This report was prepared by the Institute for Health Metrics and Evaluation (IHME) and the Infectious Diseases Research Collaboration (IDRC). This work is intended to provide information on levels and trends for key child health outcomes, such as under-5 mortality, and coverage of child and maternal health interventions across regions in Uganda. The estimates may change following peer review. The contents of this publication may not be reproduced in whole or in part without permission from IHME.


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Assessing Impact, Improving Health Progress in Child Health Across Regions in Uganda

A REPORT OF THE MCPA PROJECT

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ABOUT IHME

The Institute for Health Metrics and Evaluation (IHME) is an independent global health research center at the University of Washington that provides rigorous and comparable measurement of the world’s most important health problems and evaluates the strategies used to address them. IHME makes this information freely available so that policymakers have the evidence they need to make informed decisions about how to allocate resources to best improve population health.

To express interest in collaborating or request further information on the Malaria Control Policy Assessment (MCPA) project in Uganda, please contact IHME:

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ABOUT THIS REPORT

Assessing Impact, Improving Health: Progress in Child Health Across Regions in Uganda provides the most up-to-date results from the MCPA project in Uganda, including regional trends for child health outcomes, a range of malaria and other key child and maternal health interventions, and a subset of socio-demographic factors.

The MCPA project was led by Emmanuela Gakidou at IHME. At the Infectious Diseases Research Collaboration (IDRC), Moses Kamya served as the country principal investigator (PI). Data collation was primarily conducted by Gloria Ikilezi, Talemwa Nalugwa, and Mary Lakiyo, all researchers at IDRC. Trends in under-5 mortality were produced by Laura Dwyer-Lindgren at IHME. Intervention coverage analyses were conducted by Allen Roberts, with contributions from Marie Ng, both of IHME. Anne Gasasira provided key inputs and feedback on analyses. This report was written by Nancy Fullman of IHME.

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Acronyms

ABCE  Access, Bottlenecks, Costs, and Equity
ACP  AIDS Control Program
ACT  Artemisinin-based combination therapy
AIDS  Acquired immunodeficiency syndrome
ANC4  Antenatal care (4 visits)
BCG  Bacillus Calmette-Guérin vaccine
CI  Confidence interval (95%)
DFID  United Kingdom Department for International Development
DHS  Demographic and Health Survey
DPT  Diphtheria-pertussis-tetanus
GHDx  Global Health Data Exchange
GPR  Gaussian Process Regression
HIV  Human immunodeficiency virus
HPV  Human papillomavirus
HSSP II  Uganda Health Sector Strategic Plan II, 2005/06-2009/10
IDRC  Infectious Diseases Research Collaboration
IHME  Institute for Health Metrics and Evaluation
iCCM  Integrated community case management
IPV  Inactivated polio vaccine
IPTp2  Intermittent preventive therapy in pregnancy (2 doses)
IRS  Indoor residual spraying
ITN  Insecticide-treated net
LLIN  Long-lasting insecticide-treated net
MCPA  Malaria Control Policy Assessment
MDG  Millennium Development Goal
MOH  Ministry of Health
NMCP  National Malaria Control Program
OPV  Oral polio vaccine
PMI  President’s Malaria Initiative
PMTCT  Prevention of mother-to-child transmission of HIV
RED  Reaching Every District
SBA  Skilled birth attendance
SP  Sulfadoxine-pyrimethamine
UAC  Uganda AIDS Commission
UBOS  Uganda Bureau of Statistics
WHO  World Health Organization
Terms and definitions

**Artemisinin-based combination therapy (ACT) coverage:** the proportion of children under 5 years old who received an ACT for fever experienced in the last two weeks, as reported by survey respondents.

**All-cause under-5 mortality:** the probability (expressed as the rate per 1,000 live births) that children born alive will die before reaching the age of 5 years.

**Antenatal care (ANC4) coverage:** the proportion of children under 1 year old whose mothers had four or more antenatal visits at a health facility during their pregnancy.

**BCG immunization coverage:** the proportion of children under 5 years old who have been vaccinated against tuberculosis with the Bacillus Calmette-Guérin (BCG) vaccine. Vaccine receipt was determined by immunization cards, or in the absence of a card, by maternal recall.

**Care-seeking for suspected pneumonia:** the proportion of children under 5 years old who sought care at a health facility after experiencing symptoms indicative of suspected pneumonia (cough) in the last two weeks, as reported by survey respondents.

**Childhood underweight:** the proportion of children aged 6 to 59 months who are two or more standard deviations below the international anthropometric reference population median of weight for age.

**Exclusive breastfeeding coverage:** the proportion of children under 2 years old who exclusively consumed breast milk the previous night, as reported by survey respondents.

**Household access to improved sanitation:** the proportion of households with an improved sanitation system (flush toilet, covered pit latrine). Unimproved sanitation systems include uncovered pit latrines and having no formal structure.

**Household access to improved water sources:** the proportion of households with an improved water source (piped water, borehole, protected well, protected spring, rainwater, bottled water, gravity flow scheme). Unimproved water sources include unprotected wells or springs, rivers or ponds, vendor-provided water, and tanker trucks.

**Indoor residual spraying (IRS) coverage:** the proportion of households that were sprayed with an insecticide-based solution in the last 12 months.

**Insecticide-treated net (ITN):** a net treated with an insecticide-based solution that is used for protection against mosquitoes that can carry malaria. ITNs include long-lasting insecticide-treated nets (LLINs), which are impregnated with insecticides that are supposed to remain effective for three to five years, and traditional ITNs, which require retreatment each year after receipt.

**Intermittent preventive therapy in pregnancy, two doses (IPTp2):** the proportion of pregnant women who received at least two treatment doses of Fansidar (sulfadoxine/pyrimethamine [SP]) at antenatal care visits during pregnancy.

**Intervention coverage:** the proportion of individuals or households who received an intervention that they needed.

**ITN ownership:** the proportion of households that own at least one ITN.

**ITN use by children under 5:** the proportion of children under 5 years old who slept under an ITN the previous night, as reported by household heads.

**Maternal educational attainment:** the total number years of education achieved by women of reproductive age (15 to 44 years).

**Measles immunization coverage:** the proportion of children aged 12 to 59 months who have received measles vaccination. Vaccine receipt was determined by immunization cards, or in the absence of a card, by maternal recall.

**Pentavalent immunization coverage:** the proportion of children aged 12 to 24 months who have received the pentavalent vaccine, which includes protection against diphtheria-pertussis-tetanus (DPT), hepatitis B, and *Haemophilus influenzae* type b. Vaccine receipt was determined by immunization cards, or in the absence of a card, by maternal recall.

**Polio immunization coverage:** the proportion of children aged 12 to 59 months who have received three doses of the oral polio vaccine (OPV). Vaccine receipt was determined by immunization cards, or in the absence of a card, by maternal recall.

**Skilled birth attendance (SBA) coverage:** the proportion of children under 1 year old whose mothers delivered with a skilled birth attendant (a doctor, nurse, midwife, or clinical officer), as determined by self-report.
Executive summary

Uganda has seen marked improvement in childhood survival over the past two decades. While the scale-up of malaria interventions has been suggested as one of the biggest drivers of these improvements, little research has considered the contribution of other health interventions and socio-demographic factors alongside malaria interventions. To address this knowledge gap, the Infectious Diseases Research Collaboration (IDRC) and the Institute for Health Metrics and Evaluation (IHME) collaborated to implement the Malaria Control Policy Assessment (MCPA) project. The objective of the MCPA project was to harness existing data in Uganda and use rigorous statistical methods to quantify trends in child health interventions, with a focus on malaria interventions, as well as non-health factors, to better understand their collective impact on under-5 mortality at the subnational level.

In this report, we show trends for a range of key child health outcomes, interventions, and socio-demographic factors from 1990 to 2011 for 10 regions in Uganda. This is the first time that annual estimates and corresponding levels of uncertainty for such a range of indicators have been generated at the regional level and for this period of time. Regional profiles, located at the back of this report, depict trends in child health over time and benchmark regional performance across indicators. With this information, local and national policymakers and health officials can identify areas of successful health service delivery and detect early signs of declining coverage or stalled progress.

We originally attempted to conduct analyses at the district level. Although we collated all available data from a range of sources, no health survey could provide sufficient sample sizes to extract district-level estimates, and the country's frequent redistricting from 1990 to 2011 led us to use regions as the unit of analysis. District-level results would have been more directly relevant for policymakers and local health program managers in Uganda, as the district is the administrative level at which health services are delivered. Further, district-level trends would have allowed us to conduct causal attribution analyses and to determine the impact of various factors on declines in under-5 mortality.

The results presented in this report are descriptive, and while informative, they cannot be used to make causal inferences. This highlights the critical need for greater investment in health information systems and routine data collection, as these are the mechanisms by which policymakers should receive timely and locally relevant information to answer the key health questions they face. Without this kind of investment going forward, properly assessing the impact of any priority health programs or scale-up of intervention packages is likely to be fraught with challenges. An increasing emphasis is placed on documenting the impact of programs, particularly amidst competing policy agendas and tightening budgets. To maintain and strengthen the argument for continued investment in malaria programs, it is crucial to collect the kind of data and invest in the information systems that can support the assessment of program impact.

This report shows that Uganda is succeeding on several fronts in child health and development. First, we found that between 1990 and 2011, under-5 mortality significantly declined across all regions in Uganda, with the majority of regions achieving the child survival targets set forth by the Ugandan Ministry of Health (MOH). Second, coverage of key malaria interventions, such as household ownership of insecticide-treated nets (ITNs) and the receipt of artemisinin-based combination therapies (ACTs), increased dramatically in a very short period of time. Some of the regions with the highest malaria transmission documented the highest levels of ACT coverage, reflecting Uganda's ongoing commitment to reducing its malaria burden. Third, as an early adopter of the pentavalent vaccine in 2002, Uganda has successfully brought coverage to levels comparable to vaccines that have been on the immunization schedule for decades. Fourth, the proportion of children under 5 who sought care for suspected pneumonia steadily increased between 1990 and 2011, suggesting that both access to health facilities and health-care-seeking behaviors may have improved in Uganda during this time. Finally, steady gains were recorded in educational attainment among women and household access to improved sanitation in most areas of the country.

These successes were accompanied by concerning trends for a number of key child and maternal health interventions. First, declines in under-5 mortality slowed after 2007 in several regions, as evidenced by complete stagnation of progress or even slight increases in under-5 mortality for some regions. Second, the receipt of at least two doses of intermittent preventive therapy in pregnancy (IPTp2) was persistently low over time and across regions. This finding warrants further investigation, especially since trends in the proportion of women who had at least four antenatal care visits (ANC4) consistently exceeded levels of IPTp2. Third, despite substantial gains in vaccine coverage over time, levels of measles and polio immunization for most regions remained lower than optimal in 2011. Uganda has experienced outbreaks of both diseases in recent years, further highlighting the importance of expanding coverage and maintaining high immunization rates. Last, a number of regions recorded minimal progress in improving low levels of ANC4 and skilled birth attendance (SBA), with some even recording declines in ANC4. Targeting these areas for improvement should be a priority if Uganda is to ensure that its achievements in child health continue into the present decade.

With a focus on subnational trends, findings from the MCPA project in Uganda provide side-by-side comparisons of health performance over time, geography, and intervention type. The child health landscape is markedly heterogeneous, even at the regional level, highlighting the need for continuous and timely assessment of even more local data to understand the determinants of effective delivery of health services. With regularly collected and analyzed health information, policymakers can have the evidence base they need to make targeted, data-driven decisions for achieving greater and more equitable health gains in Uganda.
Introduction

Over the past decade, Uganda's child health and development landscape has been substantially reshaped by new programs, interventions, and priorities, including extensive malaria control programs. In order to fully understand what has contributed to Uganda's progress in reducing under-5 mortality, it is important to comprehensively track and assess all interventions and factors that may have improved child health.

The MCPA project in Uganda had two main objectives:
1) Determine what proportion of the decline in all-cause under-5 mortality in Uganda was attributable to the scale-up of malaria control interventions, while accounting for a range of other key child health interventions and non-health factors; and
2) Assess this impact at a subnational level between 1990 and 2010.

