

# DYNAMIS-POP SENEGAL (2013)

First Results – Draft

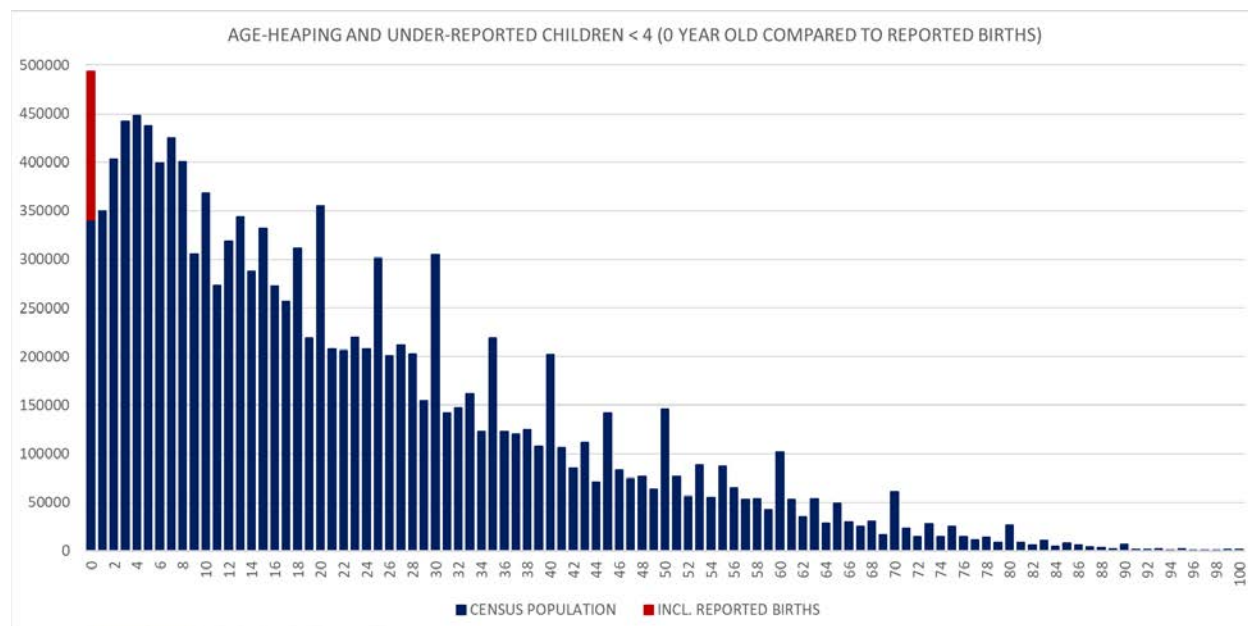
Martin Spielauer ([martin.spielauer@dms-c.com](mailto:martin.spielauer@dms-c.com)) and Olivier Dupriez ([odupriez@worldbank.org](mailto:odupriez@worldbank.org))

19 November 2018

This note describes first results of DYNAMIS-POP applied to Senegal. DYNAMIS-POP is a portable dynamic micro-simulation platform allowing to create realistic data-driven simulations with emphasis on applications addressing development issues. It is based on data readily available for most developing countries. As a highly modular system it can be adapted and refined for specific uses in a broad field of policy-relevant applications. DYNAMIS-POP is documented at [www.dms-c.com/dynamis](http://www.dms-c.com/dynamis).

## Data and Data Issues

We have parameterized DYNAMIS-POP based on analysis run on the 2013 Census (10% Sample) and the 2014 DHS. Data were taken “as is”, skipping the typical first step in creating a micro-simulation, namely fixing known data issues, like age heaping and the under-reporting of young children which is a phenomenon in most developing countries (and for which we have tools available). In consequence, this document just provides a first demo of the model and some model results for Senegal.



**Figure:** Census population by age. Female respondents reported 493,000 births in the past 12 months, a number 45% higher than the Census population age 0 which is 340,000.

## Models and assumptions

**Fertility:** we use models estimated from Census (first birth) and DHS (higher order births) which, besides age, account for parity, education, marital status and birth intervals. The number of births is aligned to DemProj projections, thus does not differ from available population projections. While producing the same number of births as in available projections, babies are realistically distributed to women which allows using mothers' characteristics when modeling other processes.

