U.S. Census Bureau Subnational Projections Toolkit
Extended Abstract
Poster prepared for the 2013 meetings of the Population Association of America
Lisa Lollock, U.S. Census Bureau

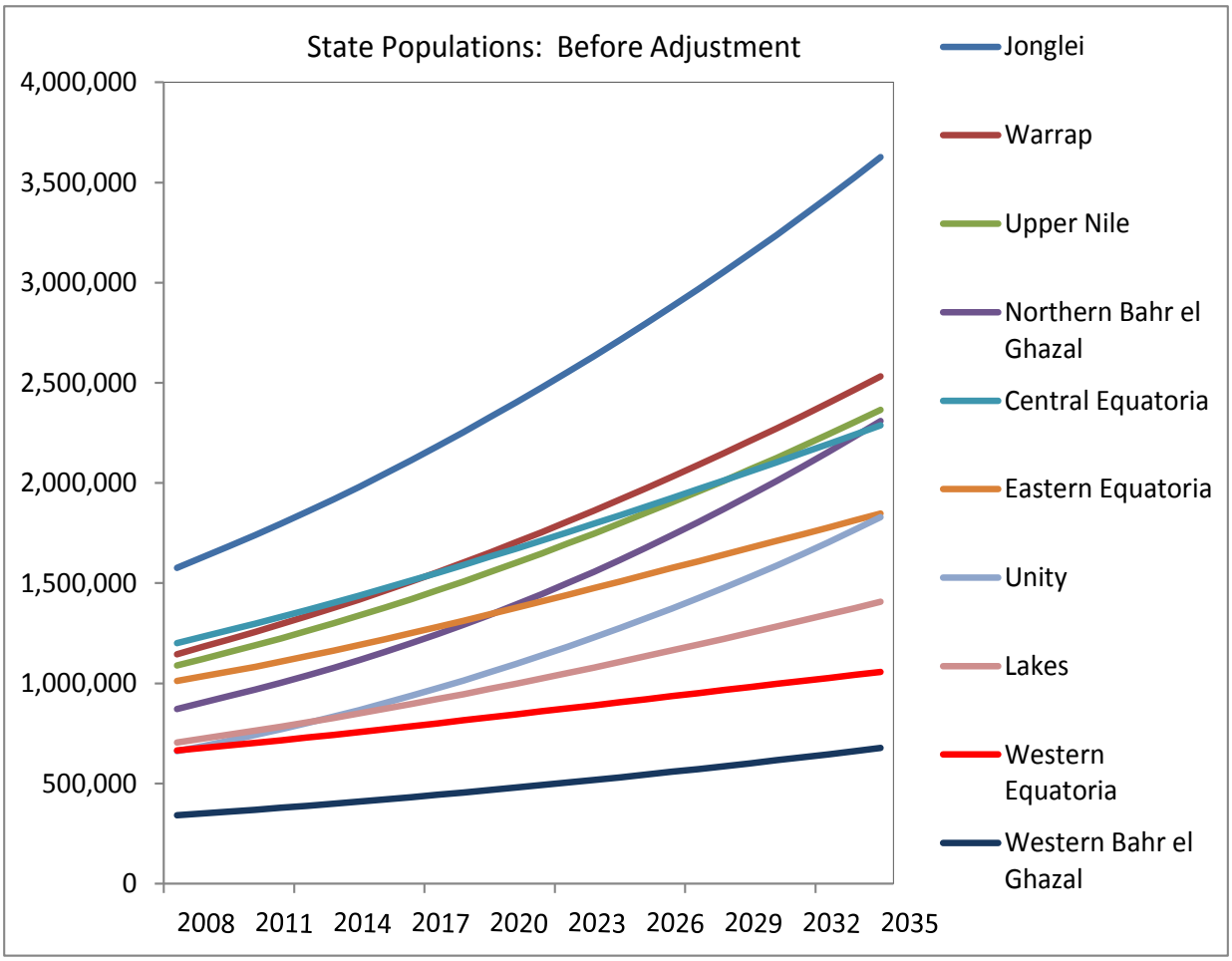
Introduction

In recent years, the availability of demographic data for subnational areas has increased. Censuses, demographic surveys, and an array of administrative records now provide a wealth of information from which to better understand population dynamics and provide decision-makers with information useful in planning social programs at the subnational level. In order to harness the unprecedented opportunities presented in these subnational data, demographers rely on software that can capture the complexities of the subnational populations while retaining consistency between subnational and national-level figures. The U.S. Census Bureau's Subnational Projections Toolkit is designed to meet these objectives. The Toolkit is comprised of several Excel workbooks, each containing special formulas that apply to national and subnational data. These specialized workbooks adjust totals and estimate rates of change of subnational areas, in order to render them consistent with the national-level trajectory. Application of these workbooks is a multi-step process, designed to retain the individual demographic profiles of subnational areas, while adjusting them to be consistent with the national-level figures.