The MCPA project sought to use all available data sources to generate annual estimates of child health outcomes, interventions, and key socio-demographic factors. Table 1 provides an overview of the range of these data sources. The original aim was to produce district-level trends, but consistently collected data were lacking at this administrative level over time. Multiple data extraction and statistical techniques were used in an effort to generate district-level estimates, but they were unsuccessful for a number of reasons, including the omission of district identifiers in surveys, frequent redistricting of administrative boundaries (i.e., there were 44 districts in 1997, 79 in 2006, and 112 in 2010 [Green 2008, UBOS and ICF Inc. 2012]), and insufficient documentation of redistricting activities. As a result, we used the 10 regional boundaries commonly applied for the Demographic and Health Survey (DHS) for subnational analysis. This small number of regions meant that we were not able to conduct causal attribution

### MAIN FINDINGS FROM THE MCPA PROJECT IN UGANDA

- Under-5 mortality significantly declined in every region between 1990 and 2011. However, some regions experienced slower progress, if not stagnation, in reducing under-5 mortality after 2007.

- Coverage of key malaria interventions, namely ITN ownership and the receipt of ACTs among febrile children under 5, rapidly scaled up during a short period of time throughout Uganda. At the same time, no region reached the malaria coverage goals set forth by the MOH.

- As malaria interventions were scaled up, Uganda also recorded substantial gains in coverage of the pentavalent vaccine and care-seeking for suspected pneumonia among children under 5.

- Large increases in the average years of education attained by women of reproductive age and household access to improved sanitation were documented in many regions. Nonetheless, sizeable gaps between the highest and lowest levels of educational attainment, as well as other determinants of health, persisted between 1990 and 2011.

- Amidst the country's health successes, other worrisome trends warrant further attention. IPTp2 coverage remained very low throughout Uganda, and few regions recorded improvements in ANC4 over the 21-year period analyzed. Most regions recorded minimal progress in improving polio immunization coverage, even after polio outbreaks occurred. Substantial disparities between the health trends found in Kampala and a subset of regions also have endured over time. Addressing these gaps in health service provision is crucial to maintaining, as well as accelerating, Uganda's gains in child health.
Table 1. Data sources used in the MCPA project

<table>
<thead>
<tr>
<th>DATA SOURCE</th>
<th>YEARS REPRESENTED</th>
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<tbody>
<tr>
<td><strong>SURVEYS</strong></td>
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<tr>
<td>Anemia and Parasitemia Survey (A&amp;P)</td>
<td>2011</td>
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<tr>
<td>Integrated Household Survey (IHS)</td>
<td>1992-1993</td>
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<tr>
<td>Malaria Indicator Survey (MIS)</td>
<td>2009-2010</td>
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<tr>
<td>Netmark Survey reports</td>
<td>2000, 2006</td>
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<tr>
<td>Northern Uganda Baseline Survey</td>
<td>2004</td>
</tr>
<tr>
<td>Quantitative Service Delivery Survey</td>
<td>2000</td>
</tr>
<tr>
<td>Service Provision Assessment (SPA)</td>
<td>2007</td>
</tr>
<tr>
<td>Uganda National Panel Survey (UNPS)</td>
<td>2009-2010, 2010-2011</td>
</tr>
<tr>
<td><strong>POPULATION CENSUSES</strong></td>
<td></td>
</tr>
<tr>
<td>National census</td>
<td>1992, 2002</td>
</tr>
<tr>
<td><strong>ADMINISTRATIVE SOURCES</strong></td>
<td></td>
</tr>
<tr>
<td>Drug supply and delivery records</td>
<td>2006–2012</td>
</tr>
<tr>
<td>Health Management Information System (HMIS)</td>
<td>2002–2012</td>
</tr>
<tr>
<td>Malaria intervention tracking databases</td>
<td>2006–2010</td>
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</tbody>
</table>

analyses, and thus the results presented here are mainly descriptive.

We produced a time series of regional estimates and corresponding levels of uncertainty (as expressed by 95% confidence intervals [CI]) from 1990 to 2011. To our knowledge, this is the first time that regional trends were systematically generated for each region in Uganda and across a full range of key child health outcomes, health interventions, and socio-demographic factors. Annex 1 provides an overview of the analytical approach used to generate the estimates and trends shown in this report.

Detailed descriptions of the findings for each region are presented in this report. Regional data can be downloaded from IHME’s Global Health Data Exchange (GHDx): http://ghdx.healthdata.org.
Main findings

Significant declines in under-5 mortality were observed across all regions, but gains slowed in recent years
Uganda made marked progress in improving child survival between 1990 and 2011, with all regions recording statistically significant reductions in all-cause under-5 mortality during this time (Figure 1). Further, the majority of regions achieved the under-5 mortality target set forth by the Uganda Health Sector Strategic Plan II (HSSP II), 2005/06-2009/10, which was to reduce under-5 mortality to no more than 103 deaths per 1,000 live births by 2010 (MOH 2005a).

At the national level, under-5 mortality fell by 48%, from 163 deaths per 1,000 live births in 1990 (95% CI: 157, 170) to 85 in 2011 (95% CI: 79, 93) (Wang et al. 2014). Regionally, declines ranged from 38% to 54%. Such countrywide progress corresponded with some reductions in inequalities as well. In 1990, levels of under-5 mortality spanned from 104 deaths per 1,000 live births (95% CI: 85, 128) to 201 (95% CI: 169, 236) across regions. By 2011, this gap moderately narrowed, with a range of 50 deaths per 1,000 live births (95% CI: 38, 66) to 121 (95% CI: 94, 154). The absolute difference between the region with the highest level of under-5 mortality and the lowest decreased about 30% (dropping from a difference of 97 to 71). Nonetheless, a persistent disparity remained between child survival in Kampala and the levels of under-5 mortality observed for the rest of Uganda.

Amidst these improvements, it is worth noting that several regions experienced slowed gains or even slight increases in under-5 mortality between 2007 and 2011. It is critical to determine whether these regions have recorded improvements in more recent years, especially as the deadline approaches for achieving the fourth Millennium Development Goal (MDG4), reducing under-5 mortality by two-thirds between 1990 and 2015.

Malaria interventions were rapidly scaled up in Uganda, but regions fell short of national targets
Coverage of nearly all malaria interventions greatly increased throughout Uganda in a very short period of time, with most of the gains occurring after 2007. Nationally, the proportion of households that either owned at least one ITN or had indoor residual spraying (IRS) remained below 10% until 2005 and only reached about 30% in 2007. Soon after, coverage climbed more quickly, exceeding 40% in 2009 and rising to around 60% in 2011.

Prior to 2005, coverage of malaria control interventions was quite low in Uganda. By 2011, all regions had coverage levels exceeding 50% for having either ITNs or IRS. Figure 2 shows the rise in coverage of malaria control in this short period of time. At the same time, the regional difference between the lowest and highest levels of coverage in 2011 remained sizeable, ranging from 53% (95% CI: 27%, 76%) to 82% (95% CI: 68%, 92%). Some of these coverage discrepancies may be related to variances in malaria transmission intensity in Uganda, as areas in the North region and western

Figure 1. Regional estimates of all-cause under-5 mortality in Uganda, 1990-2011
Uganda have recorded some of the highest rates of malaria transmission in the world (WHO 2006a). Nonetheless, high levels of malaria transmission also persist in southern Uganda (Gething et al. 2011), where a few regions showed relatively lower coverage of malaria control interventions.

Uganda formally implemented ACTs as the first-line treatment for uncomplicated malaria in April 2006 (Nanyunja et al. 2011), and based on trends produced through the MCPA project, the uptake of ACTs appeared be quite rapid and widespread. Nationally, the proportion of children who had a fever in the preceding two weeks and received ACTs as treatment rose from 6% in 2007 (95% CI: 3%, 11%) to 19% in 2009 (95% CI: 12%, 29%) and then quickly climbed to 49% in 2011 (95% CI: 34%, 65%). This rapid increase in the receipt of ACTs is an important success story for Uganda, especially since some of the regions with the most intense malaria transmission had the highest levels of ACT coverage (e.g., nearly 70% of children under 5 with fever received ACTs in the North). Figure 3 displays the country’s swift expansion of ACTs across regions between 2007 and 2011.

At the same time, it is important to note that the receipt of ACTs in response to a fever does not directly reflect optimal case management of malaria. On one hand, it is possible that the receipt of ACTs among children with a fever and a positive test is actually higher than this indicator implies; conversely, if children who presented with a fever but tested negative for malaria (or were not tested at all) received ACTs, the indicator would be an overestimate of optimal malaria case management. Improving the measurement of proper malaria diagnostic and treatment practices at local levels should be a priority.

Figure 2. Percentage of households covered by an ITN, IRS, or both interventions in 2005, 2008, and 2011

![Figure 2. Percentage of households covered by an ITN, IRS, or both interventions in 2005, 2008, and 2011](image)

Figure 3. Percentage of febrile children under 5 who received ACTs in 2007, 2009, and 2011

![Figure 3. Percentage of febrile children under 5 who received ACTs in 2007, 2009, and 2011](image)
is less clear. Persistently low levels of IPTp2 do not appear to be an antenatal care access issue, as the proportion of women who had at least four antenatal care visits (ANC4 coverage) consistently exceeded IPTp2 coverage. This result also does not seem to be a supply-side stocking issue, as over 90% of all health facilities stocked SP in 2012, as measured by a nationally representative sample of facilities across levels of care and ownership in Uganda (IHME 2014b). More localized studies suggest that low levels of IPTp2 coverage may be related to provider-level gaps and prescription practices (Sangaré et al. 2010), but further investigation is warranted to address this ongoing health challenge in Uganda.

The Uganda Malaria Control Strategic Plan 2005/06–2009/10 set several malaria intervention targets to achieve by mid-2010, including (1) 85% of households with at least one ITN; (2) 85% of children under 5 sleeping under an ITN the previous night; and (3) 85% of pregnant women receiving at least two doses of SP (IPTp2) (MOH 2005b). These targets were very ambitious, and despite marked progress since 2005, no region achieved any of these targets in 2010 (or by 2011). Across these indicators, each region showed the highest levels of coverage for ITN ownership, but as shown in Figure 4, all regions fell below the target by at least 10 percentage points. As Uganda solidifies its new malaria reduction plan, for which the country has proposed to provide universal access to malaria prevention and treatment to all populations at risk for malaria, it is critical to consider past drivers of gains and barriers to successful achievement of bold malaria goals. It is likely that recent efforts to increase access to and the use of malaria control interventions in Uganda, such as a 2014 mass net distribution campaign and accompanying community mobilization activities (PMI 2014), will contribute to higher levels of intervention coverage in the near future.

**Pentavalent vaccine scale-up occurred quickly throughout Uganda, while gains for other vaccines were less pronounced**

Nationally, trends in immunization coverage generally pointed to progress and increased receipt of four key childhood vaccines: BCG, measles, polio, and the pentavalent vaccine. Regionally, a wider range of trends emerged, which is crucial to consider further given Uganda’s investments in its Reaching Every District (RED) efforts (MOH 2010a, MOH 2013).

Steady progress has been made in elevating rates of measles immunization in Uganda; this is particularly noteworthy given that some regions had levels of measles coverage close to 50% in the 1990s. Nationally, measles immunization coverage reached 85% in 2011 (95% CI: 75%, 91%), ranging from 83% in a number of regions to 93% in Western (95% CI: 86%, 96%). Despite these gains, only two regions met or exceeded the 90% coverage goal for measles immunization set forth by the Uganda National Expanded Programme on Immunization Multi Year Plan, 2010-2014 (MOH 2010a).

**Figure 4. Comparison of malaria program targets with regional levels of malaria intervention coverage, 2011**

Note: Regions are ordered by their level of ITN ownership in 2011.
Coverage of polio immunization stagnated over time, consistently hovering around or slightly below 80%. After remaining polio-free for 13 years (from 1996 to 2009) and receiving certification in 2006, Uganda experienced a re-emergence of wild polio virus in 2009 (MOH 2010a). The country rolled out mass immunization campaigns to districts that were considered at high-risk for polio outbreaks, but at the regional level, gains in polio immunization coverage were not observed. As Uganda considers introducing the inactivated polio vaccine (IPV) (MOH 2013) to immediately supplement and eventually replace the oral polio vaccine (OPV), it will be essential for the country to determine which factors may have prevented further gains in polio immunization with OPV.