**Mortality:** we use a standard UN life table and DemProj projections of male and female life expectancy. For child mortality (age 0-4) we use our own model based on DHS data. The results are aligned to the macro projection for the first year, but then can differ from macro projections as we account for composition effects by mothers' characteristics (teenage pregnancies, education) which influence child mortality.

**Migration:** For modeling immigration, emigration and internal migration we use period rates calculated from the Census data accounting for age and sex. The number of immigrants is assumed to grow 1% per year; all other rates stay constant. DYNAMIS-POP allows three geographical levels: national – regional – provincial; in this study we only model the 14 regions of Senegal.

**Primary Education:** We use a cohort model based on the Census to decide about school entry and graduation by region. The model contains a logarithmic trend informed by the educational improvements observed in the data. We run two scenarios:

- **Base Scenario:** we continue the education trend as modeled
- **Alternative Scenario:** we assume universal primary education for all children born 2015 and thereafter

**School grade tracking:** based on parameters on grade repetition, dropout and the distribution of the highest attained grade of dropouts we generate realistic school histories which can be used for modeling required numbers of teachers and classrooms etc. For Senegal, we currently use ad hoc values; for school planning applications, fixing data issues (age heaping, realistic number of children) is required.

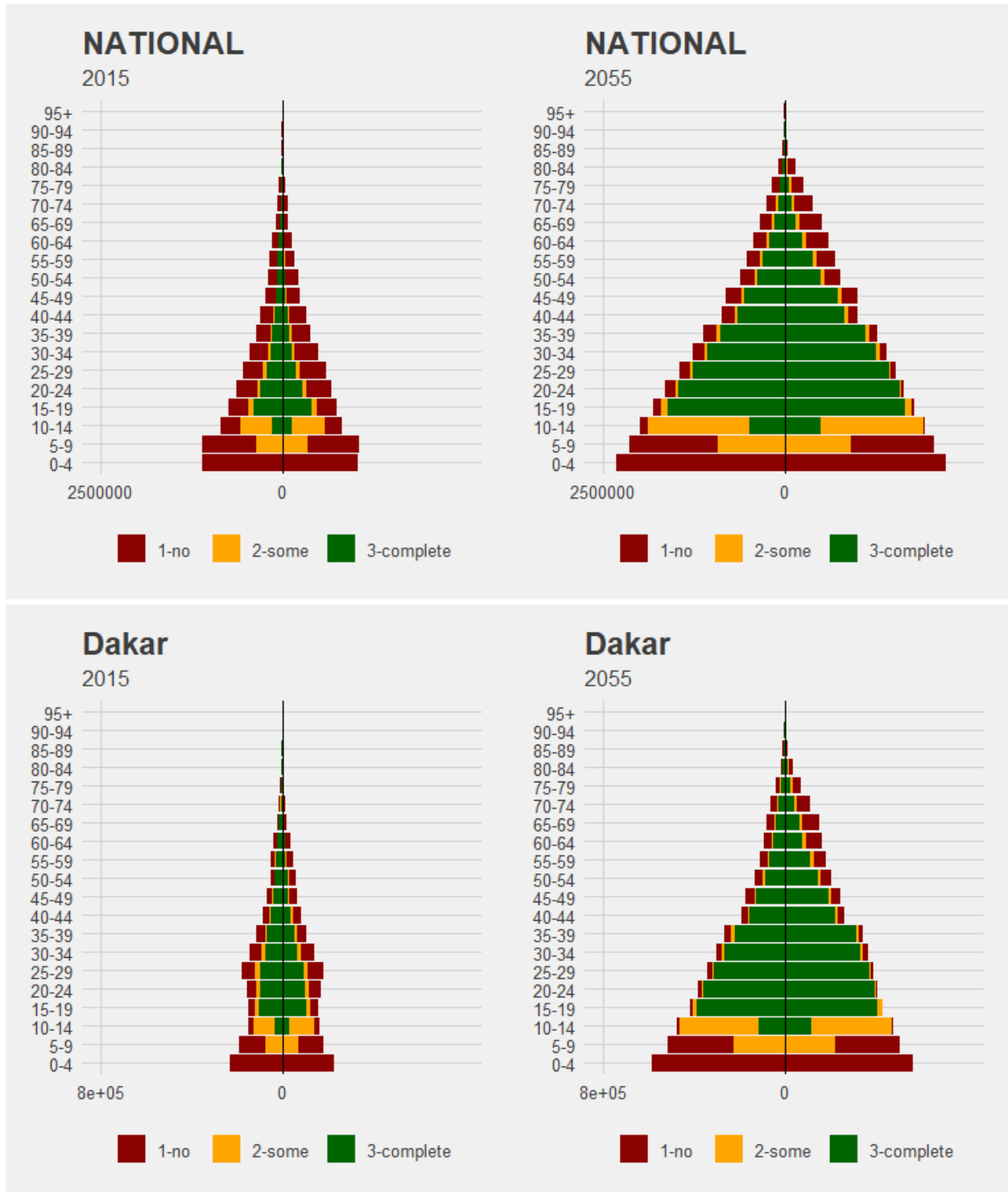
**First Marriage:** Usually, first marriage is modeled fitting a Coale McNeil model by education based on Census data and trends informed by this analysis. The Senegal Census does not contain information on first marriage. Instead, we used DHS data and simplified the analysis. While parameters for youngest and average age at first marriage, as well as the proportion of women eventually married are close to comparable countries, at this step we do not include any trend.