What follows is an illustration of the applications of these specialized Excel workbooks, as used in developing estimates and projections of the ten states in South Sudan. The Toolkit application to South Sudan's data shows that the software adjusts subnational area projections to be consistent with independent projections at the national level. Additionally, although the subnational projections are adjusted to agree with the national-level projection, they continue to reflect distinct area-specific assumptions.

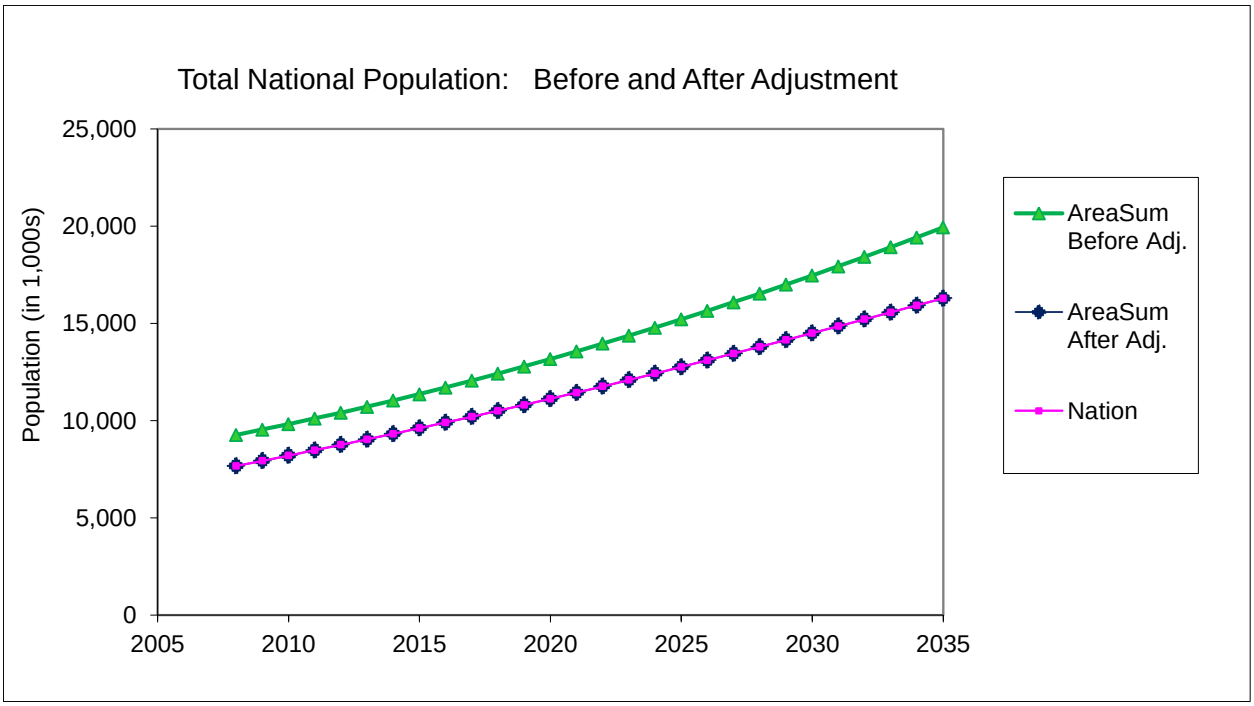
Preliminary results

Subnational area projections for South Sudan's ten states were developed with the Toolkit, based on the cohort-component method. Projections were generated from 2008 to 2035. The first step in the process was the generation of ten separate preliminary cohort-component projections – one projection per state – using state-level data from censuses, surveys, and administrative records.

