-based industry and service lead economy. The percentage of urbanization has increased from 17.97 % in 1961 to 31.16% in 2011. The total urban population has risen from 7.9 crores to 37.71 crores during the same period of time. The urban population grew at 2.76% per annum during 2001-2011 [Bhagat, 2011]. It is also important to note that for the first time since independence, the absolute increase in the urban population was higher than that in the rural population. However, though India's urbanization rate is moderate compare to its peers, the large scale emergence of census towns in 2011 signals the rapid transformation is taking place in the rural areas in the form of non-farming activities.

Cities and towns of India constitute the world's second-largest urban system, and over 50% of the country's gross domestic products generated by these cities and towns [Tripathi, 2013]. The agglomeration economies helped to reduce poverty, increased standard of living by increasing job opportunities and reduced dependence on agriculture in India. Therefore, several recent urban policies such as 100 smart cities mission, and Atal Mission for Rejuvenation and Urban Transformation (AMRUT) are put in place for the promotion of urbanization in India.

In this paper, we argue that urbanization not only worthy of higher economic growth and reduction of poverty but it has also a positive impact on overall health outcomes. Health outcomes are measured by total fertility rate, crude birth rate, infant mortality rate, and life expectancy at birth. All the measurements of health outcomes are relevant. For instance, from an environmental point of view having fewer children is positive; recent research has shown that having one fewer child reduces a parent's carbon footprint by 58 tonnes of CO_2 a year.[1] On the other hand, urbanization is measured by the total urban population, percentage of urban population, and urban population growth rate.

The crude birth rate (CBR) is declining in India states/union territories. CBR in Delhi declined from 33.6 in 1971 to 17.5 in 2011. The total fertility (TFR) rate in Assam dropped from 5.7 to 2.4 in the same period. The infant mortality rate (IMR) in Bihar reduced from 118 in 1981 to 44 in 2011. Life expectancy at birth (LEB) in Madhya Pradesh has increased from 54.7 in 1991 to 62.8 in 2011. On the other hand, Indian states are witnessing variations in their levels of

[1] https://www.theguardian.com/world/2018/dec/26/falling-total-fertility-rate-should-be-welcomed-population-expert-says

urbanization. For instance, in 2011 the level of urbanization in Mizoram was 52% whereas it was only 11% in Bihar. Hence, the assessment of the relationship between state-level urbanization and health outcomes is very important for the promotion of urbanization in India.

Our period of the study lies between 1971 and 2011. Data for life expectancy at birth is fetched by a quinquennial Survey and not available before 1991. Therefore, we consider 1991-95 as 1991, 1997-01 as 2001 and 2007-2011 as 2011. Data for TFR, CBR, IMR, and LEB are collected from Sample Registration System (SRS) Bulletin various issues, Office of the Registrar General & Census Commissioner. LEB data before 1995-99 are collected from Economic Survey, Government of India.

Brief review of literature

Some empirical studies have systematically studied the relationship between health outcomes and urbanization. Bandyopadhyay and Green (2017), using cross-national panel data, found evidence of a robust negative correlation between crude death rates and urbanization. They also found robust evidence that mortality decline is correlated with urbanization through the creation of new cities rather than promoting urban growth in already-extant cities.

Indian literature is mainly concentrated on how city-specific urbanization level impact on urban health. For instance, Saravanan et al. (2016) analyzed the water-borne diseases in the city of Ahmedabad, India. Butsch et al. (2012) demonstrated that urban health is closely connected with the specifics of India's urbanization. Differences in lifestyle and access to resources result in polarisation: the healthiest and the least healthy citizens now live in urban India. Kumar et al. (2018) suggested that there is a strong need to set up primary healthcare system in urban areas and systematically deal with urban health challenges in terms of vector-borne diseases, rising incidence of noncommunicable diseases, air pollution and acute respiratory infections, road traffic accidents, trauma, and injuries. Singh et al. (2011) found that urbanization and coverage of safe delivery were not associated with either infant or under-five mortality.

A brief review of Indian literature suggests that the overall impact of urbanization on health is missing. Therefore, it is very much important to assess the impact of urbanization on the overall health of the Indian states.