**Ethnicity:** We model the intergenerational transmission of ethnicity (12 groups) but at this step do not use this information in any process.

**Other Modules:** DYNAMIS-POP has a collection of additional modules – e.g. intergenerational transmission of education, secondary education, stunting, human capital - which are not used in this analysis.

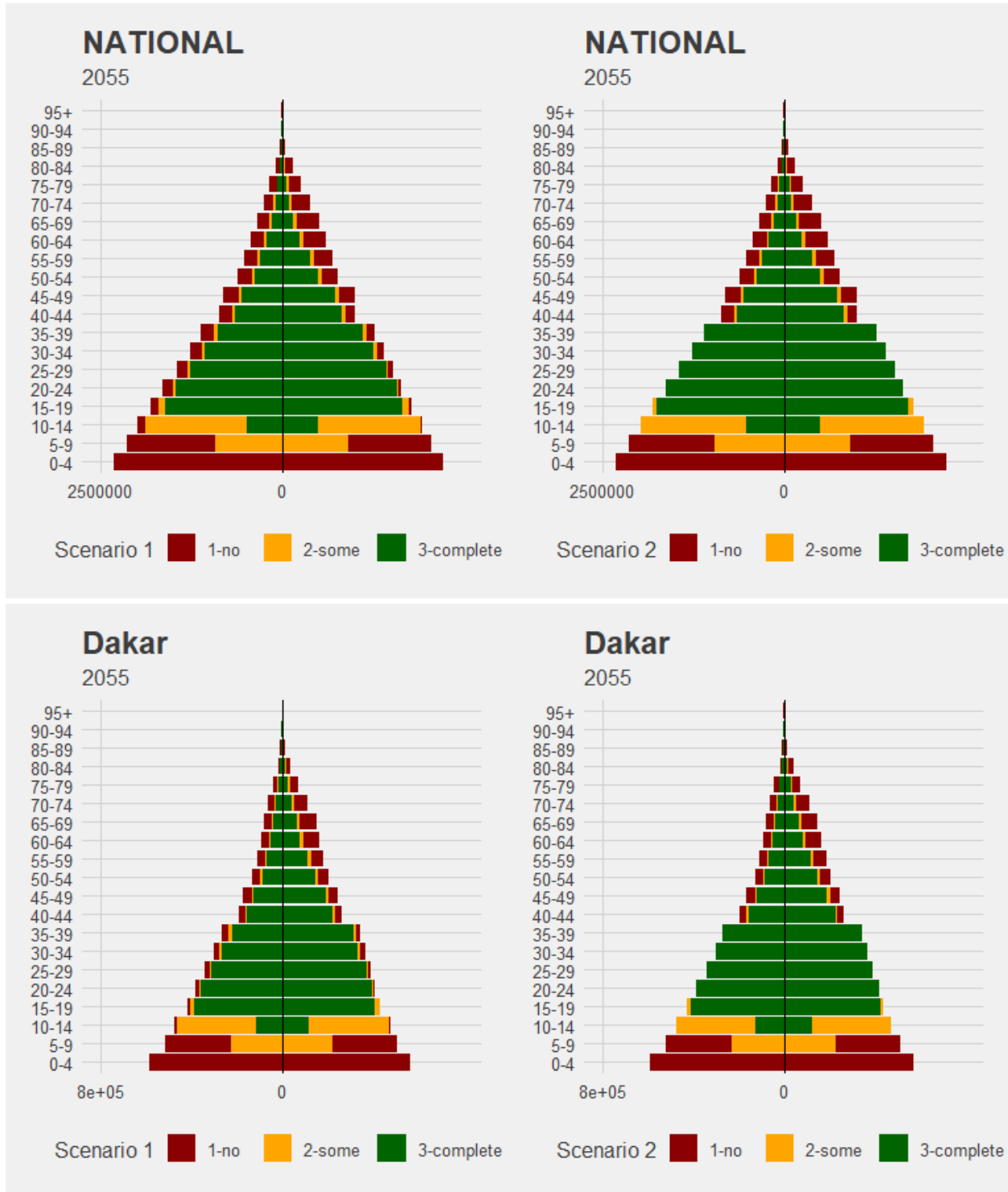
# Some Results

## Projected Population 2015 and 2055 by Primary Education Attainment Base Scenario



## Projected Population 2015 and 2055 by Primary Education Attainment Alternative Scenario

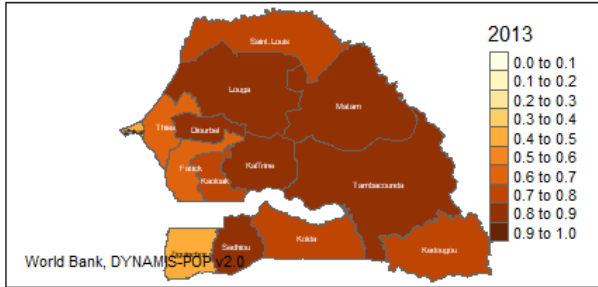