Since its 2002 introduction of the pentavalent vaccine (MOH 2010a), Uganda successfully brought up pentavalent vaccine coverage throughout the country. Nationally, coverage climbed from 35% in 2004 (95% CI: 12%, 70%) to 77% in 2011 (95% CI: 51%, 92%). Nonetheless, gains in coverage slowed or stagnated in more recent years, with the national average hovering just below 80% between 2009 and 2011. Finding ways to further accelerate gains in pentavalent vaccine coverage will likely benefit Uganda.

The Ugandan MOH set the goal of achieving 80% coverage of all childhood immunizations in 80% of districts by 2014, directly supporting the country’s RED objectives and aims for the “fully immunized child,” or ensuring that every child finishes the Uganda immunization schedule prior to the age of 1 year (MOH 2010a). Although regional estimates of immunization coverage do not reveal district-level differences, they provide a good foundation from which in-depth investigations into district variations could be based. Figure 5 illustrates the range of immunization coverage levels, across vaccines and regions, in 2011. Two regions achieved coverage exceeding 80% for all vaccines in 2011, and all regions had levels of BCG and measles immunization coverage above 80%. On the other hand, fewer regions recorded coverage equaling or surpassing 80% for polio and pentavalent vaccine immunization.

It is important note that these estimates of coverage likely indicate a “ceiling” level of immunization rates, as they do not reflect the proportion of children who received effective protection against these antigens. A recent study found that nearly 10% of health facilities in Uganda did not store vaccines within the recommended temperature range in 2012 (IHME 2014b, WHO 2006b), which could compromise vaccine viability and effective immunity. Ongoing work in Uganda is trying to quantify what proportion of children demonstrate proper immunity against a subset of antigens (IHME 2014c).

Progress recorded for some key maternal and child health interventions, whereas antenatal care coverage stagnated

Between 1990 and 2011, Uganda documented varied progress in improving a subset of key maternal and child health interventions. SBA coverage and exclusive breastfeeding gradually increased at the national level, whereas ANC4 coverage consistently remained between 41% and 49%. The latter is cause for concern, as Uganda has recommended a minimum of four antenatal care visits during pregnancy since 2002 (MOH 2002).

For some regions, substantial gains in SBA coverage occurred between 2000 and 2005, but by 2011, the range in coverage was quite large, spanning from 27% (95% CI: 16%, 43%) to 95% (95% CI: 90%, 97%). Few, if any, interventions had such a large discrepancy between the highest and lowest levels of coverage for 2011. Past work suggests that SBA coverage in Uganda has often varied in parallel with levels of maternal education and relative household wealth (UBOS and ICF Inc. 2012), which corresponds with our findings (e.g., Kampala consistently had among the highest levels of SBA coverage and educational attainment for women of reproductive age between 1990 and 2011).

Figure 5. Regional estimates of immunization coverage, by vaccine, 2011

<table>
<thead>
<tr>
<th>REGION</th>
<th>BCG IMMUNIZATION</th>
<th>MEASLES IMMUNIZATION</th>
<th>POLIO IMMUNIZATION</th>
<th>PENTAVALENT IMMUNIZATION</th>
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<td>East Central</td>
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Note: Cells highlighted in light blue reflect achievement of at least 80% coverage for a given vaccine in 2011; dark blue designates at least 90% coverage. Cells in yellow indicate that 80% coverage was not reached as of 2011; orange reflects coverage less than 70%.
Although negligible progress in ANC4 coverage was found at the national level between 1990 and 2011, regional trends revealed a much more heterogeneous landscape for antenatal care. Some regions, especially those located along the western border of Uganda, showed substantial progress in improving ANC4 coverage, especially between 2000 and 2011. At the same time, other regions, particularly those found along the southeastern areas of Uganda, recorded declines in coverage. Figure 6 illustrates these divergent trends in ANC4 coverage throughout Uganda.

Trends in exclusive breastfeeding were quite varied, which may be related to regional differences in Uganda’s HIV/AIDS epidemic and the perceived safety of breastfeeding among HIV-positive mothers (Guay et al. 1996, Fadnes et al. 2009). For instance, in Kampala, a region which has experienced some of the highest rates of HIV/AIDS in Uganda (MOH 2010b), exclusive breastfeeding coverage was quite low during the 1990s. There is likely an association between Uganda’s gradual expansion of services for prevention of mother-to-child transmission (PMTCT) of HIV and gains in exclusive breastfeeding after 2000, especially in regions with high HIV/AIDS prevalence (UAC 2012).

Serving as a proxy for health-care-seeking behaviors, the proportion of children under 5 years old who sought care at a health facility for suspected pneumonia steadily increased over time. Nationally, rates of this health-care-seeking behavior increased from lower than 30% in the early 1990s to 77% in 2011 (95% CI: 76%, 78%). By 2011, nearly all regions had care-seeking rates at or exceeding 70%, ranging from 67% (95% CI: 56%, 76%) to 84% (95% CI: 77%, 89%). Figure 7 displays this rapid and widespread scale-up of health-care-seeking behavior. This finding likely reflects a variety of factors influencing access to and the demand for health services, which may include heightened overall access to health facilities, especially for more remote areas, and improved community outreach through programs such as integrated community case management (iCCM). It is important to note that this indicator does not reflect whether children actually received the care they needed, for pneumonia or any other illness with similar symptoms.

Large gains in maternal educational attainment were observed, while less widespread progress was found for improved household characteristics. Many non-health factors, ranging from levels of education to access to improved water sources, can affect child health outcomes as much as specific health interventions. For instance, multiple studies have found that gains in average years of education among women of reproductive age (15 to 44 years old) are directly associated with improved childhood survival (Gakidou et al. 2010, Wang et al. 2014).

Nationally, Uganda documented an impressive 77% increase in maternal educational attainment, rising from an average of 3.5 years of education in 1990 (95% CI: 3.3, 3.9) to 6.2 years in 2011 (95% CI: 5.9, 6.4). While all regions saw heightened levels of educational attainment among women of reproductive age during this time, most regions recorded an average less than seven years of education in 2011 (or the equivalent of finishing primary school). Figure 8 illustrates both the progress made in increasing educational attainment across regions in Uganda and the continued disparities in subnational levels of maternal education.

Two main findings emerged for improved household characteristics in Uganda: (1) a subset of regions, rather than all regions, recorded large gains from 1990 to 2011; and (2) the discrepancy between the highest and lowest regional levels of improved household characteristics remained large over time. These results were exemplified by trends in household access to improved sanitation (Figure 9), a priority of the Ugandan MOH (MOH 2005a, MOH 2010c). Between 1990 and 2011, a number of regions documented a large increase in the proportion of households with improved sanitation, especially those in the western areas of Uganda. At the same time, the range between the regions with the highest and lowest levels of improved sanitation was quite sizeable during this time. In 2011, the difference was 74 percentage points, from 24% (95% CI: 17%, 33%) to 98% (95% CI: 98%, 99%). These findings demonstrate Uganda’s considerable success in expanding access to improved sanitation, but also highlight the country’s ongoing challenges in addressing regional disparities.

Figure 6. Regional estimates of ANC4 coverage in 1990, 2000, and 2011
Figure 7. Percentage of children who sought care for suspected pneumonia in 1990, 2000, and 2011

Figure 8. Average years of educational attainment among women of reproductive age in 1990, 2000, and 2011

Figure 9. Percentage of households with access to improved sanitation in 1990, 2000, and 2011

Note: Improved sanitation included having a flush toilet or covered pit latrine. Unimproved sanitation systems included pit latrines and having no formal structure.
Conclusions and policy implications

Between 1990 and 2011, the health landscape in Uganda changed sizably, and for the most part, these changes reflect progress in child health and the successful expansion of health service delivery throughout the country. Under-5 mortality substantially decreased at the national level, and several regions achieved the 2010 MOH target for improving childhood survival (MOH 2005a). These declines may be related to Uganda’s efforts to increase coverage for several child health interventions and indicators, including ITN ownership, receipt of ACTs in response to fever, the pentavalent vaccine, and care-seeking for suspected pneumonia. It is also likely that the country’s gains in educational attainment among women of reproductive age and household access to improved sanitation may have contributed to declines in under-5 mortality, either directly or via heightened use of interventions (Gakidou et al. 2010, Wang et al. 2014).

It is possible that at least some of these gains in malaria intervention coverage, receipt of other health interventions, maternal educational attainment, and improved sanitation helped drive Uganda’s progress in childhood survival. However, quantifying their individual or collective impact on declining rates of under-5 mortality was not analytically feasible. Until greater investments are made in strengthening health information systems and routinely collecting local data, demonstrating the impact of malaria interventions – or any health program – may remain quite challenging.

In more data-rich environments, it is not easy to parse out how much interventions individually have contributed toward reductions in under-5 mortality (IHME 2014a). Yet it is critical to assess their relative – or joint – contributions, as often interventions are scaled up and socio-demographic changes occur within the same broader health context. Expanding the use of prospective impact evaluations, such as IDR and IHME’s ongoing assessment of Uganda’s immunization programs (IHME 2014c), will improve our collective ability to determine what contributes to improved health outcomes.

Amidst Uganda’s areas of progress, IDRC and IHME identified some troubling trends that warrant further attention. IPTp2 coverage remained quite low over time, with no region exceeding 35% in 2011. Since 2002, Uganda’s clinical guidelines have stipulated that women should receive at least two doses of SP during pregnancy (MOH 2002), yet this analysis shows that little, if any, improvement occurred for raising levels of IPTp2. Regional trends in ANC4 coverage consistently exceeded levels of IPTp2, indicating that women potentially had enough contact with the health system, for the purposes of antenatal care, to receive at least two doses of IPTp. Findings from the Access, Bottlenecks, Costs, and Equity (ABCE) project in Uganda showed that over 90% of facilities stocked SP in 2012 (IHME 2014b), suggesting that low IPTp2 coverage may not be a drug stocking issue. Localized studies point to provider prescription practices as a possible explanation for persistently low levels of IPTp2 (Sangaré et al. 2010); further investigation is needed to determine whether this result is broadly applicable throughout Uganda and across levels of care.

Immunization coverage steadily improved throughout Uganda, a notable success given that some regions recorded coverage below 60% for the measles vaccine during the early 1990s. Nonetheless, absolute levels of coverage for most routine immunizations, particularly polio and measles, remained lower than optimal by 2011. Outbreaks of wild polio virus occurred in 2009 and the following years, while Uganda continues to experience measles outbreaks in a number of districts (MOH 2010a). It is possible that even fewer children are receiving effective protection against these diseases, as a notable portion of Ugandan health facilities were found to store vaccines at temperatures outside the recommended range in 2012 (IHME 2014b, WHO 2006). Uganda plans to introduce new vaccines over the next few years, such as IPV and the human papillomavirus (HPV) vaccine (MOH 2013), as well as achieve its RED goals. New vaccine introduction requires substantial resources, ranging from trained medical staff and functional facility equipment to proper funding and timing of social mobilization activities, and can easily burden routine immunization systems. As Uganda rolls out new vaccines, it will also be important for the country to prioritize maintaining its gains in immunization coverage, as well as increasing levels of currently used vaccines in many regions.

Overall, the proportion of pregnant women who sought a minimum of four antenatal care visits remained moderately low between 1990 and 2011, with a number of regions recording steady declines in ANC4 coverage. In several regions, less than 50% of pregnant women had four antenatal visits in 2011, suggesting that the majority of women in these regions are not receiving the number of antenatal care visits recommended by Ugandan clinical guidelines (MOH 2002). Recognizing that antenatal care services are linked to better maternal and child health outcomes (WHO 2003), Uganda should consider addressing its minimal improvements in ANC4 coverage.