Regression Results

Our regression analyses aim to quantify the relationship between urbanization and health outcome. As our data set is a panel, we estimate the following equation:

$$\boldsymbol{Healthoutcome_{it} = \alpha + \mu_{it} + \lambda_{it} + \beta\, Urbanization_{it} + \epsilon_{it}} \quad (1)$$

where $Healthoutcome_{it}$ is the health outcome of state *i* in year *t*, $\boldsymbol{\mu_{it}}$ is a state fixed effect (to measure state-specific factors such as culture and geography, $\boldsymbol{\lambda_{it}}$ is a year fixed effect (to measure state-invariant time shocks or trends), $\boldsymbol{\epsilon_{it}}$ is a well-behaved error term. Our independent variable is urbanization.

Table 1 presents the summary statistics of each variable used in the regression models. The coefficient of variation (CV) measures the dispersions of data points in a data series. Life expectancy at birth, crude birth rate, and total fertility rate have lower values of CV, which indicate little differences in their means, implying a more symmetrical distribution. However, it is not the case for the total urban population, percentage of urban population, and urban population growth rate.

Table 1: Descriptive statistics for panel data

Variable	Observ-ations	Mean	Standard deviation	Mini-mum	Maxi-mum	CV (in %)
Total urban population (in thousands)	173	6643.763	9473.413	7	50818	142.5911
Urban population growth rate	131	3.931603	2.405088	-3.2	14.6	61.17322
Percentage of urban population	164	30.14744	21.29322	0	97.5	70.63028
Total fertility rate	114	3.094925	1.345929	0.719	6.7	43.48826
Crude birth rate	149	25.85772	7.463634	13.3	44.9	28.86424
Infant mortality rate	109	62.9633	36.05216	11	167	57.25901
Life expectancy at birth	47	64.16809	4.662716	54.7	74.4	7.266409

Table 2 presents the raw correlation coefficients. The estimated values of correlation coefficients quantify the direction and strength of the linear association between the variables. The results show that the total urban populations have a positive association with life expectancy at birth. In contrast, the total urban population is negatively correlated with the total fertility rate, crude birth rate, and infant mortality rate.

Table 2: Correlation coefficient of the variables used in regression model

	tup	upgr	pup	tfr	cbr	imr	leb
Total urban population (tup)	1						
Urban population growth rate (upgr)	-0.09	1					
Percentage of urban population (pup)	0.57	0.21	1				
Total fertility rate (tfr)	-0.11	0.11	-0.51	1			
Crude birth rate (cbr)	-0.17	0.11	-0.52	0.97	1		
Infant mortality rate (imr)	-0.20	0.01	-0.51	0.74	0.80	1	
Life expectancy at birth (leb)	0.14	0.07	0.55	-0.75	-0.81	-0.93	1

Before we choose the appropriate panel models, we do several diagnostic tests for regression models 1-4. Table 3 shows the statistically significant F-test and compels us to go for the fixed-effect model over the pooled model. The statistically significant values of the Breusch–Pagan Lagrange multiplier (LM) test indicate that the random effect models are appropriate. To decide between random and fixed-effect models, we run the Hausman test. The statistically significant values of the Hausman tests support the estimation of fixed-effect models. After that, we test for heteroskedasticity using STATA command *xttest3*. We found that the errors of all models suffer from heteroskedasticity. Therefore, to ensure the validity of the regression results, we must obtain robust estimations. To do that, we use a 'robust' option with the fixed-effect model estimation to obtain heteroscedasticity-robust standard errors (also known as Huber/White or sandwich estimators). The robust estimation results are presented in Table 3. As our data point is not typically macro panels as with 10 years interval we do not find any problem of serial correlation. The significant values of F statistics for regressions 1–4 indicate that the overall models are statistically significant.

Regression model 1 indicates that both the total urban population and the percentage of the urban population have a negative and statistically significant (at 1% level) effect on the total fertility rate. A 1 percent increase in the total urban population (or the percentage of urban population) decreases the total fertility rate by an average of 0.8% (or 0.4%). However, urban population growth rates do not have any impact on the state-wise total fertility rate.