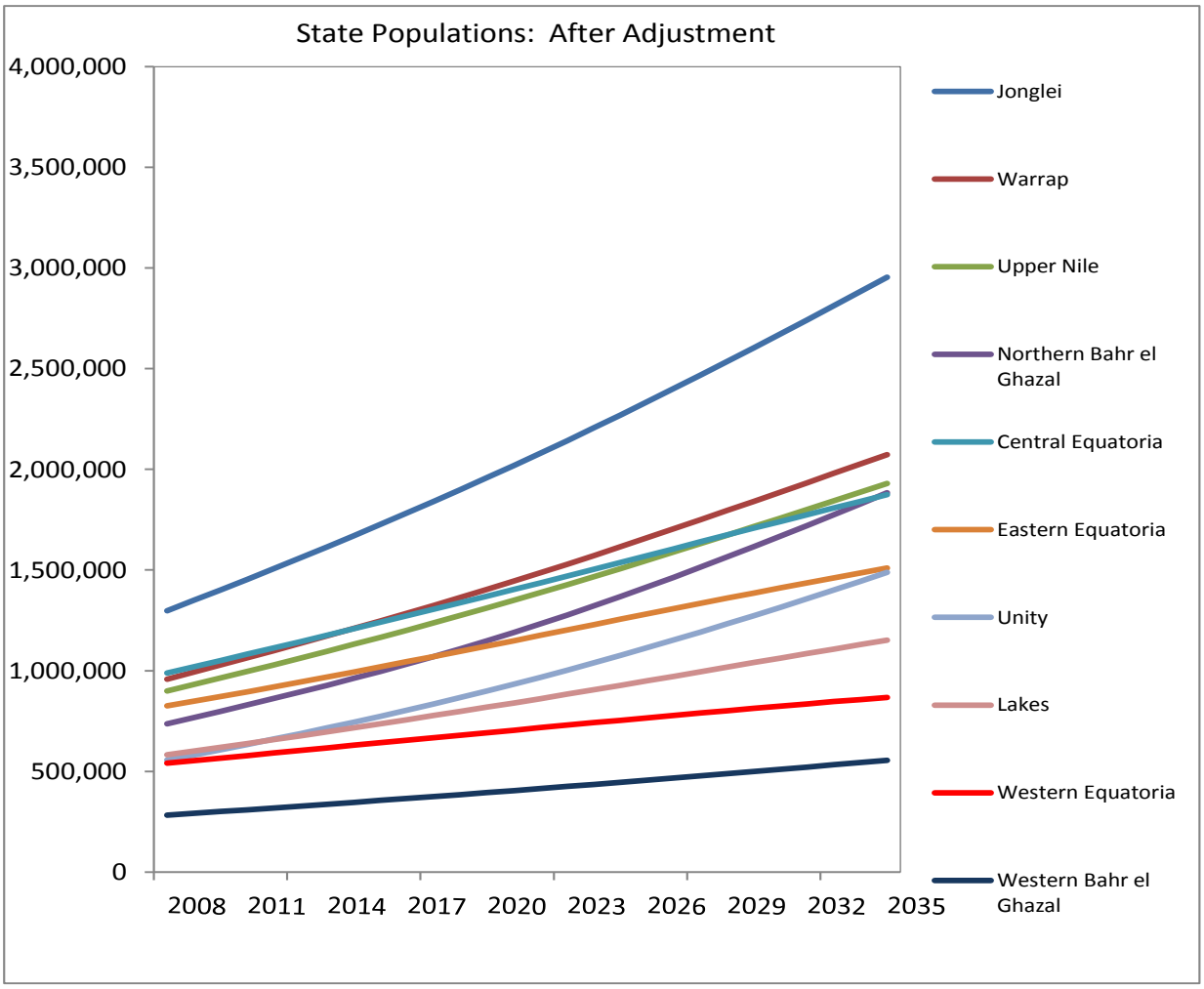


As illustrated in the preliminary projections above, in 2035 Jonglei is projected to have the largest state population in South Sudan, followed by (in descending order of population size) Warrap, Upper Nile, Northern Bahr el Ghazal, Central Equatoria, Eastern Equatoria, Unity, Lakes, Western Equatoria, and Western Bahr el Ghazal.