Uganda is in the process of formalizing its 2014–2020 malaria reduction strategic plan, through which the country strives to make progress toward a “malaria-free Uganda.” Its ambitious strategic objectives include achieving universal coverage of long-lasting insecticide-treated nets (LLINs) and IPTp2 by 2017. Given that regional levels of coverage remained lower than the intervention targets set for mid-2010, the country may need to consider strategies to further expand and sustain higher levels of malaria intervention coverage in order to meet its 2017 goals. For instance, the President’s Malaria Initiative (PMI), World Vision, the United Kingdom Department for International Development (DFID), and the
Global Fund to Fight AIDS, Tuberculosis and Malaria recently funded one of the largest net distribution campaigns in Uganda to date (PMI 2014), and it is likely that estimates of ITN coverage for 2014 will be considerably higher post-campaign.

As demonstrated through the MCPA project in Uganda, as well as the project’s findings from Zambia (IHME 2014a), national trends can mask significant subnational differences. The regional profiles included in this report provide a data-driven foundation for benchmarking subnational performance and targeting areas for improvement. Future analyses should include developing methods to address Uganda’s frequent redistricting in the past, which would allow for an even more granular understanding of the country’s local health trends. Further, it is important for governments to prioritize continued monitoring and data gathering at the district level to make future analyses more robust and to provide critical inputs for decision-making and priority-setting by district health offices.

To maintain and further advance the health gains Uganda has made in child survival, continued efforts dedicated to delivering a range of health interventions, including malaria control and treatment, are essential. Improving the regular and timely collection of local health data will be crucial for guiding policy decisions and resource allocation. By strengthening the use of subnational data and focusing on health gaps experienced by areas within the country, Uganda will be in the position to accelerate progress in childhood survival and to promote greater equality in health attainment to all populations.
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Annex 1. Overview of the MCPA analytical approach and methods

In order to comprehensively assess trends in child health outcomes, intervention coverage, and socio-demographic factors in a data-driven, systematic way, the MCPA research team’s methodological approach took place in two main steps:

1) **Collating data and generating source-specific estimates.** The MCPA research team brought together a broad range of data sources including surveys, population censuses, and administrative databases, to generate source-specific estimates for all indicators of interest. Birth histories, wherein women are interviewed about the survival of their children, were extracted from surveys and censuses to generate estimates of under-5 mortality for particular years. For childhood underweight, health interventions, and socio-demographic indicators, regional estimates were also produced using surveys and censuses.

In total, 17 household surveys and two population censuses were included in the final analysis.

2) **Estimating trends for 10 regions from 1990 to 2011.** Given the range of data types assembled for the MCPA project, statistical modeling approaches had to be used in order to synthesize the estimates from those different data sources into a unified trend.

For under-5 mortality, generalized linear mixed effects regression was used to bring together the disparate estimates. This model incorporated explicit spatial and temporal terms in order to borrow strength between different regions and over time. These terms also allowed for data-driven adjustments for any discrepancies observed between the different sources of data. A simulated validation environment was used to assess expected model performance in terms of bias, efficiency, and confidence interval coverage.

For all other indicators, a two-step modeling approach was used to generate regional trends between 1990 and 2011. First, a linear model was fit to all of the source-specific estimates, applying a one-knot natural spline and including random intercepts and slopes for each region. The predicted trend from this regression was used as a function for Gaussian Process Regression (GPR), a statistical modeling technique specifically designed for interpolating non-linear trends. GPR allowed for the temporal smoothing of trends, as well as the estimation of 95% confidence intervals.
Regional profiles

Tracking trends in child health outcomes, intervention coverage, and socio-demographic factors at subnational levels provides timely, useful, and actionable information to local and national policymakers in Uganda.

In the section that follows, regional profiles are ordered alphabetically, with each profile providing “barometers” for 2011. These barometers compare a given region’s performance on key child health outcomes, interventions, and socio-demographic indicators to the national average and the range observed across regions in Uganda. Further, each profile details trends estimated for each group of indicators: child health outcomes, malaria interventions, immunizations, other maternal and child health interventions, and socio-demographic factors related to health.

These regional profiles aim to provide a foundation from which health and development officials can assess child health status at more local levels and then target high-priority areas for improvement. Individual profiles can be downloaded from IHME’s GHDx: http://ghdx.healthdata.org.
Between 1990 and 2011, all-cause under-5 mortality substantially decreased in Central 1, whereas less pronounced progress occurred for the prevalence of childhood underweight. Prioritizing efforts to further accelerate gains in child health outcomes, especially for childhood underweight, should be considered.

ITNs and the receipt of ACTs were quickly scaled up in Central 1, whereas IPTp2 coverage remained quite low. Although the region recorded improvement in immunization coverage, Central 1 nonetheless fell below the national average for most key childhood vaccines in 2011. From 1990 to 2011, coverage of exclusive breastfeeding and ANC4 stagnated or declined, whereas the proportion of children who sought care for suspected pneumonia steadily increased.

The region documented gains in the proportion of households with improved sanitation, exceeding the national average in 2011. In comparison to the national trend, Central 1 consistently averaged higher levels of educational attainment among women of reproductive age. Conversely, the region persistently fell below the national average for household access to improved water sources.

In 2011, Central 1 generally met or exceeded the national average for malaria interventions and maternal and child health interventions but fell below for immunizations. Except for access to improved water sources, the region exceeded the national average for socio-demographic factors. In comparison with the national average, Central 1 showed similar levels of under-5 mortality and childhood underweight.
From 1990 to 2011, the region of Central 1 recorded a significant reduction in all-cause under-5 mortality, dropping 44% from 149 deaths per 1,000 live births in 1990 (95% CI: 126, 175) to 83 in 2011 (95% CI: 66, 103). In 2011, the region’s under-5 mortality was similar to the national average of 85 deaths per 1,000 live births (95% CI: 79, 93).

The proportion of children who were underweight in Central 1 remained around 18% during the 1990s, after which prevalence declined to 14% in 2008 (95% CI: 12%, 18%) and remained at 14% through 2011. This level of childhood underweight equaled the national average in 2011.

ITN ownership remained below 10% until 2007, after which coverage rapidly rose to 64% in 2011 (95% CI: 38%, 83%), topping the national average of 59% (95% CI: 36%, 79%).

The use of ITNs by children under 5 years old increased quickly from 9% in 2007 (95% CI: 5%, 15%) to 45% in 2011 (95% CI: 27%, 62%). This level of ITN use was higher than the national average of 39% (95% CI: 27%, 53%). In this region, the difference between ITN ownership and ITN use by children under 5 (19 percentage points) was comparable to what was observed at the national level (20 percentage points).

No districts in the region of Central 1 had formally implemented IRS as of 2011.

ACTs formally became Uganda’s first-line treatment for uncomplicated malaria in 2006, and the proportion of children in Central 1 who received ACTs in response to experiencing a fever quickly escalated thereafter. Receipt of ACTs among febrile children under 5 increased from 10% in 2008 (95% CI: 7%, 16%) to 48% in 2011 (95% CI: 35%, 60%), which was comparable to the national average of 49% (95% CI: 34%, 65%).

The proportion of pregnant women who received IPTp2 remained below 10% until 2005, after which coverage increased to 27% in 2009 (95% CI: 16%, 42%). IPTp2 coverage dipped to 26% in 2011 (95% CI: 15%, 44%), which was slightly lower than the national average of 29% (95% CI: 15%, 50%).
The proportion of children who received the BCG vaccine remained below 80% until 2004, after which coverage increased to 89% in 2011 (95% CI: 80%, 94%). This level of BCG immunization was lower than the national average of 94% (95% CI: 89%, 97%) and among the lowest in Uganda for 2011.

Measles immunization steadily rose from 61% in 1990 (95% CI: 33%, 83%) to 83% in 2011 (95% CI: 69%, 91%), which was slightly lower than the national average of 85% (95% CI: 75%, 91%).

Coverage of polio immunization remained relatively consistent from 1990 to 2011, generally hovering between 70% and 75% during this time. In 2011, polio immunization coverage was 69% in Central 1 (95% CI: 44%, 87%), which was lower than the national average of 76% (95% CI: 52%, 90%) and among the lowest in Uganda.

The pentavalent vaccine was formally introduced in Uganda in 2002, after which coverage in Central 1 rapidly increased from 32% in 2004 (95% CI: 11%, 62%) to 75% in 2010 (95% CI: 51%, 89%). This level of pentavalent coverage was sustained through 2011, and was comparable to the national average of 77% (95% CI: 51%, 92%).

ANC4 coverage remained fairly consistent between 1990 and 2011, slightly declining from 60% in 1990 (95% CI: 35%, 79%) to 50% in 2008 (95% CI: 39%, 60%). ANC4 coverage remained at 50% through 2011, slightly higher than the national average of 47% (95% CI: 41%, 54%).

Skilled birth attendance gradually increased from 48% in 1990 (95% CI: 24%, 76%) to 63% in 2011 (95% CI: 45%, 78%), which was slightly higher than the national average of 60% (95% CI: 47%, 73%).

The proportion of children who were exclusively breastfed rose from 46% in 1990 (95% CI: 22%, 73%) to 67% in 2003 (95% CI: 54%, 77%). Exclusive breastfeeding coverage remained at this level through 2005, after which levels declined to 59% in 2011 (95% CI: 44%, 73%). While this level of exclusive breastfeeding was comparable to the national average of 61% (95% CI: 54%, 67%), the region’s downward trend in coverage is cause for concern.

Serving as proxy for health system access, the proportion of children under 5 who sought care for suspected pneumonia rapidly increased from 24% in 1990 (95% CI: 12%, 44%) to 82% in 2007 (95% CI: 75%, 87%), and remained at this level through 2011. By contrast, the national average was lower in 2011, at 77% (95% CI: 76%, 78%).
Among women of reproductive age (15 to 44 years old) in Central 1, the average years of education attained increased 57% between 1990 and 2011, rising from 4.7 years in 1990 (95% CI: 3.8, 5.6) to 7.4 years in 2011 (95% CI: 6.7, 8.2). This level of educational attainment far exceeded the national average in 2011, which was 6.2 years (95% CI: 5.9, 6.4), and was among the highest in Uganda for that year.

Household access to improved sanitation (a flush toilet or covered pit latrine) increased from 57% in 1990 (95% CI: 32%, 79%) to 85% in 2011 (95% CI: 78%, 89%). This level of improved sanitation was higher than the national average of 79% in 2011 (95% CI: 76%, 81%).

Central 1 recorded substantial progress in household access to improved water sources (e.g., piped water, protected wells, protected springs), rising from 36% in 1990 (95% CI: 20%, 56%) to 64% in 2011 (95% CI: 56%, 72%). Despite this progress, the proportion of households with improved water was lower in Central 1 than the national average, which was 76% in 2011 (95% CI: 73%, 79%).
Central 2

SUMMARY

Between 1990 and 2011, all-cause under-5 mortality and the prevalence of childhood underweight substantially decreased in Central 2. Further, the region consistently recorded much lower levels of underweight than the national trend. Prioritizing efforts to maintain these gains and further accelerate progress in child health outcomes should be considered.

ITNs and the receipt of ACTs were quickly scaled up in Central 2 but trailed slightly behind the national trend. While the region recorded gradual improvement in immunization coverage, Central 2 still had polio and pentavalent immunization rates slightly below the national average. Skilled birth attendance continuously increased over time, whereas the proportion of women who received at least four antenatal care visits (ANC4) declined.

The region documented gradual gains in improving household access to improved sanitation and water sources. In comparison to the national trend, Central 2 consistently averaged slightly higher levels of educational attainment among women of reproductive age.

In 2011, Central 2 generally met or exceeded the national average for maternal and child health interventions, but fell below for malaria interventions and immunization coverage. For socio-demographic factors, the region largely equaled or surpassed the national average in 2011, but had a slightly lower proportion of households with improved water. In comparison with the national average, Central 2 showed similar levels of under-5 mortality and lower levels of childhood underweight.

Note: Estimates of intervention coverage are for 2011, with better performance reflected by higher levels of coverage.

Note: Estimates of child health outcomes and socio-demographic factors are for 2011. Better performance is shown by lower levels of child health outcomes and higher levels for socio-demographic factors.
From 1990 to 2011, the region of Central 2 recorded a significant reduction in all-cause under-5 mortality, dropping 44% from 154 deaths per 1,000 live births in 1990 (95% CI: 131, 179) to 86 in 2011 (95% CI: 70, 106). In 2011, the region’s under-5 mortality was similar to the national average of 85 deaths per 1,000 live births (95% CI: 79, 93).