Table 3: Regression results from fixed-effect model

Independent variable	Dependent Variable			
	Total fertility rate	Crude birth rate	Infant mortality rate	Life expectancy at birth
	Model 1	Model 2	Model3	Model4
Total urban population	-0.0831867***	-0.4609718***	-2.646046***	0.3847682***
	(0.0173681)	(0.1014489)	(0.5465919)	(0.1297111)
Percentage of urban population	-0.0437692***	-0.37568***	-0.9880629**	0.1042742
	(0.0119973)	(0.0781787)	(0.4439989)	(0.1530414)
Urban population growth rate	0.0944864	1.017043***	4.904715***	-0.6167882
	(0.0611309)	(0.2367432)	(1.663697)	(0.5579803)
Constant	4.679025***	36.36082***	97.178***	56.92342***
	(0.2662022)	(1.794091)	(10.95679)	(1.078854)
F statistics	21.67***	34.70***	24.35***	39.26***
Overall R^2	0.0482	0.1272	0.0254	0.0393
Number of observations	101	126	97	47
F-test for model specification. Null hypothesis: Pool versus FE	10.94***	8.16***	9.9***	11.79***
LM-criteria for model specification. Null hypothesis: Pool versus RE: Pool	22.96***	18.07***	8.77***	8.08***
Hausman criteria for model specification. Null hypothesis: RE versus FE	817.23***	145.86***	45.04***	15.90***
Wald test for groupwise heteroskedasticity: The null is homoskedasticity	2359.59***	4.9e+30***	3.6e+30***	6231.46***

Robust standard errors in parentheses
*** p<0.01, ** p<0.05

Regression models 2 and 3 suggest that the total urban population and percentage of the urban population have a negative effect on the crude birth rate and the infant mortality rate. On the contrary, the urban population growth rate has a positive effect on them. This indicates that the percentage change of urban population that represents the relative change in the size between populations across a period is more important than the urban population growth rate which represents the average amount of change across a period. Finally, the total urban population has a positive and statistically significant (at 1% level) effect on the life expectancy at birth. The

estimated results show that a 1% increase in the total urban population increases life expectancy at birth by 3.8 %. The results indicate that urbanization has a positive impact on health outcomes.

Discussion

The "Theory of Demographic Transition" in demographic literature (e.g., Notestein, 1945; Davis, 1949; Stolnitz, 1964; and Lee, 2003) stated that through the economic development and social changes fertility and mortality rate decline. Amonker and Brinker (2007) supported this theory for India and suggested that modernization, health, education, and family planning are inversely related to fertility rates (crude birth rate and total fertility rate) among the states of India. There is also evidence that urbanization was responsible for about 22% of the decrease in TFR between 1982 and 2008 [Guo et al., 2012].

This paper suggests that India's urbanization also has a similar effect on the total fertility rate. Urbanization is associated with higher economic development through higher engagement in education and work. This reduces fertility rates. Higher economic development that is associated with a higher rate of urbanization in India has demanded higher medical facilities. This, in turn, reduces the infant mortality rate. Urban dwellers with higher income secure more medical insurance than rural areas. In 2014, 14.1 % of rural people have health insurance whereas 18.1 percent in urban areas.[2] It is important to note that 68% of the people in India live in rural areas in 2011. Finally, life expectancy at birth is higher for urban dwellers than rural people. The difference in life expectancy between urban and rural India was about 4.7 years in 2013-17. Urban dwellers benefit from advances in healthcare services. They also become conscious of making them healthy. Therefore, we suggest that urbanization is essential for higher overall health outcomes in India.

Conclusions

The relationship between urbanization and health outcome is assessed in this study. Urbanization is measured by the total urban population, the percentage of the urban population, and the growth rate of the urban population. On the other hand, health outcome is measured by total fertility rate, crude birth rate, infant mortality rate, and life expectancy at birth. This paper finds that urbanization has a positive effect on the overall health outcomes of the Indian States.

[2] https://economictimes.indiatimes.com/news/economy/policy/18-population-of-urban-area-covered-under-health-insurance-government/articleshow/52149871.cms?from=mdr

No country has ever reached middle-income status without a significant increase in urbanization (Annez and Buckley, 2009). Urbanization has contributed, not only to higher-income but also has improved people's lives (Jacobs, 1984; Hall, 1998). Therefore, the promotion of urbanization is very important for many developing countries such as India. The finding of this study suggests that urbanization is not only good for higher economic growth and development but also higher health outcomes.

On the other hand, by lowering the fertility rate urbanization can control the population in India. Prime Minister Narendra Modi in his Independence speech pointed out that population growth is a major concern in India. Indian delegate Karan Singh in the 1974 Conference on Population and Development declared that 'development is the best contraceptive'. It is proved that in developing countries such as India urbanization and development go hand-in-hand. Therefore, we suggest urbanization may also control population size in India with higher health outcomes.

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