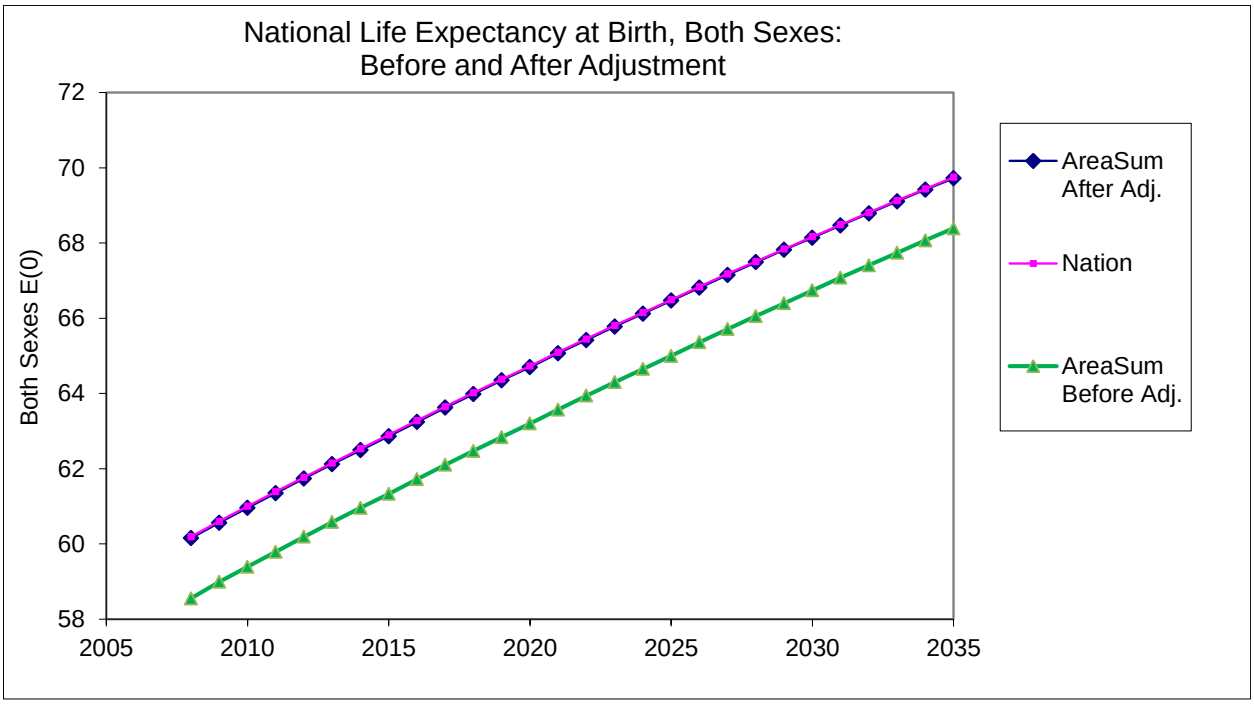
National-level cohort-component projections were also developed independently, with corresponding national-level data from the same sources. The gap between the national-level and subnational area (aggregation) is closed with the application of the Toolkit, as presented in the graph below. Closing the population gap is essentially a three-step process. First, subnational area base populations are proportionally adjusted, wherein each state is adjusted upward or downward to an equal degree, to agree with the national-level population for the same year. Second, adjusted state populations are projected forward according to their components of change. Third and finally, the projected state populations are adjusted proportionally upward or downward, also to an equal degree to agree with the national population for the same year. The graph below illustrates the initial gap between the sum of the subnational areas and the independent national projection prior to adjustment as well as the closing of the gap after adjustment.