The proportion of children who were underweight in Central 2 decreased from 15% in 1990 (95% CI: 10%, 23%) to 9% in 2008 (95% CI: 7%, 12%). Prevalence of childhood underweight remained at 9% through 2011, which was well below the national average of 14% (95% CI: 12%, 15%) and among the lowest in Uganda.

ITN ownership remained below 10% until 2007, after which coverage rose to 54% in 2011 (95% CI: 29%, 79%). This level of ITN ownership was lower than the national average of 59% in 2011 (95% CI: 36%, 79%).

The use of ITNs by children under 5 years old increased from 9% in 2007 (95% CI: 5%, 17%) to 35% in 2011 (95% CI: 21%, 51%). This level of ITN use was lower than the national average of 39% (95% CI: 27%, 53%). In this region, the difference between ITN ownership and ITN use by children under 5 (19 percentage points) was comparable to what was observed at the national level (20 percentage points).

No districts in the region of Central 2 had formally implemented IRS as of 2011.

ACTs formally became Uganda’s first-line treatment for uncomplicated malaria in 2006, and the proportion of children in Central 2 who received ACTs in response to experiencing a fever rose thereafter. Receipt of ACTs among febrile children under 5 increased from 9% in 2008 (95% CI: 6%, 14%) to 42% in 2011 (95% CI: 30, 55%), which was lower than the national average of 49% (95% CI: 34%, 65%).

The proportion of pregnant women who received IPTp2 remained below 10% until 2005, after which coverage slightly increased to 23% in 2010 (95% CI: 13%, 36%). IPTp2 coverage stayed at 23% through 2011, which was lower than the national average of 29% (95% CI: 15%, 50%).
The proportion of children who received the BCG vaccine steadily increased from 78% in the early 1990s to 92% in 2010 (95% CI: 86%, 95%). This level of BCG immunization was sustained through 2011, which was comparable to the national average of 94% (95% CI: 89%, 97%).

Measles immunization rose from 62% in 1990 (95% CI: 37%, 82%) to 83% in 2011 (95% CI: 70%, 90%), which was similar to the national average of 85% (95% CI: 75%, 91%).

Coverage of polio immunization remained relatively consistent from 1990 to 2011, generally hovering between 70% and 80% during this time. In 2011, polio immunization coverage was 72% in Central 2 (95% CI: 46%, 88%), which was slightly lower than the national average of 76% (95% CI: 52%, 90%).

The pentavalent vaccine was formally introduced in Uganda in 2002, after which coverage in Central 2 increased from 32% in 2004 (95% CI: 12%, 61%) to 72% in 2010 (95% CI: 50%, 88%). This level of pentavalent coverage was sustained through 2011, and was slightly lower than the national average of 77% (95% CI: 51%, 92%).

ANC4 coverage gradually declined from 69% in 1990 (95% CI: 45%, 84%) to 49% in 2010 (95% CI: 39%, 61%), and remained at 49% through 2011. This level of ANC4 was comparable to the national average of 47% (95% CI: 41%, 54%), but the region’s downward trend in coverage is cause for concern.

Skilled birth attendance steadily rose from 50% in 1990 (95% CI: 25%, 76%) to 74% in 2011 (95% CI: 58%, 85%), far exceeding the national average of 60% (95% CI: 47%, 73%).

The proportion of children who were exclusively breastfed hovered around 60% until 2006, after which coverage gradually increased to 66% in 2011 (95% CI: 51%, 79%). This level of exclusive breastfeeding was slightly higher than the national average of 61% (95% CI: 54%, 67%).

Serving as proxy for health system access, the proportion of children under 5 who sought care for suspected pneumonia rapidly increased from 25% in 1990 (95% CI: 12%, 44%) to 82% in 2004 (95% CI: 75%, 87%). Coverage of this health-care-seeking behavior was sustained through 2006 before dipping to 78% in 2011 (95% CI: 68%, 85%), a level similar to the national average of 77% (95% CI: 76%, 78%).
Among women of reproductive age (15 to 44 years old) in Central 2, the average years of education attained increased 67% between 1990 and 2011, rising from four years in 1990 (95% CI: 3.3, 4.8) to 6.7 years in 2011 (95% CI: 6, 7.4). This level of educational attainment was slightly higher than the national average in 2011, which was 6.2 years (95% CI: 5.9, 6.4).

Household access to improved sanitation (a flush toilet or covered pit latrine) increased from 54% of households with improved sanitation in 1990 (95% CI: 29%, 76%) to 79% in 2010 (95% CI: 71%, 84%). This level of improved sanitation was sustained through 2011, equaling the national average for that year.

Central 2 recorded gradual progress in household access to improved water sources (e.g., piped water, protected wells, protected spring), rising from 60% in 1990 (95% CI: 40%, 77%) to 72% in 2011 (95% CI: 64%, 79%). This level of access to improved water was slightly lower than the national average of 76% in 2011 (95% CI: 73%, 79%).
East Central

**SUMMARY**

All-cause under-5 mortality in East Central substantially declined between 1990 and 2011, but still remained above the national average in 2011. Less progress was made for the prevalence of childhood underweight, with the region’s levels only slightly decreasing since the 1990s. Prioritizing efforts to accelerate gains in child health outcomes, especially childhood underweight, should be considered.

ITNs and the receipt of ACTs were quickly scaled up in East Central but trailed behind the national trend. In 2011, East Central documented some of the lowest levels of IPTp2 coverage in Uganda. While the region recorded gradual improvement in immunization coverage, East Central still had polio and pentavalent immunization rates below the national average. Skilled birth attendance continuously increased over time, whereas the proportion of women who received at least four antenatal care visits (ANC4) declined. This downward trend in antenatal care is cause for concern.

The region documented sizeable gains for household access to improved sanitation, but remained slightly lower than the national average in 2011. In comparison to the national trend, East Central consistently averaged higher levels of household access to improved water sources. Educational attainment among women of reproductive age in East Central followed a very similar trend to that of the national average.

In 2011, East Central largely fell below the national average across interventions, with skilled birth attendance as the primary exception. For socio-demographic factors, the region had a more mixed performance. In comparison with the national average, East Central showed higher levels of under-5 mortality and slightly higher levels of childhood underweight.

**Note:** Estimates of child health outcomes and socio-demographic factors are for 2011. Better performance is shown by lower levels of child health outcomes and higher levels for socio-demographic factors.
From 1990 to 2011, the region of East Central recorded a significant reduction in all-cause under-5 mortality, dropping 39% from 163 deaths per 1,000 live births in 1990 (95% CI: 138, 192) to 99 in 2011 (95% CI: 79, 124). Despite this progress, the region’s under-5 mortality was higher than the national average of 85 deaths per 1,000 live births in 2011 (95% CI: 79, 93).

The proportion of children who were underweight in East Central remained around 20% through 2007, after which prevalence declined slightly to 16% in 2011 (95% CI: 13%, 20%). This level of childhood underweight was slightly higher than the national average of 14% (95% CI: 12%, 15%).

MALARIA INTERVENTIONS

ITN ownership remained below 10% until 2007, after which coverage rose to 53% in 2011 (95% CI: 27%, 76%). This level of ITN ownership was lower than the national average of 59% in 2011 (95% CI: 36%, 79%).

The use of ITNs by children under 5 years old moderately increased from 8% in 2007 (95% CI: 4%, 15%) to 28% in 2011 (95% CI: 16%, 43%). This level of ITN use was much lower than the national average of 39% (95% CI: 27%, 53%) and was among the lowest in Uganda. In this region, the difference between ITN ownership and ITN use by children under 5 (25 percentage points) was higher than what was observed nationally (20 percentage points) in 2011.

No districts in the East Central region had formally implemented IRS as of 2011.

ACTs formally became Uganda’s first-line treatment for uncomplicated malaria in 2006, and the proportion of children in East Central who received ACTs in response to experiencing a fever moderately increased thereafter. Receipt of ACTs among febrile children under 5 rose from 9% in 2008 (95% CI: 6%, 14%) to 31% in 2011 (95% CI: 21%, 44%), which was far lower than the national average of 49% (95% CI: 34%, 65%) and among the lowest in Uganda for that year. The region’s relatively low uptake of ACTs warrants further investigation.

The proportion of pregnant women who received IPTp2 remained below 10% until 2005, after which coverage increased to 19% in 2007 (95% CI: 10%, 32%). IPTp2 coverage dipped to 14% in 2011 (95% CI: 8%, 27%), which was well below the national average of 29% (95% CI: 15%, 50%) and among the lowest in the country. While the national uptake of IPTp2 remained fairly low throughout Uganda in 2011, the region’s exceedingly low levels of IPTp2 coverage is cause for concern.

Overall, East Central recorded some of the country’s lowest levels of coverage across malaria intervention indicators. Addressing the region’s challenges in increasing access to and the use of these interventions ought to be prioritized.
The proportion of children who received the BCG vaccine steadily rose from 76% in 1990 (95% CI: 58%, 89%) to 94% in 2011 (95% CI: 88%, 97%), equaling the national average for that year.

Measles immunization substantially increased from 53% in 1990 (95% CI: 29%, 76%) to 83% in 2011 (95% CI: 70%, 91%), which was similar to the national average of 85% (95% CI: 75%, 91%). East Central’s progress in elevating measles immunization coverage is particularly noteworthy given its very low levels of coverage during the 1990s.

Coverage of polio immunization remained relatively consistent from 1990 to 2011, generally hovering between 65% and 75% during this time. In 2011, polio immunization coverage was 71% in East Central (95% CI: 46%, 87%), which was slightly lower than the national average of 76% (95% CI: 52%, 90%).

The pentavalent vaccine was formally introduced in Uganda in 2002, after which coverage in East Central increased from 30% in 2004 (95% CI: 11%, 60%) to 68% in 2009 (95% CI: 47%, 84%). Pentavalent vaccine coverage dipped to 67% in 2011 (95% CI: 42%, 86%), which was lower than the national average of 77% (95% CI: 51%, 92%) and among the lowest in Uganda for that year.

ANC4 coverage remained fairly low between 1990 and 2011, hovering around 40% to 45% for that period of time. In 2011, ANC4 coverage was at 40% (95% CI: 28%, 53%), which was lower than the national average of 47% (95% CI: 41%, 54%).

Skilled birth attendance gradually increased from 52% in 1990 (95% CI: 26%, 77%) to 66% in 2011 (95% CI: 49%, 80%), which was slightly higher than the national average of 60% (95% CI: 47%, 73%).

The proportion of children who were exclusively breastfed hovered around 40% until 2005, after which coverage increased to 54% in 2011 (95% CI: 38%, 68%). This level of exclusive breastfeeding was lower than the national average of 61% (95% CI: 54%, 67%).

Serving as proxy for health system access, the proportion of children under 5 who sought care for suspected pneumonia rose from 26% in 1990 (95% CI: 12%, 47%) to 69% in 2011 (95% CI: 58%, 78%). This level of health-care-seeking behavior was lower than the national average of 77% (95% CI: 76%, 78%).
Among women of reproductive age (15 to 44 years old) in East Central, the average years of education attained increased 74% between 1990 and 2011, rising from 3.5 years in 1990 (95% CI: 2.8, 4.2) to 6.1 years in 2011 (95% CI: 5.5, 6.8). This level of educational attainment was similar to the national average in 2011, which was 6.2 years (95% CI: 5.9, 6.4).

Household access to improved sanitation (a flush toilet or covered pit latrine) substantially rose from 47% of households with improved sanitation in 1990 (95% CI: 24%, 71%) to 77% in 2011 (95% CI: 67%, 84%). This level of improved sanitation was comparable to the national average, which was 79% in 2011 (95% CI: 76%, 81%). East Central’s progress in improving household access to improved sanitation was particularly notable, as the region’s levels were much lower than the national average in 1990 (61% [95% CI: 44%, 76%]).

The proportion of households with access to improved water sources (e.g., piped water, protected wells, protected springs) continuously increased in East Central, rising from 71% in 1990 (95% CI: 50%, 84%) to 87% in 2011 (95% CI: 83%, 91%). The region consistently recorded higher levels of improved water access than the national average between 1990 and 2011.
Between 1990 and 2011, Eastern recorded substantial declines in all-cause under-5 mortality and the prevalence of childhood underweight. Prioritizing efforts to maintain these gains and further accelerate the region’s progress in child health outcomes should be considered.

