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# Impact of Different Type of Disabilities on Worker Among Disable Population, In Million Plus Urban Agglomerations/ Cities In India

Partho Pratim Bhadra[1], Debapriya Ghose[2], Tushar Kanti Ghara[3]
[1]*Deputy Director, Directorate of Census Operations, West Bengal, Govt. of India*
*IB-199, Sector –III, Salt Lake, Kolkata 700106; bhadrap37@gmail.com*
[2]*Assistant Director, Directorate of Census Operations, West Bengal, Govt. of India*
*IB-199, Sector –III, Salt Lake, Kolkata 700106; debapriya04@gmail.com*
[3]*Joint Director of Public Instruction, Department of Higher Education, Govt. of West Bengal8th Floor, Bikash Bhavan, Salt Lake City, Kolkata 700091; tkghara@gmail.com*
*Corresponding Author: Tushar Kanti Ghara*

**Abstract:** Disability is a multi-dimensional and complex construct and there is no single universally accepted definition of disability. In Census of India, 2011, information on eight types of disability has been collected. Other than disable population, data on disable workers were also collected. Here an attempt has been made to evaluate the impact of different type of disabilities on worker among disable population, in Million Plus Urban Agglomeration As/Towns in India. Based on the type of disabilities, which are having most impact on number of disable workers, the million plus cities are ranked using an index, derived through the application used for analyzing the data.

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## I. INTRODUCTION

The WHO estimates suggest that the total global number of people with disabilities has already surpassed one billion[1]. International evidence on the prevalence of disability in developing countries is scarce, and often generates contradictory figures. Disability is usually defined as a physical or a mental health condition that limits a person's ability to perform normal life activities. However, the prevalence figures largely depend on data sources and methodological approaches. The existing rough estimations from international agencies such as the UN or the World Bank suggest that 10–12% of the global population have at least one disability[2]. The analytical work deals with two types of variables. Disability and workers among disability. Census 2001 has revealed that over 21 million people in India as suffering from one or the other kind of disability. This is equivalent to 2.1% of the population. Among the total disabled in the country, 12.6 million are males and 9.3 million are females. In Census 2001, information on five types of disability was collected [3]. In Census 2011, as per the Census 2011, the differently-abled population in India is 26.8 million. In percentage terms, this stands at 2.21 %. There are 14.9 million men with disabilities as compared to 11.9 million women in the country. The total number of differently-abled people is over 18.0 million in the rural areas and just 8.1 million enumerated in the urban settings [4].

In India, as per 2011 Census, Data considered for 52UAs/Towns each has a population of one million or above each are known as Million Plus UAs/Cities. These are the major urban centers in the country. An urban agglomeration is a continuous urban spread constituting a town and its adjoining outgrowths (OGs), or two or more physically contiguous towns together with or without outgrowths of such towns. An Urban Agglomeration must consist of at least a statutory town and its total population (i.e. all the constituents put together) should not be less than 20,000 as per the 2001 Census. In varying local conditions, there were similar other combinations which have been treated as urban agglomerations satisfying the basic condition of contiguity (Census of India 2011). An Out Growth (OG) is a viable unit such as a village or a hamlet or an enumeration block made up of such village or hamlet and clearly identifiable in terms of its boundaries and location [5].

Work is defined as participation in any economically productive activity with or without compensation, wages or profit. Such participation may be physical and/or mental in nature. Work involves not only actual work but also includes effective supervision and direction of work. It even includes part

time help or unpaid work on farm, family enterprise or in any other economic activity. All persons (irrespective of age and sex) who participated in any economically productive activity for any length of time during the reference period are defined as workers. Normally, production for self-consumption is not treated as economic activity. However, for the purpose of census an exception has been made in the case of persons who are engaged in growing of crops (except plantation crops), rearing of animals and milk production for self-consumption. These categories have been treated as16economic activity. Reference period for determining a person as worker and non-worker is one year preceding the date of enumeration. Main Workers- Workers who worked for more than 6 months (180 days) in the reference period are termed as Main Workers. Marginal Workers who worked for less than six months (180 days) in the reference period are termed as Marginal Workers. Marginal workers are further bifurcated into two categories i.e. those who worked for 3 months or more but less than 6 months and those who worked for less than 3 month (Census of India 2011)[6].

Here, in this analytical study, the purpose is to find out the relationship between Dependent (i.e, Number of Workers) and Independent Variables (Number of persons in each type of disability). Identifying the type of disability for which the disable workers number is mostly effective and the extent by which other independent variables are effecting the dependent variable and then on the basis of the effectiveness of these independent variables, evaluation of 52 Million Plus UA's/Cities in India is to be done.

