

## South African Multiple Deprivation-Concentration Index Quantiles Differentiated by Components of Success and Impediment to Tuberculosis Control Programme Using Mathematical Modelling in Rural O. R. Tambo District Health Facilities

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**Abstract :** Background: The gap between complexities related to the integration of Tuberculosis /HIV control and evidence-based knowledge motivated the initiation of the study. Therefore, the objective of this study was to explore correlations between national TB management guidelines, multiple deprivation indexes, quantiles, components and levels of Tuberculosis control programme using mathematical modeling in rural O.R. Tambo District Health Facilities, South Africa. Methods: The study design used mixed secondary data analysis and cross-sectional analysis between 2009 and 2013 across O.R Tambo District, Eastern Cape, South Africa using univariate/ bivariate analysis, linear multiple regression models, and multivariate discriminant analysis. Health inequalities indicators and component of an impediment to the tuberculosis control programme were evaluated. Results: In total, 62 400 records for TB notification were analyzed for the period 2009-2013. There was a significant but negative between Financial Year Expenditure ( $r = -0.894$ ;  $P = 0.041$ ) Seropositive HIV status ( $r = -0.979$ ;  $P = 0.004$ ), Population Density ( $r = -0.881$ ;  $P = 0.048$ ) and the number of TB defaulter in all TB cases. It was shown unsuccessful control of TB management program through correlations between numbers of new PTB smear positive, TB defaulter new smear-positive, TB failure all TB, Pulmonary Tuberculosis case finding index and deprivation-concentration-dispersion index. It was shown successful TB program control through significant and negative associations between declining numbers of death in co-infection of HIV and TB, TB deaths all TB and SMIAD gradient/ deprivation-concentration-dispersion index. The multivariate linear model was summarized by unadjusted  $r$  of 96%, adjusted  $R^2$  of 95 %, Standard Error of estimate of 0.110,  $R^2$  changed of 0.959 and significance for variance change for  $P = 0.004$  to explain the prediction of TB defaulter in all TB with equation  $y = 8.558 - 0.979 \times$  number of HIV seropositive. After adjusting for confounding factors (PTB case finding the index, TB defaulter new smear-positive, TB death in all TB, TB defaulter all TB, and TB failure in all TB). The HIV and TB death, as well as new PTB smear positive, were identified as the most important, significant, and independent indicator to discriminate most deprived deprivation index far from other deprivation quintiles 2-5 using discriminant analysis. Conclusion: Elimination of poverty such as overcrowding, lack of sanitation and environment of highest burden of HIV might end the TB threat in O.R Tambo District, Eastern Cape, South Africa. Furthermore, ongoing adequate budget comprehensive, holistic and collaborative initiative towards Sustainable Developmental Goals (SDGs) is necessary for complete elimination of TB in poor O.R Tambo District.

**Keywords :** tuberculosis, HIV/AIDS, success, failure, control program, health inequalities, South Africa

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