ITNs and the receipt of ACTs were quickly scaled up in Eastern, closely following the national trend. The region recorded improvements in immunization coverage as well, bringing BCG coverage to among the highest in the country in 2011. Skilled birth attendance gradually rose over time, but remained lower than the national average. Minimal progress was made for the proportion of women who had at least four antenatal care visits (ANC4), with the region’s coverage consistently falling below the national trend.

The region documented gains in the proportion of households with improved water, far exceeding the national average by 2011. While household access to improved sanitation slowly increased, Eastern lagged behind the national trend. After the mid-1990s, the region’s average levels of educational attainment among women of reproductive age began falling below the national average.

In 2011, Eastern generally equaled or exceeded the national average for malaria interventions and immunization coverage, but largely fell below for maternal and child health interventions. For socio-demographic factors, the region mostly performed below the national average; household access to improved water was the exception. In comparison with the national average, Eastern showed similar levels of under-5 mortality and childhood underweight.

Note: Estimates of intervention coverage are for 2011, with better performance reflected by higher levels of coverage.

Note: Estimates of child health outcomes and socio-demographic factors are for 2011. Better performance is shown by lower levels of child health outcomes and higher levels for socio-demographic factors.
From 1990 to 2011, the region of Eastern recorded a significant reduction in all-cause under-5 mortality, dropping 52% from 178 deaths per 1,000 live births in 1990 (95% CI: 151, 209) to 85 in 2011 (95% CI: 67, 108). At the same time, it is important to note that Eastern's progress in reducing under-5 mortality slowed after 2005. In 2011, the region’s under-5 mortality equaled the national average.

The proportion of children who were underweight in Eastern substantially decreased from 26% in 1990 (95% CI: 17%, 38%) to 12% in 2009 (95% CI: 10%, 15%). The prevalence of childhood underweight remained at 12% through 2011, which was slightly lower than the national average of 14% (95% CI: 12%, 15%). Eastern’s improvements in childhood underweight are particularly notable given that the region had one of Uganda’s highest levels of underweight during the early 1990s.

ITN ownership remained below 10% until 2004, after which coverage rose to 60% in 2011 (95% CI: 35%, 82%). This level of ITN ownership was similar to the national average of 59% (95% CI: 36%, 79%).

The use of ITNs by children under 5 years old steadily increased from 13% in 2005 (95% CI: 7%, 24%) to 41% in 2011 (95% CI: 25%, 58%). This level of ITN use was comparable to the national average of 39% (95% CI: 27%, 53%). In this region, the difference between ITN ownership and ITN use by children under the age of 5 (19 percentage points) was comparable to what was observed at the national level (20 percentage points).

No districts in the region of Eastern had formally implemented IRS as of 2011.

ACTs formally became Uganda’s first-line treatment for uncomplicated malaria in 2006, and the proportion of children in Eastern who received ACTs in response to experiencing a fever rapidly increased thereafter. Receipt of ACTs among febrile children under 5 rose from 9% in 2008 (95% CI: 6%, 13%) to 50% in 2011 (95% CI: 37%, 66%), which was similar to the national average of 49% (95% CI: 34%, 65%).

The proportion of pregnant women who received IPTp2 remained below 10% until 2005, after which coverage increased to 35% in 2011 (95% CI: 21%, 54%). This level of IPTp2 was higher than the national average of 29% (95% CI: 15%, 50%).
The proportion of children who received the BCG vaccine continuously increased between 1990 and 2011, rising from 78% in 1990 (95% CI: 61%, 90%) to 97% in 2010 (95% CI: 94%, 98%). This level of BCG immunization coverage was sustained through 2011, exceeding the national average of 94% (95% CI: 89%, 97%). Eastern had one of the highest rates of BCG immunization in Uganda for 2011.

Measles immunization substantially rose from 56% in 1990 (95% CI: 32%, 79%) to 86% in 2011 (95% CI: 74%, 92%), which was similar to the national average of 85% (95% CI: 75%, 91%). The region made marked progress in increasing measles immunization coverage since 1990.

Polio immunization coverage remained somewhat consistent from 1990 to 2011, generally hovering between 70% and 80% during this time. In 2011, polio immunization coverage was 73% in Eastern (95% CI: 50%, 89%), which was slightly lower than the national average of 76% (95% CI: 52%, 90%).

The pentavalent vaccine was formally introduced in Uganda in 2002, after which coverage in Eastern rapidly increased from 38% in 2004 (95% CI: 15%, 68%) to 82% in 2010 (95% CI: 62%, 92%). Pentavalent vaccine coverage dipped to 81% in 2011 (95% CI: 59%, 92%), but remained slightly higher than the national average of 77% (95% CI: 51%, 92%).

ANC4 coverage gradually increased between 1990 and 2011, rising from 26% in 1990 (95% CI: 12%, 47%) to 35% in 2011 (95% CI: 24%, 47%). This level of ANC4 coverage was well below the national average of 47% (95% CI: 41%, 54%), and was among the lowest in Uganda for 2011. Eastern’s persistently low levels of antenatal care are quite worrisome.

There was a substantial rise in skilled birth attendance in Eastern, increasing from 20% in 1990 (95% CI: 8%, 41%) to 52% in 2011 (95% CI: 34%, 67%). While this level of SBA coverage remained lower than the national average of 60% in 2011 (95% CI: 47%, 73%), Eastern’s gains in SBA are notable, especially given the region’s very low coverage in the 1990s.

The proportion of children who were exclusively breastfed remained fairly consistent between 1990 and 2011, largely hovering between 55% and 60%. In 2011, coverage of exclusive breastfeeding was at 62% (95% CI: 46%, 75%), which was comparable to the national average of 61% (95% CI: 54%, 67%).

Serving as proxy for health system access, the proportion of children under 5 who sought care for suspected pneumonia steadily increased from 22% in 1990 (95% CI: 10%, 42%) to 76% in 2011 (95% CI: 67%, 84%). This level of health-care-seeking behavior was comparable to the national average of 77% (95% CI: 76%, 78%).
Among women of reproductive age (15 to 44 years old) in Eastern, the average years of education attained increased 68% between 1990 and 2011, rising from 3.4 years in 1990 (95% CI: 2.8, 4.1) to 5.7 years in 2011 (95% CI: 5.1, 6.3). This level of educational attainment was lower than the national average in 2011, which was 6.2 years (95% CI: 5.9, 6.4).

Household access to improved sanitation (a flush toilet or covered pit latrine) steadily rose from 42% of households with improved sanitation in 1990 (95% CI: 19%, 66%) to 67% in 2011 (95% CI: 57%, 76%). Despite this progress, household access to improved sanitation in Eastern was well below the national average in 2011, which was 79% (95% CI: 76%, 81%).

The proportion of households with access to improved water sources (e.g., piped water, protected wells, protected springs) continuously increased in Eastern, rising from 73% in 1990 (95% CI: 55%, 86%) to 86% in 2011 (95% CI: 81%, 90%). The region consistently recorded higher levels of improved water access than the national average between 1990 and 2011.
Between 1990 and 2011, all-cause under-5 mortality and the prevalence of childhood underweight substantially declined in Kampala, falling to among the lowest levels in the country in 2011. Prioritizing efforts to maintain these gains and further accelerate such progress in child health outcomes should be considered.

ITN ownership and ITN use were quickly scaled up in Kampala, as was the receipt of ACTs for treatment of suspected malaria. The region recorded improvement in immunization coverage over time and documented a rapid scale-up of the pentavalent vaccine. Skilled birth attendance and the proportion of women who received at least four antenatal care visits (ANC4) were consistently above the national average, whereas Kampala’s coverage of exclusive breastfeeding persistently remained below the national average.

Across all socio-demographic factors, Kampala recorded much higher levels than the national trend over time, each rising to among the highest in Uganda. In 2011, Kampala largely met or exceeded the national average across interventions, with exclusive breastfeeding as the primary exception. For socio-demographic factors, the region consistently surpassed national trends over time. In comparison with the national average, Kampala documented much lower levels of under-5 mortality and childhood underweight.

**Note:** Estimates of child health outcomes and socio-demographic factors are for 2011. Better performance is shown by lower levels of child health outcomes and higher levels for socio-demographic factors.
From 1990 to 2011, the region of Kampala recorded a significant reduction in all-cause under-5 mortality, dropping 52% from 104 deaths per 1,000 live births in 1990 (95% CI: 85, 128) to 50 in 2011 (95% CI: 38, 66). In 2011, the region’s under-5 mortality was well below the national average of 85 deaths per 1,000 live births (95% CI: 79, 93) and was among the lowest in Uganda.

The proportion of children who were underweight in Kampala decreased from 12% in the early 1990s to 7% in 2010 (95% CI: 6%, 9%). The prevalence of childhood underweight remained at 7% through 2011, which was much lower than the national average of 14% (95% CI: 12%, 15%) and among the lowest in the country. While Kampala consistently recorded lower levels of childhood underweight than the national average between 1990 and 2011, the region saw a more accelerated reduction in underweight than the rest of Uganda during this time.

MALARIA INTERVENTIONS

ITN ownership remained below 10% until 2005, after which coverage rapidly rose to 61% in 2011 (95% CI: 34%, 82%). This level of ITN ownership was slightly higher than the national average of 59% (95% CI: 36%, 79%).

The use of ITNs by children under 5 years old steadily increased from 11% in 2005 (95% CI: 6%, 21%) to 48% in 2011 (95% CI: 31%, 65%). This level of ITN use far exceeded the national average of 39% (95% CI: 27%, 53%). In this region, the difference between ITN ownership and use (13 percentage points) was much lower than what was observed nationally (20 percentage points), which suggests that net use by children under 5 may be high among households with ITNs.

No districts in the region of Kampala had formally implemented IRS as of 2011.

ACTs formally became Uganda’s first-line treatment for uncomplicated malaria in 2006, and the proportion of children in Kampala who received ACTs in response to experiencing a fever rapidly increased thereafter. Receipt of ACTs among febrile children under 5 rose from 12% in 2008 (95% CI: 8%, 18%) to 51% in 2011 (95% CI: 39%, 63%), which was slightly higher than the national average of 49% (95% CI: 34%, 65%).

The proportion of pregnant women who received IPTp2 remained below 10% until 2004, after which coverage increased to 31% in 2008 (95% CI: 18%, 47%). IPTp2 coverage dipped to 27% in 2011 (95% CI: 15%, 45%), which was comparable to the national average of 29% (95% CI: 15%, 50%).
The proportion of children who received BCG vaccine remained above 90% between 1990 and 2011, slightly rising from 91% in 1990 (95% CI: 83%, 96%) to 96% in 2011 (95% CI: 92%, 98%). This level of BCG immunization coverage was slightly higher than the national average of 94% (95% CI: 89%, 97%).

Measles immunization increased from 71% in 1990 (95% CI: 46%, 88%) to 86% in 2009 (95% CI: 77%, 92%). Coverage remained at 86% through 2011, which was comparable to the national average of 85% for that year (95% CI: 75%, 91%).

Coverage of polio immunization remained somewhat consistent from 1990 to 2011, generally hovering between 80% and 85% during this time. Coverage hit its peak at 87% in 2000 (95% CI: 75%, 94%) and remained at this level through 2004, gradually decreasing to 79% in 2011 (95% CI: 58%, 92%). This level of polio immunization was slightly higher than the national average of 76% (95% CI: 52%, 90%).

The pentavalent vaccine was formally introduced in Uganda in 2002, after which coverage in Kampala rapidly increased from 32% in 2004 (95% CI: 11%, 62%) to 79% in 2010 (95% CI: 58%, 91%). Pentavalent vaccine coverage remained at 79% through 2011 (95% CI: 55%, 92%), which was comparable to the national average of 77% (95% CI: 51%, 92%).

ANC4 coverage gradually decreased between 1990 and 2011, sliding from 70% in 1990 (95% CI: 47%, 85%) to 61% in 2011 (95% CI: 48%, 72%). Despite declines in coverage, this level of ANC4 coverage remained above the national average of 47% in 2011 (95% CI: 41%, 54%) and was among the highest in Uganda for that year.