## DATA

Census of India, 2011 data is used here. The data used here is for Million plus (Million Plus UA's/Cities) : Disabled Population Among Main Workers, Marginal Workers, Non- Workers by Type of Disability, Age And Sex -2011. The age group 15-59 is considered here as the main analysis is based on Workers among Disabled population in these 52 Million Plus UA's/Cities in India.

In Census 2011, information on eight types of disability has been collected.

Those are Disability – (i) in seeing, (ii) in hearing, (iii) in speech, (iv) in movement, (v) in mental retardation, (vi) in mental illness, (vii) any other and (viii) multiple disability.

The information on disability was collected during the Population Enumeration phase of Census 2011 through 'Household Schedule'. Questions on disability were asked about all persons in the Household in all types of households, i.e. 'Normal', 'Institutional' and 'Houseless' households covered.

The data used for analysis is for 52 million plus UAs/Cities of the country. Age 15-59 is considered for this purpose as the analysis is done considering the variable Worker as dependent. Worker is classified in Main and Marginal, where marginal workers are also classified as marginal workers (Less than 3 months) and marginal workers (3-6) months. However, for this work, only total worker data is considered.

$$Xij = Number\ of\ disable\ person\ corresponding\ to\ i^{th}\ unit\ and\ j^{th}\ type\ of\ Disability\ .$$

There are 52 million plus UAs / Cities which are considered a Unit and refer the suffix i. Similarly, 8 type of disability which refers the suffix j.

If we consider the first million plus UAs / Cities

$X_{11}$ = No of disable person , disability in seeing for the first million plus UAs / Cities,

$X_{12}$ = No of disable person , disability in hearing for the first million plus UAs / Cities

$X_{13}$ = No of disable person , disability in speech ,for the first million plus UAs / Cities

$X_{14}$ = No of disable person, disability in movement, for the first million plus UAs / Cities

$X_{15}$= No of disable person, disability in mental retardation, for the first million plus UAs / Cities

$X_{16}$= No of disable person, disability in mental illness, for the first million plus UAs / Cities

$X_{17}$= No of disable person, disability in any other for the first million plus UAs / Cities

$X_{18}$= No of disable person, disability in multiple disabilityfor the first million plus UAs / Cities

Similarly, $X_{2j}$ will refer the jth type of disability for the 2nd million plus UAs / Cities and so on.

Similarly, $Y_{11}$ = Number of disable workers having disability in seeing in the first million plus UAs / Cities; $Y_{12}$ = Number of disable workers having disability in hearing in the first million plus UAs / Cities

and so on for all kind of disability.

Similarly, $Y_{2j}$ will refer the Number of disable workers having disability in hearing in the 2nd million plus UAs / Cities and so on.

# II. METHODOLOGY

The analysis will be done in two folds.

A. To find out the relationship of Dependent and Independent Variables in this analysis

(i) Through Regression Analysis, the relationship between the single dependent variable, ie. Number of Worker for each type of Disability corresponding to Each Million plus UAs/ Cities and several independent variables, ie Type of Disability will be worked out. In other words, to explain variability in dependent variable by means of one or more of independent or control variables or to Determine the effect of each of the explanatory (Dependent) variables on the response (Independent) variable.

This prediction will be done based on the estimated coefficients of Dependent Variables.

B. Ranking of Million plus UAs/ Cities will be done

(i) Using an Index derived through components generated by Regression Analysis method.

(ii) Using Principal Component Analysis (PCA)

A Statistical comparison among two series of Ranks, will be done to conclude.

## ANALYSIS

Here, the variable "worker" is considered as dependent variable and other variables , i.e different types of disabilities are considered as independent variable.

$Y_{ij} = Number\ of\ workers\ corresponding\ to\ i^{th}\ unit\ of\ j^{th}\ type\ of\ Disability$

$$i = 1(1)52, \qquad j = 1(1)8\ ;$$

$X_{ij} = Number\ of\ disable\ person\ corresponding\ to\ i^{th}\ unit\ and\ j^{th}\ type\ of\ Disability\ .$

$$i = 1(1)52, \qquad j = 1(1)8$$

Considering, $Y_{ij} = Dependent\ Variable\ and\ X_{ij} = Independent\ Variable$

For analyzing the dataset, the Yij and Xij s are to be transformed to Proportionatevalues, which in turn will be transformed to Logarithmic value of Proportions.