(Note that the number of births is aligned to DemProj; To show the effects of educational improvements on fertility would require calibrating the model for the base scenario and running without alignment)



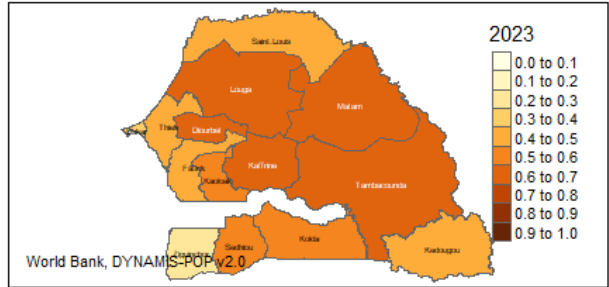
# Births by mothers who never attended school

Base Scenario

### Births Mothers No School, 2013



### Births Mothers No School, 2023



### Births Mothers No School, 2033

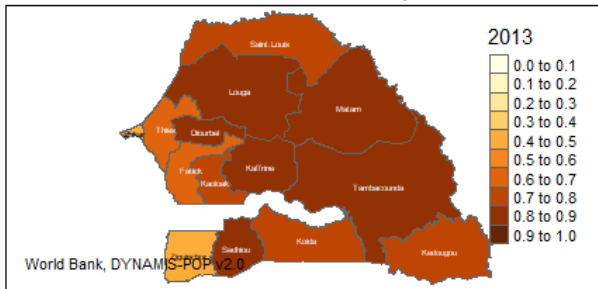


### Births Mothers No School, 2043

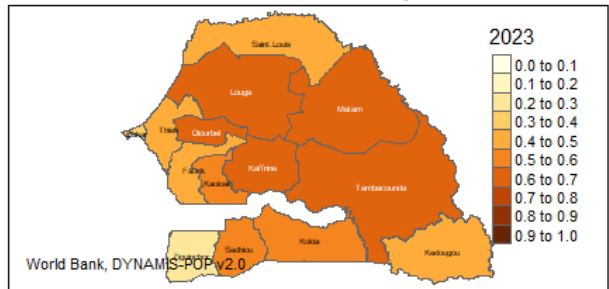


Alternative Scenario (Universal primary education cohorts 2015+)