Skilled birth attendance steadily increased from 83% in 1990 (95% CI: 62%, 94%) to 95% in 2011 (95% CI: 90%, 97%), far exceeding the national average of 60% in 2011 (95% CI: 47%, 73%). After consistently exceeding the national trend since 1990, Kampala’s levels of SBA also were among the highest in Uganda in 2011.

The proportion of children who were exclusively breastfed slowly rose from 23% in 1990 (95% CI: 9%, 44%) to 50% in 2005 (95% CI: 38%, 63%). Coverage of exclusive breastfeeding remained at 50% through 2007, slipping to 46% in 2011 (95% CI: 31%, 62%) and falling below the national average of 61% (95% CI: 54%, 67%) for that year. Kampala had one of the lowest levels of exclusive breastfeeding in Uganda in 2011.

Serving as proxy for health system access, the proportion of children under 5 who sought care for suspected pneumonia increased from 32% in 1990 (95% CI: 16%, 54%) to 82% in 2003 (95% CI: 76%, 87%). This level of health-care-seeking behavior was sustained through 2005, after which coverage slipped to 78% in 2011 (95% CI: 69%, 85%) and was comparable to the national average of 77% (95% CI: 76%, 78%) for that year.
Among women of reproductive age (15 to 44 years old) in Kampala, the average years of education attained increased 32% between 1990 and 2011, rising from 7.2 years in 1990 (95% CI: 6.6, 8.6) to 9.5 years in 2011 (95% CI: 8.6, 10.5). This level of educational attainment was much higher than the national average in 2011, which was 6.2 years (95% CI: 5.9, 6.4); at the same time, Kampala consistently recorded higher levels of educational attainment than the national trend from 1990 to 2011.

Household access to improved sanitation (a flush toilet or covered pit latrine) increased from 88% of households with improved sanitation in 1990 (95% CI: 68%, 97%) to 99% in 2000 (95% CI: 98%, 99%). This level of improved sanitation was sustained through 2010, registering at 98% in 2011 (95% CI: 98%, 99%). Kampala’s household availability of improved sanitation far exceeded the national average of 79% (95% CI: 76%, 81%) and was among the highest in Uganda.

Household access to improved water sources (e.g., piped water, protected wells, protected springs) consistently remained above 90% between 1990 and 2011; however, coverage dipped from 99% in 1990 (95% CI: 97%, 99%) to 94% in 2004 (95% CI: 92%, 96%). Improved water access remained at 94% through 2004, after which levels rebounded to 97% in 2010 and 2011, exceeding the national average of 76% (95% CI: 73%, 79%) and rising to among the highest in Uganda at that time.
SUMMARY

All-cause under-5 mortality in Karamoja substantially declined between 1990 and 2005, but progress stagnated from 2005 to 2011. The proportion of children who were underweight was consistently well above the national trend over time. In 2011, Karamoja’s under-5 mortality and prevalence of underweight were among the highest in Uganda, emphasizing the region’s need to further prioritize improving child health outcomes.

The scale-up of ITNs and receipt of ACTs occurred quickly in Karamoja, slightly exceeding the national averages for these malaria interventions in 2011. Except for polio immunization coverage, the region recorded higher levels of immunization coverage than the national average across childhood vaccines; in fact, Karamoja had one of the highest levels of pentavalent vaccine coverage in the country for 2011. Exclusive breastfeeding steadily increased over time, rising to among the highest levels in the country by 2011, whereas the region persistently showed low coverage of skilled birth attendance.

The region documented gains in the proportion of households with improved water sources, which were largely driven by heightened availability of public boreholes. Nonetheless, Karamoja continually had some of the lowest levels of households with access to improved sanitation, as well as educational attainment among women of reproductive age in Uganda.

In 2011, Karamoja generally equaled or exceeded the national average across interventions, with skilled birth attendance as the primary exception. For socio-demographic factors, the region largely fell well below the national average; the region’s proportion of households with access to improved water sources was the main exception. In comparison with the national average, Karamoja showed much higher levels of under-5 mortality and childhood underweight.

Note: Estimates of child health outcomes and socio-demographic factors are for 2011. Better performance is shown by lower levels of child health outcomes and higher levels for socio-demographic factors.
From 1990 to 2011, the region of Karamoja recorded a significant reduction in all-cause under-5 mortality, dropping 40% from 201 deaths per 1,000 live births in 1990 (95% CI: 169, 236) to 121 in 2011 (95% CI: 94, 154). Despite this progress, it is important to note that the region’s annual reductions in under-5 mortality stalled between 2005 and 2011, plateauing in contrast with the national trend’s downward trajectory. In 2011, Karamoja’s under-5 mortality remained well above the national average of 85 deaths per 1,000 live births (95% CI: 79, 93), and was among the highest levels of under-5 mortality in Uganda.

The proportion of children who were underweight in Karamoja steadily increased from 29% in the early 1990s to 35% in 2003 (95% CI: 28%, 41%). Childhood underweight remained at 35% through 2004, after which prevalence gradually decreased to 29% in 2011 (95% CI: 24%, 34%). This level of childhood underweight far exceeded the national average of 14% (95% CI: 12%, 15%), and was among the highest in Uganda for 2011.

ITN ownership remained below 10% until 2007, after which coverage rapidly rose to 65% in 2011 (95% CI: 39%, 85%). This level of ITN ownership was higher than the national average of 59% in 2011 (95% CI: 36%, 79%).

The use of ITNs by children under 5 years old increased from 11% in 2007 (95% CI: 6%, 21%) to 46% in 2011 (95% CI: 31%, 64%). This level of ITN use exceeded the national average of 39% in 2011 (95% CI: 27%, 53%). In this region, the difference between ITN ownership and ITN use by children under 5 (19 percentage points) was comparable to what was observed at the national level (20 percentage points).

No districts in the region of Karamoja had formally implemented IRS as of 2011.

ACTs formally became Uganda’s first-line treatment for uncomplicated malaria in 2006, and the proportion of children in Karamoja who received ACTs in response to experiencing a fever rapidly increased thereafter. Receipt of ACTs among febrile children under 5 rose from 14% in 2008 (95% CI: 9%, 21%) to 60% in 2011 (95% CI: 46%, 72%), which was higher than the national average of 49% (95% CI: 34%, 65%). The region’s quick uptake of ACTs, especially given its high levels of malaria transmission, is quite notable.

The proportion of pregnant women who received IPTp2 remained below 10% until 2006, after which coverage steadily rose to 27% in 2011 (95% CI: 14%, 44%). This level of IPTp2 coverage was comparable to the national average of 29% (95% CI: 15%, 50%).
KARAMOJA, continued

IMMUNIZATIONS

The proportion of children who received the BCG vaccine increased from 86% in 1990 (95% CI: 72%, 94%) to 97% in 2010 (95% CI: 94%, 98%). This level of BCG immunization was sustained through 2011, exceeding the national average of 94% (95% CI: 89%, 97%) and rising to among the highest in Uganda in 2011.

Measles immunization substantially escalated in Karamoja, rising from 60% in 1990 (95% CI: 34%, 82%) to 90% in 2010 (95% CI: 82%, 95%). Coverage remained at 90% through 2011, which was higher than the national average of 85% (95% CI: 75%, 91%). Karamoja’s progress in elevating measles immunization coverage since 1990 is particularly laudable.

Coverage of polio immunization remained relatively consistent from 1990 to 2011, generally hovering between 70% and 80% during this time. In 2011, polio immunization coverage was 74% in Karamoja (95% CI: 49%, 89%), which was comparable to the national average of 76% (95% CI: 52%, 90%).

The pentavalent vaccine was formally introduced in Uganda in 2002, after which coverage in Karamoja rapidly increased from 32% in 2004 (95% CI: 10%, 64%) to 85% in 2011 (95% CI: 66%, 95%). This level of coverage far exceeded the national average of 77% (95% CI: 51%, 92%), and was among the highest in Uganda for 2011.

MATERNAL AND CHILD HEALTH INTERVENTIONS

ANC4 coverage gradually increased from 37% in 1990 (95% CI: 18%, 58%) to 55% in 2001 (95% CI: 45%, 66%). Coverage remained at 55% through 2004 before slipping to 47% in 2011 (95% CI: 35%, 59%), equaling the national average for that year.

Skilled birth attendance rose from 10% in 1990 (95% CI: 3%, 28%) to 27% in 2011 (95% CI: 16%, 43%), but was well below the national average of 60% (95% CI: 47%, 73%) and was among the lowest in Uganda in 2011. The region’s consistently low levels of SBA coverage from 1990 to 2011 warrant further attention.

The proportion of children who were exclusively breastfed steadily increased from 31% in 1990 (95% CI: 13%, 57%) to 75% in 2007 (95% CI: 64%, 84%). Coverage remained at 75% through 2009, after which exclusive breastfeeding dipped to 73% in 2011 (95% CI: 58%, 84%). This level of exclusive breastfeeding exceeded the national average of 61% in 2011 (95% CI: 54%, 67%), and was among the highest in Uganda for that year.

Serving as proxy for health system access, the proportion of children under 5 who sought care for suspected pneumonia escalated from 23% in 1990 (95% CI: 10%, 42%) to 83% in 2011 (95% CI: 76%, 89%). This level of health-care-seeking behavior was sustained through 2011, exceeding the national average of 77% (95% CI: 76%, 78%).
Among women of reproductive age (15 to 44 years old) in Karamoja, the average years of education attained more than doubled between 1990 and 2011, rising from 0.7 years in 1990 (95% CI: 0.6, 0.8) to 2.3 years in 2011 (95% CI: 2.0, 2.5). This level of educational attainment was dramatically lower than the national average in 2011, which was 6.2 years (95% CI: 5.9, 6.4), and was among the lowest in Uganda. Given the association between gains in women’s educational attainment and reductions in under-5 mortality, Karamoja would likely benefit from addressing its persistently low levels of education among women of reproductive age.

Household access to improved sanitation (a flush toilet or covered pit latrine) remained around 10% until 2004, after which improved sanitation increased to 24% in 2011 (95% CI: 17%, 33%). Nonetheless, this level of improved sanitation was far below the national average of 79% (95% CI: 76%, 81%) and was among the lowest in Uganda for 2011. The region’s persistently low availability of improved sanitation warrants further attention.

Karamoja recorded gains in household access to improved water sources (e.g., piped water, protected wells, protected springs), rising from 69% in 1990 (95% CI: 49%, 83%) to 89% in 2011 (95% CI: 85%, 92%). This level of improved water access was much higher than the national average in 2011, which was 76% (95% CI: 73%, 79%). It is important to note that most of these gains were driven by increased access to public boreholes located within communities, and not necessarily at households.
Between 1990 and 2011, North recorded substantial declines in all-cause under-5 mortality and the prevalence of childhood underweight. Prioritizing efforts to maintain these gains and further accelerate the region’s progress in child health outcomes should be considered.

ITNs and the receipt of ACTs were quickly scaled up in the region, with ITN use by children under 5 and ACT coverage rising to among the highest in Uganda for 2011. IRS coverage rapidly escalated after 2006, reflecting the region’s expansion of spraying to more districts. Coverage of the pentavalent vaccine rapidly rose in North, whereas polio immunization coverage stagnated over time. North recorded gradual gains in skilled birth attendance, and the proportion of children who sought care for suspected pneumonia increased to among the highest in Uganda in 2011. At the same time, ANC4 coverage remained moderately low and exclusive breastfeeding was higher in the 1990s than levels of coverage in the following decade.

The region documented gains in the proportion of households with improved sanitation and educational attainment among women of reproductive age, but remained below the national average by 2011.

In 2011, North generally equaled or exceeded the national average across malaria interventions and immunizations, whereas the region’s performance for maternal and child health interventions was more mixed. For socio-demographic factors, the region largely fell below the national average, except for the proportion of households with improved water sources. In comparison with the national average, North showed comparable levels of under-5 mortality and lower levels of childhood underweight.

**SUMMARY**

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**Note:** Estimates of intervention coverage are for 2011, with better performance reflected by higher levels of coverage.