Thus defining, $Y'_{ij} = LN(\frac{Y_{ij}}{\sum_{j=1}^{8} X_{ij}})$ and $X'_{ij} = LN(\frac{X_{ij}}{\sum_{j=1}^{8} X_{ij}})$

The correlation Coefficients matrix below shows that the Independent variables are highly correlated.

| Correlations (Pearson Correlation) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | worker | In-Seeing | In-Hearing | In-Speech | In-Movement | Mental-Retardation | Mental-Illness | Any-Other | Multiple-Disability |
| Worker | 1.000 | 0.440 | 0.480 | 0.310 | -0.514 | -0.662 | -0.804 | 0.640 | -0.794 |
| In-Seeing | 0.440 | 1.000 | 0.321 | 0.149 | -0.591 | -0.535 | -0.544 | 0.082 | -0.577 |
| In-Hearing | 0.480 | 0.321 | 1.000 | -0.255 | -0.671 | -0.707 | -0.647 | 0.637 | -0.749 |
| In-Speech | 0.310 | 0.149 | -0.255 | 1.000 | -0.202 | -0.267 | -0.201 | -0.081 | -0.228 |
| In-Movement | -0.514 | -0.591 | -0.671 | -0.202 | 1.000 | 0.743 | 0.710 | -0.487 | 0.776 |
| Mental-Retardation | -0.662 | -0.535 | -0.707 | -0.267 | 0.743 | 1.000 | 0.804 | -0.587 | 0.896 |
| Mental-Illness | -0.804 | -0.544 | -0.647 | -0.201 | 0.710 | 0.804 | 1.000 | -0.671 | 0.876 |
| Any-Other | 0.640 | 0.082 | 0.637 | -0.081 | -0.487 | -0.587 | -0.671 | 1.000 | -0.642 |
| Multiple-Disability | -0.794 | -0.577 | -0.749 | -0.228 | 0.776 | 0.896 | 0.876 | -0.642 | 1.000 |

The above correlation table shows that few of the dependent variables are having moderately high correlation between them. In particular, Mental illness , Multiple disability and Mental retardation.

The Method of Stepwise regression is adopted here.The method that almost always resolves multi-collinearity is stepwise regression.

The Regression equation is defined as

$Y'_{ij} = b_0 + \sum_i b_i X'_{ij} + ei\ for\ i = 1\ (1)52\ \&\ j = 1\ (1)8$; $b_0$ and $b_i$'s are regression coefficients

The Stepwise Regression yields a 3 steps model

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics : R Square |
|---|---|---|---|---|---|
| 1 | .804a | 0.646 | 0.639 | 0.096 | 0.646 |
| 2 | .825b | 0.68 | 0.667 | 0.092 | 0.034 |
| 3 | .845c | 0.714 | 0.697 | 0.088 | 0.034 |
| a. Predictors: (Constant), Mental-Illness | | | | | |
| b. Predictors: (Constant), Mental-Illness, Multiple-Disability | | | | | |
| c. Predictors: (Constant), Mental-Illness, Multiple-Disability, In-Movement | | | | | |

The above table reflect the Model Summary. Finally it ends in 3rd step where adjusted r-square is 0.697, which means that 3 predictors account for 69.7% of the variance in overall Worker data. This is highly acceptable result in social science research.

| | Model (step 3) | | | | |
|---|---|---|---|---|---|
| | Un-standardized Coefficients | | Standardized Coefficients | t-value | Sig. |
| | B | Std. Error | Beta | | |
| (Constant) | -1.647 | 0.080 | | -20.527 | 0.000 |
| Mental-Illness | -0.123 | 0.039 | -0.505 | -3.139 | 0.003 |
| Multiple-Disability | -0.194 | 0.060 | -0.579 | -3.223 | 0.002 |
| In-Movement | 0.109 | 0.046 | 0.294 | 2.392 | 0.021 |

The above table is the Coefficient table , according to the 3rd Model. B-coefficients are all significant (sig <.05). Here the strongest predictor is Multiple-Disability , at B = -0.194 which implies that if the Multiple disability in increased by 1%, Worker will decrease by 1.94%. Similar negative impact is for 2nd strongest Independent variable, which is Mental Illness where as the 3rd strongest variable suggest that , among disable person, if the disable in Movement is increased by 1%, Worker will increase by 1.09%.