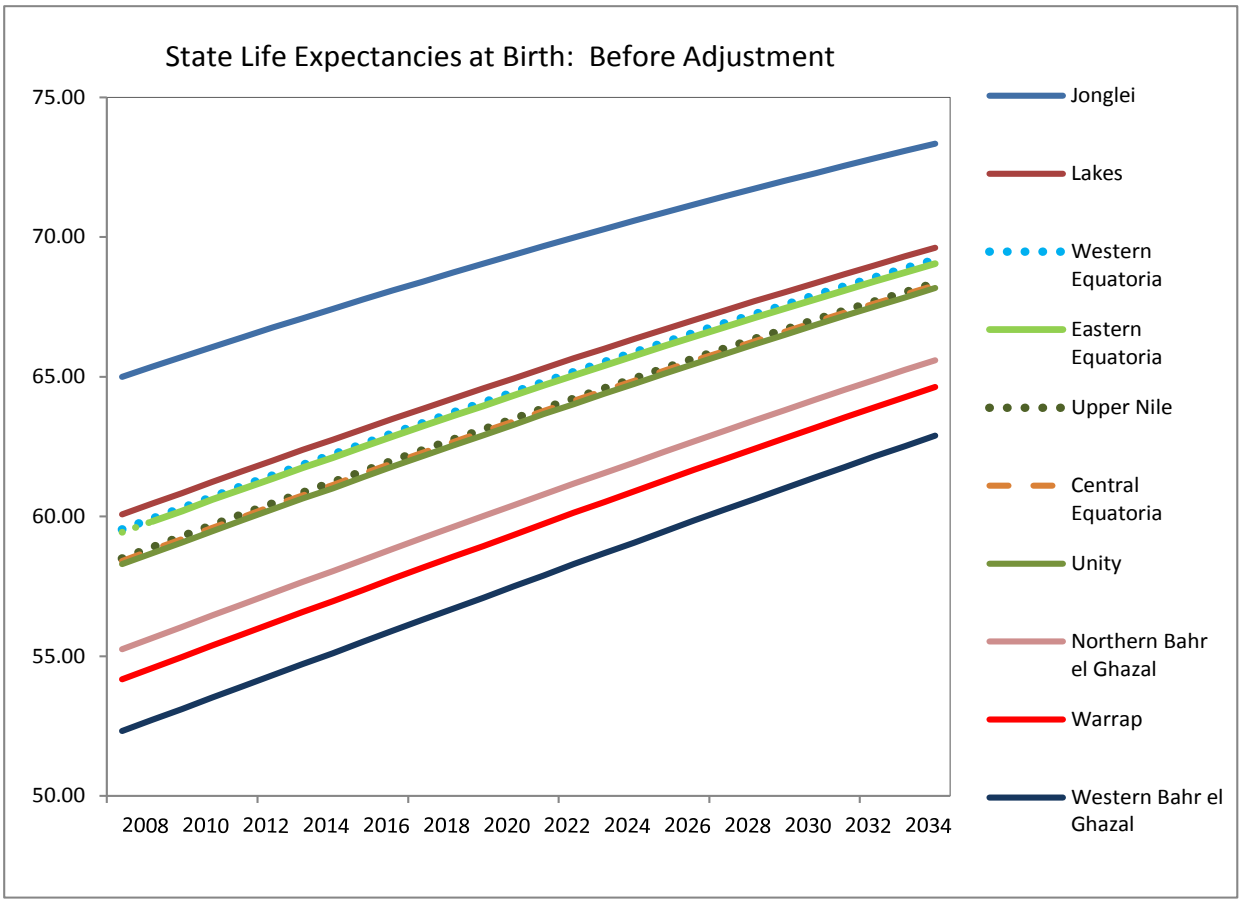
After adjustment to the independently produced national-level figures, in 2035 state population sizes are projected to rank in the same order as the preliminary projections, as illustrated in the graph below.



The process of adjusting subnational area populations to agree with national-level projections is not confined to total population alone; fertility, mortality, and international migration are also adjusted. Below is an example of how this process was applied to mortality, measured as life expectancy at birth e(0), for South Sudan. In adjusting subnational level e(0)s to agree with those at the national level, two key steps are applied. First a specialized Toolkit workbook is used to determine rates of subnational area e(0) change over the projection period that are consistent with change at the national level. Second and finally, proportional adjustment is applied. More specifically, in this second and final step, the deaths associated with the e(0)s for each state, by age and sex, are proportionally adjusted to agree with the independently projected national-level deaths by age and sex. In this proportional adjustment, each state's deaths will be scaled upward (or downward) to an equal degree. Following this proportional adjustment of deaths, e(0)s are then recalculated for each state. (There will be minor discrepancies between the recalculated e(0)s and those generated independently at the national level.)