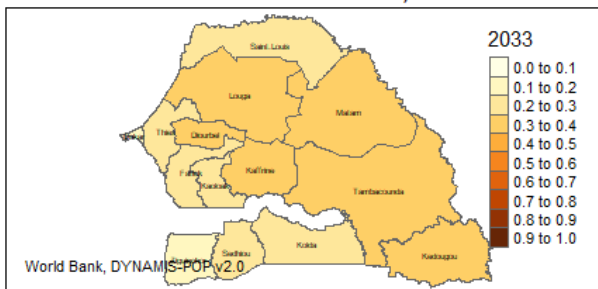
### Births Mothers No School, 2013



### Births Mothers No School, 2023



### Births Mothers No School, 2033



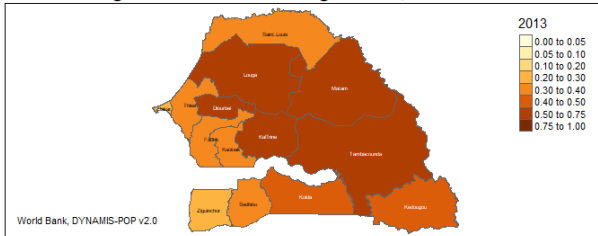
### Births Mothers No School, 2043



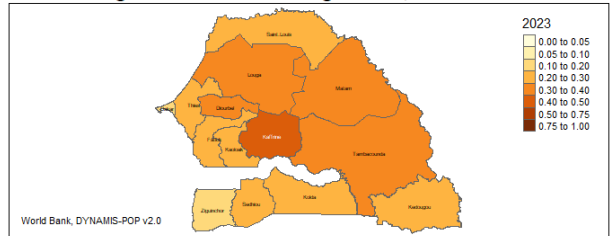
## Children age 9-11 not attending school

Base Scenario (Universal primary education would take full effect 2015+11=2026)

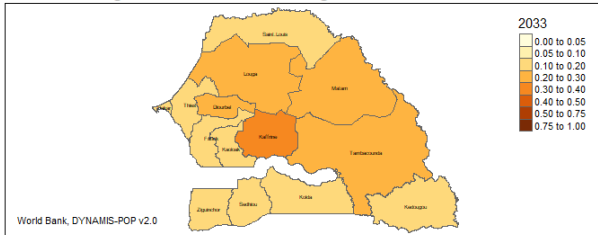
Children aged 9-11 not attending school, 2013



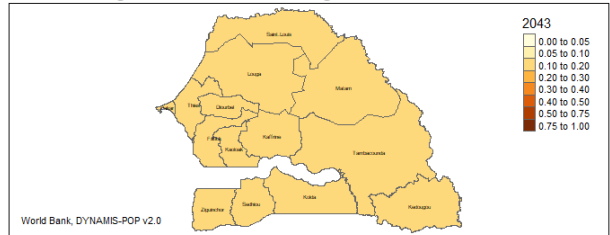
Children aged 9-11 not attending school, 2023