**Ranking of Million plus UAs/ Cities**

(i) Next, considering the Standardized Coefficients Beta as weight, the index is derived as below:

$$Index\ (i1) = \frac{\sum_{j=1}^{3} b_j X_{ij}^{'}}{\sum_{j=1}^{3} b_j}$$

According to the Index values the ranking of the Million plus UAs/ Cities is done. (Rank 1).

Principal Component Analysis has been done on these $X_{IJ}^{'}$. 61% variations has been explained by the first factor. The first factor has been considered for further analysis. The weight has been taken as factor scores of rotated Component matrix. Index for a particular Million plus UAs/ Cities is the weighted Arithmatic mean considering the weight as mentioned.. The Index then defined is as

$$Index\ (i2) = \frac{\sum_{j=1}^{3} w_j X_{ij}^{'}}{\sum_{j=1}^{3} w_j} \quad w\square ere\ w_j = \text{ factor scores of rotated Component matrix}$$

Based on these Index values the ranking of the Million plus UAs/ Cities is done. (Rank 2)

| Million plus UAs/ Cities | Rank 1 | Rank 2 |
|---|---|---|
| Agra UA | 1 | 2 |
| Ahmadabad UA | 15 | 20 |
| Allahabad UA | 9 | 21 |
| Amritsar UA | 30 | 36 |
| Asansol UA | 40 | 32 |
| Aurangabad UA | 8 | 8 |
| Bhopal UA | 7 | 10 |
| Bruhat Bangalore UA | 5 | 7 |
| Chennai UA | 35 | 38 |
| Coimbatore UA | 34 | 35 |
| Delhi UA | 44 | 44 |
| Dhanbad UA | 16 | 22 |
| Durg-Bhilainagar UA | 42 | 43 |
| Faridabad (M Corp.) | 22 | 39 |
| Ghaziabad UA | 2 | 13 |
| Greater Mumbai UA | 12 | 3 |
| GVMC | 11 | 6 |
| Gwalior UA | 31 | 37 |
| Hyderabad UA | 6 | 4 |
| Indore UA | 19 | 24 |
| Jabalpur UA | 33 | 29 |
| Jaipur (M Corp.) | 23 | 25 |
| Jamshedpur UA | 39 | 42 |
| Jodhpur UA | 36 | 28 |

| | | |
|---|---|---|
| Kannur UA | 48 | 47 |
| Kanpur UA | 13 | 23 |
| Kochi UA | 47 | 48 |
| Kolkata UA | 38 | 26 |
| Kollam UA | 49 | 49 |
| Kota (M Corp.) | 32 | 31 |
| Kozhikode UA | 52 | 51 |
| Lucknow UA | 14 | 15 |
| Ludhiana (M Corp.) | 27 | 34 |
| Madurai UA | 29 | 30 |
| Malappuram UA | 51 | 52 |
| Meerut UA | 10 | 17 |
| Nagpur UA | 28 | 11 |
| Nashik UA | 17 | 9 |
| Patna UA | 4 | 5 |
| Pune UA | 26 | 14 |
| Raipur UA | 25 | 27 |
| Rajkot UA | 41 | 40 |
| Ranchi UA | 43 | 41 |
| Srinagar UA | 45 | 45 |
| Surat UA | 24 | 19 |
| Thiruvananthapuram UA | 46 | 46 |
| Thrissur UA | 50 | 50 |
| Tiruchirappalli UA | 37 | 33 |
| Vadodara UA | 21 | 16 |
| Varanasi UA | 18 | 18 |
| Vasai-Virar City (M Corp.) | 3 | 1 |
| Vijayawada UA | 20 | 12 |

To find the association between the two ranks, Spearman Rank Correlation has been calculated and its value is .917, from which it may be stated that these two ranks are highly correlated.

## REMARKS

The Stepwise regression analysis finds the most significant and strongest predictors of the dataset, which are Mental-Illness, Multiple-Disability and disability in-movement, removing the multi-collinearity of the data. Mental-Illness, Multiple-Disability are having negative impact whereas disability In-Movement is having positive impact. Standerdized coefficients of these three dependent variables are then used to find the rank of all Million plus UAs/ Cities. Lower the index values, higher rank is given considering the fact that if these three variables are strongest to determine the number of workers among disable person, it is better for the society that their impact among disable person is minimized. In other words, in ideal situation, all disable person should work irrespective of their disability and type of disability.

To validate or to substantiate the model fitted for the data set, PCA is done and considering factor scores of rotated Component matrix as weight, the rank is made which is having high correlation with the Rank1.

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