**Investigating inequality in childhood immunization coverage in Ethiopia**

**using Lorenz curve derived Gini-coefficients**

**Abstract**

**Background:** Inequitable access to vaccinations contributes to significant social gradients in health outcomes for developing countries. In Ethiopia, where poor child health status arises mainly from preventable diseases, childhood immunization programs based on the WHO guidelines have been operational since 1988.

**Aims**: We examined whether there was any evidence of socio-economic inequality in Ethiopian childhood vaccination coverage at three survey time-points of 2005, 2011 and 2016 and the extent of any trends or changes over the same time period.

**Methods**: The distribution of childhood immunization coverage was analyzed according to economic status using Lorenz curve derived Gini-coefficients on Ethiopia’s Demographic and Health Survey (EDHS) data from 2005, 2011 and 2016. Specifically, fully immunized status was analyzed according to household income quintile.

**Results**: Gini-coefficients for fully immunized for the three survey years of 2005, 2011 and 2016 were 0.25, 0.29 and 0.24 respectively. While these values remain just within the margin of preferred equality status of below 0.3, they are at the margin of equality status and variable over time. Visual inspection of the Lorenz curve plots shows clear departures from perfect equality.

**Conclusion:** WhileWHO decreedinequality ‘alert levels’ were not exceeded in any of the survey years analyzed, the clear and variable social gradient for fully vaccinated status merits close ongoing monitoring, given the risks of highly infectious childhood diseases**.** More generally, the combined use of Gini-coefficients and Lorenz curve plots is a powerful tool to interrogate vaccination coverage variability by social group.

**Keywords: -**Ethiopia, Childhood immunization coverage, inequality, household income status, Gini Coefficient, Lorenz Curve

*Word count =* ***248 words*** *excluding titles (max = 250)*

**Investigating inequality in childhood immunization coverage in Ethiopia**

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Investigating inequality in childhood immunization coverage in Ethiopia: An empirical analysis of longitudinal data using Lorenz curve based Gini coefficient

**Abstract**

**Background**

Inequitable access to vaccinations contributes to significant social gradients in health outcomes for developing countries. In Ethiopia, where poor child health status arises mainly from preventable diseases, childhood immunization programmes based on the WHO guidelines have been operational since 1988.

**Aims**: Our study set out to examine whether there was any evidence of socio-economic inequality in Ethiopian childhood vaccination coverage between 2004 and 2015 and the extent of any trends or changes over the same time period.

**Methods**: The distribution of childhood immunization coverage was analyzed according to economic status using Lorenz curve derived Gini Coefficients Ethiopia’s Demographic and Health Survey (EDHS) data from 2005, 2011 and 2016 were used in the analysis. The two dichotomous variables of ‘fully Immunized’ (FI) and ‘not Immunized’ (NI) were analyzed according to household income quintile.

**Results**: Gini Coefficients for the three survey years were 0.25, 0.29 and 0.24 respectively for the FI variable and 0.11, 0.07 and 0.04 respectively for NI. The Gini coefficients of both variables for the three survey years were within the margin of preferred equality status of below 0.3, or were well below the value that could trigger an alert of inequality in the country. We did however find clear evidence that vaccine coverage was socio-economically patterned \*\*\*

**Conclusion:** The combined use of Gini-coefficients and Lorenz curve plots clearly presents a powerful tool to interrogate vaccination coverage variability by social group.Even where **the** preferred equality status was not breached as was the case in the current study for Ethiopia, there can exist clear social gradients that leave poorer communities at greater risk of childhood preventable disease.

**Keywords: -**Ethiopia, Childhood immunization coverage, inequality, household income status, Gini Coefficient, Lorenz Curve