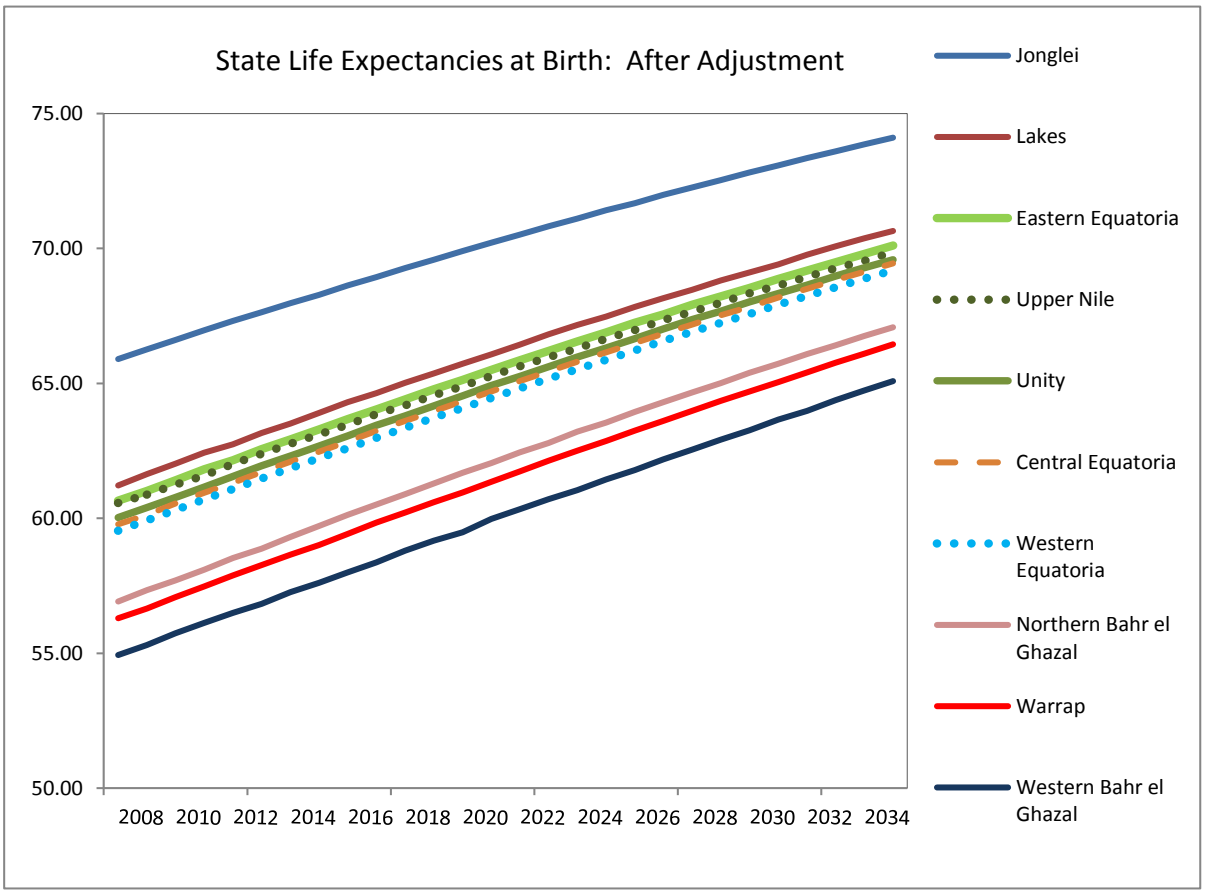


In closing the e(0) gap, distinct state e(0) levels, relative to one another, are largely retained. Some minor shifting of e(0) level rank does occur among states having similar, nearly equal values of e(0), however. Below is a graph illustrating the initial state level e(0) ranking prior to adjustment.



According to these preliminary projections of e(0), the state projected to have the markedly highest e(0) in 2035 is Jonglei. The group of states with relatively intermediate levels of projected e(0) includes Lakes, Western Equatoria, Eastern Equatoria, Upper Nile, Central Equatoria, and Unity. The group with the lowest projected e(0) includes Northern Bahr el Ghazal, Warrap, and Western Bahr el Ghazal.

The general hierarchy of e(0) levels – high, intermediate, and low -- following Toolkit adjustment, is retained, as presented below.



In final projections (those controlled to the independently projected national population) the state projected to have the highest e(0) in 2035, consistent with preliminary ranking, is Jonglei. The group of states with intermediate levels of projected e(0) includes Lakes, Eastern Equatoria, Upper Nile, Unity, Central Equatoria, and Western Equatoria. The group with the lowest projected e(0) remains Northern Bahr el Ghazal, Warrap, and Western Bahr el Ghazal.

Thus, as expected, the Toolkit, while adjusting South Sudan's state-level projections to conform to the levels of the independently generated national-level projection, retains important indicators that distinguish the demographic trends projected to occur within subnational areas.