Children aged 9-11 not attending school, 2033

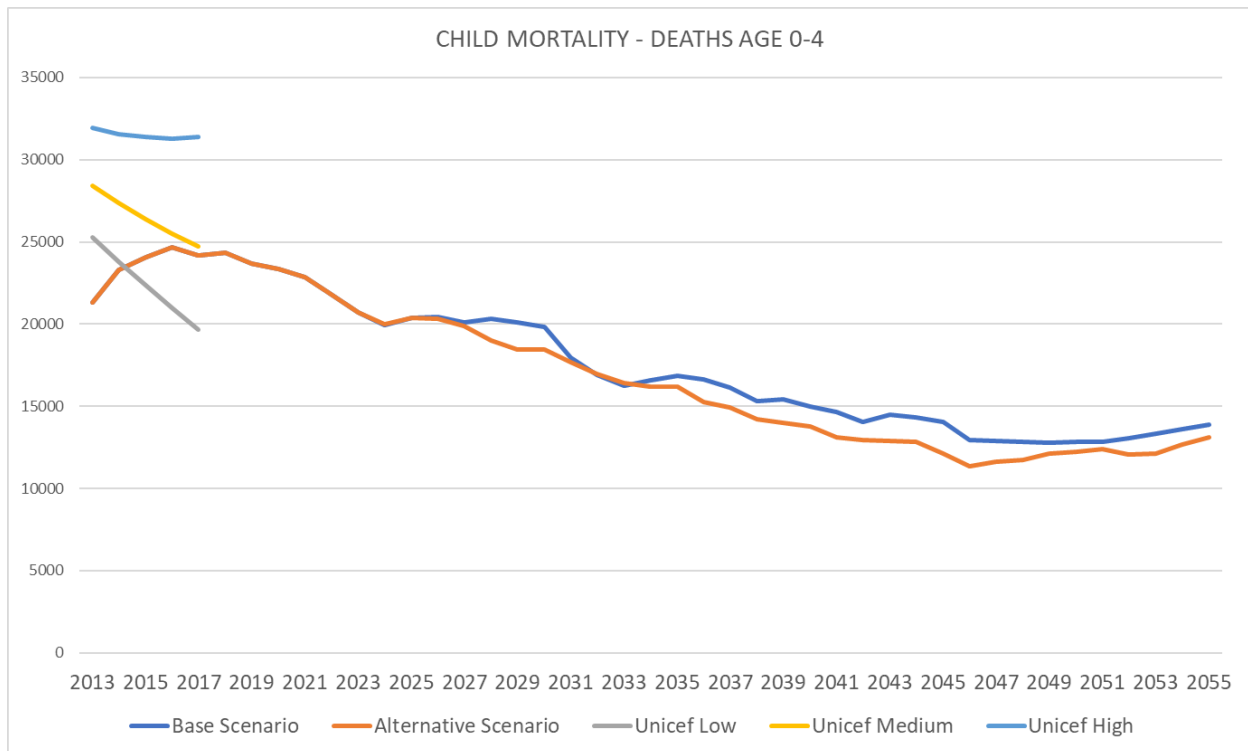


Children aged 9-11 not attending school, 2043

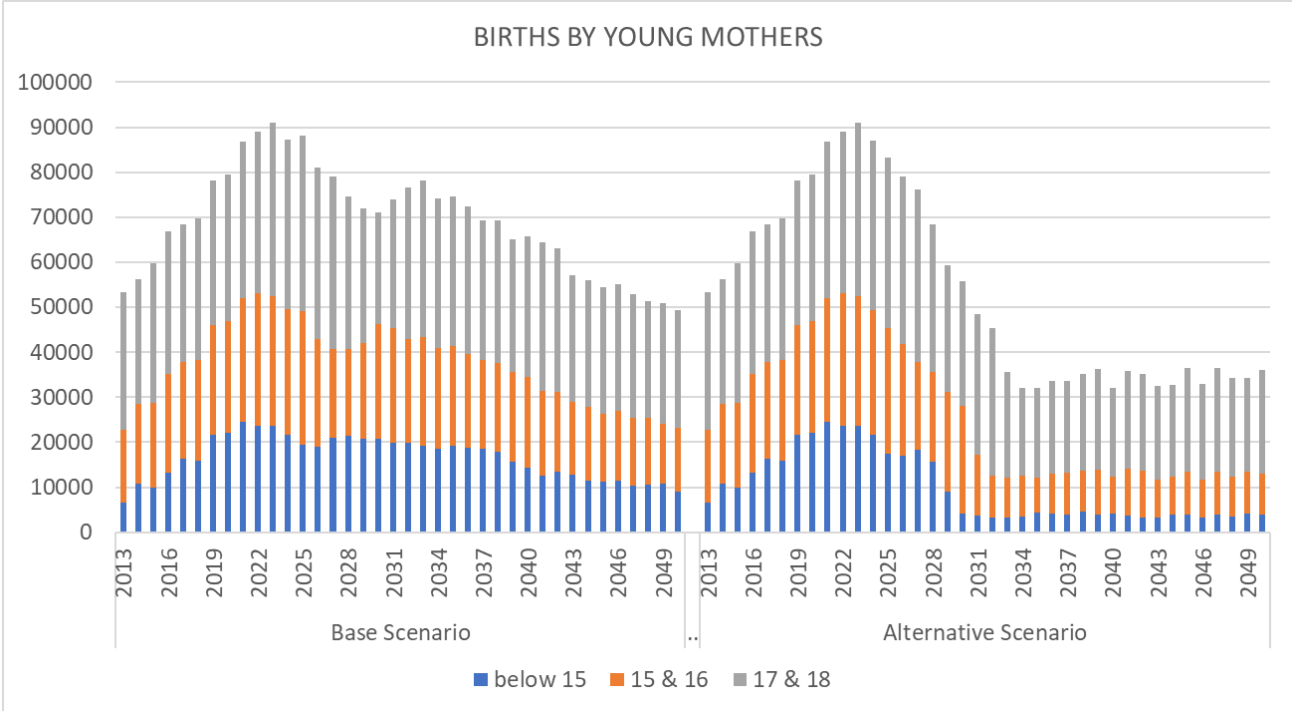


## Effect of universal primary education on child mortality

Projections coincide with the medium estimate of UNICEF in 2018, before that projections are lower due to the underreporting of young children in the Census



Births by young mothers (aged <15, 15-16, and 17-18 years)







# Primary education status at age 15 - National and selected regions

Base Scenario