**Note:** Estimates of child health outcomes and socio-demographic factors are for 2011. Better performance is shown by lower levels of child health outcomes and higher levels for socio-demographic factors.

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**CHILD HEALTH OUTCOMES**

**Socio-Demographic Factors**
From 1990 to 2011, the region of North recorded a significant reduction in all-cause under-5 mortality, dropping 54% from 191 deaths per 1,000 live births in 1990 (95% CI: 164, 221) to 87 in 2011 (95% CI: 71, 107). In 2011, the district’s under-5 mortality was similar to the national average of 85 deaths per 1,000 live births (95% CI: 79, 93).

The proportion of children who were underweight in North substantially declined from 26% in 1990 (95% CI: 17%, 37%) to 10% in 2011 (95% CI: 8%, 13%), which was lower than the national average of 14% (95% CI: 12%, 15%). This region showed much progress in reducing its prevalence of childhood underweight, especially since levels exceeded the national average in 1990.

MALARIA INTERVENTIONS

ITN ownership remained below 10% until 2005, after which coverage rapidly rose to 67% in 2011 (95% CI: 40%, 86%). This level of ITN ownership was much higher than the national average of 59% in 2011 (95% CI: 36%, 79%).

The use of ITNs by children under 5 years old quickly increased from 22% in 2007 (95% CI: 11%, 37%) to 56% in 2011 (95% CI: 37%, 70%). This level of ITN use far exceeded the national average of 39% in 2011 (95% CI: 27%, 53%), and was among the highest in Uganda for that year. In this region, the difference between ITN ownership and use (11 percentage points) was much lower than what was observed at the national level (20 percentage points) for 2011, which suggests that net use by children under 5 may be high among households with ITNs.

Formal implementation of IRS began in a few districts in 2007, reaching 15% of households that year (95% CI: 6%,
The proportion of children who received the BCG vaccine steadily increased from 71% in 1990 (95% CI: 51%, 86%) to 95% in 2010 (95% CI: 91%, 97%). This level of BCG immunization was sustained through 2011, and was comparable to the national average of 94% for that year (95% CI: 89%, 97%).

Measles immunization rose from 61% in 1990 (95% CI: 35%, 82%) to 84% in 2011 (95% CI: 72%, 91%), which was similar to the national average of 85% for that year (95% CI: 75%, 91%).

Coverage of polio immunization remained relatively consistent from 1990 to 2011, generally hovering between 65% and 75% during this time. In 2011, polio immunization coverage was 72% in North (95% CI: 47%, 87%), slightly lower than the national average of 76% (95% CI: 52%, 90%).

The pentavalent vaccine was formally introduced in Uganda in 2002, after which coverage in North rapidly increased from 31% in 2004 (95% CI: 11%, 63%) to 78% in 2010 (95% CI: 56%, 91%). This level of coverage was sustained through 2011, which was comparable to the national average of 77% (95% CI: 51%, 92%).
ANC4 coverage in North remained around 40% to 45% between 1990 and 2011, recording its highest levels in the early 1990s (46%) and lowest in 2004 and 2005 (40%). In 2011, ANC4 coverage was at 44% (95% CI: 41%, 54%), which was slightly lower than the national average of 47% (95% CI: 41%, 54%).

Skilled birth attendance steadily increased from 20% in the early 1990s to 54% in 2011 (95% CI: 37%, 71%), but remained lower than the national average of 60% that year (95% CI: 47%, 73%). Although the region’s levels of skilled birth attendance remain lower than optimal, its progress in elevating SBA coverage from very low levels during the 1990s is worthy of note.

The proportion of children who were exclusively breastfed decreased from 89% in 1990 (95% CI: 74%, 96%) to 60% in 2006 (95% CI: 47%, 71%). Exclusive breastfeeding slightly increased soon after, rising to 67% in 2011 (95% CI: 52%, 79%), which was slightly higher than the national average of 61% (95% CI: 54%, 67%).

Serving as proxy for health system access, the proportion of children under 5 who sought care for suspected pneumonia escalated from 20% in 1990 (95% CI: 9%, 38%) to 84% in 2010 (95% CI: 77%, 89%). This level of health-care-seeking behavior was sustained through 2011, exceeding the national average of 77% (95% CI: 76%, 78%) and rising to among the highest in Uganda for that year.

Among women of reproductive age (15 to 44 years old) in North, the average years of education attained increased 79% between 1990 and 2011, rising from 2.8 years in 1990 (95% CI: 2.3, 3.4) to five years in 2011 (95% CI: 4.5, 5.6). This level of educational attainment was much lower than the national average in 2011, which was 6.2 years (95% CI: 5.9, 6.4). Given the association between gains in women’s educational attainment and reductions in under-5 mortality, North would benefit from addressing its relatively low levels of education among women of reproductive age.

Household access to improved sanitation (a flush toilet or covered pit latrine) steadily rose from 46% in 1990 (95% CI: 24%, 71%) to 73% in 2011 (95% CI: 64%, 81%). Despite North’s substantial progress, this level of improved sanitation remained below the national average of 79% (95% CI: 76%, 81%).

North recorded fairly consistent levels of household access to improved water sources (e.g., piped water, protected wells, protected springs) between 1990 and 2011, generally hovering between 70% and 80%. In 2011, 79% of households (95% CI: 72%, 84%) in the region reported having access to improved water sources, which was slightly higher than the national average of 76% (95% CI: 73%, 79%).
**SUMMARY**

All-cause under-5 mortality substantially decreased in Southwest between 1990 and 2011, but nonetheless remained higher than the national average in 2011. Reductions in the prevalence of childhood underweight were less pronounced in the region. Prioritizing efforts to accelerate gains in child health outcomes, especially childhood underweight, should be considered.

ITN use by children under 5 and receipt of ACTs were moderately scaled up in Southwest, but lagged behind national trends. Immunization coverage improved for all key childhood vaccines, with the region bringing its coverage of the pentavalent vaccine to among the highest in Uganda for 2011. At the same time, coverage of exclusive breastfeeding began slipping after 2000, and skilled birth attendance remained lower than the national average in 2011.

The region documented gains in the proportion of households with access to improved sanitation, rising to among the highest levels in the country by 2011. Less progress was recorded for the proportion of households with access to improved water sources.

In 2011, Southwest generally exceeded the national average for immunizations, except for BCG immunization. On the other hand, the region largely equaled or fell below the national average for malaria interventions and maternal and child health interventions. For socio-demographic factors, Southwest had a much more mixed performance. In comparison with the national average, Southwest showed higher levels of under-5 mortality and similar levels of childhood underweight.

**Note:** Estimates of intervention coverage are for 2011, with better performance reflected by higher levels of coverage.
From 1990 to 2011, the region of Southwest recorded a significant reduction in all-cause under-5 mortality, dropping 38% from 165 deaths per 1,000 live births in 1990 (95% CI: 138, 196) to 102 in 2011 (95% CI: 79, 130). Despite this progress, the region’s under-5 mortality in 2011 was higher than the national average of 85 deaths per 1,000 live births (95% CI: 79, 93).

The proportion of children who were underweight in Southwest hovered around 20% until 2001, after which prevalence declined to 16% in 2010 (95% CI: 13%, 20%). Childhood underweight remained at 16% through 2011, which was comparable to the national average of 14% (95% CI: 12%, 15%).

ITN ownership remained below 10% until 2006, after which coverage rose to 58% in 2011 (95% CI: 34%, 81%). This level of ITN ownership was similar to the national average of 59% (95% CI: 36%, 79%).

The use of ITNs by children under 5 years old moderately increased from 12% in 2007 (95% CI: 7%, 22%) to 35% in 2011 (95% CI: 20%, 52%). This level of ITN use was lower than the national average of 39% (95% CI: 27%, 53%). In this region, the difference between ITN ownership and ITN use by children under 5 (23 percentage points) was slightly higher than what was observed at the national level for 2011 (20 percentage points).

No districts in the region of Southwest had formally implemented IRS as of 2011.

ACTs formally became Uganda’s first-line treatment for uncomplicated malaria in 2006, and the proportion of children in Southwest who received ACTs in response to experiencing a fever somewhat increased thereafter. Receipt of ACTs among febrile children under 5 rose from 3% in 2008 (95% CI: 2%, 5%) to 34% in 2011 (95% CI: 24%, 47%), which was well below the national average of 49% (95% CI: 34%, 65%) and among the lowest in Uganda for that year. The region’s relatively minimal uptake of ACTs as of 2011 is cause for concern.

The proportion of pregnant women who received IPTp2 remained below 10% until 2004, after which coverage increased to 34% in 2009 (95% CI: 22%, 50%). IPTp2 coverage remained at 34% through 2010, but slipped to 32% in 2011 (95% CI: 17%, 49%); nonetheless, this level of IPTp2 was slightly higher than the national average of 29% (95% CI: 15%, 50%).
The proportion of children who received the BCG vaccine increased from 82% in the early 1990s to 91% in 2010 (95% CI: 84%, 95%). This level of BCG immunization coverage was sustained through 2011, slightly lower than the national average of 94% (95% CI: 89%, 97%). Measles immunization steadily rose from 69% in 1990 (95% CI: 42%, 87%) to 88% in 2011 (95% CI: 78%, 94%), which was slightly higher than the national average of 85% (95% CI: 75%, 91%).

Coverage of polio immunization remained somewhat consistent from 1990 to 2011, generally hovering between 80% and 90% during this time. In 2011, polio immunization coverage was 83% in Southwest (95% CI: 63%, 93%), much higher than the national average of 76% (95% CI: 52%, 90%). The pentavalent vaccine was formally introduced in Uganda in 2002, after which coverage in Southwest rapidly increased from 42% in 2004 (95% CI: 17%, 73%) to 88% in 2009 (95% CI: 74%, 95%). Pentavalent vaccine coverage dipped to 86% in 2011 (95% CI: 69%, 95%), but remained well above the national average of 77% (95% CI: 51%, 92%).

ANC4 coverage largely remained between 30% and 35% during the 1990s and early 2000s, but coverage gradually increased, reaching 50% in 2011 (95% CI: 36%, 62%). This level of ANC4 was slightly higher than the national average of 47% (95% CI: 41%, 54%). There was a substantial rise in skilled birth attendance in Southwest, increasing from 19% in 1990 (95% CI: 8%, 43%) to 51% in 2011 (95% CI: 34%, 69%). While this level of SBA coverage remained lower than the national average of 60% in 2011 (95% CI: 47%, 73%), Southwest’s gains in SBA are notable, especially given the region’s very low coverage in the 1990s.

The proportion of children who were exclusively breastfed slowly increased from 55% in 1990 (95% CI: 31%, 78%) to 64% in 1999 and 2000. Exclusive breastfeeding coverage then declined, falling to 53% in 2011 (95% CI: 36%, 67%), which was well below the national average of 61% (95% CI: 54%, 67%). Serving as proxy for health system access, the proportion of children under 5 who sought care for suspected pneumonia increased from 28% in 1990 (95% CI: 13%, 48%) to 69% in 2007 (95% CI: 61%, 77%). This level of health-care-seeking behavior was sustained through 2008 before slightly slipping to 67% in 2011 (95% CI: 56%, 76%) and falling much lower than the national average of 77% (95% CI: 76%, 78%).
Among women of reproductive age (15 to 44 years old) in Southwest, the average years of education attained more than doubled between 1990 and 2011, rising from three years in 1990 (95% CI: 2.5, 3.6) to 6.1 years in 2011 (95% CI: 5.5, 6.8). This level of educational attainment was comparable to the national average in 2011, which was 6.2 years (95% CI: 5.9, 6.4).

Household access to improved sanitation (a flush toilet or covered pit latrine) steadily rose from 69% of households with improved sanitation in 1990 (95% CI: 42%, 87%) to 95% in 2009 (95% CI: 92%, 96%). This level of improved sanitation was sustained through 2011, far exceeding the national average of 79% (95% CI: 76%, 81%) and becoming among the highest in Uganda for that year.

The proportion of households with access to improved water sources (e.g., piped water, protected wells, protected springs) gradually increased in Southwest, rising from 42% in 1990 (95% CI: 26%, 62%) to 62% in 2011 (95% CI: 53%, 70%). The region consistently had lower levels of improved water access than the national trend between 1990 and 2011, recording among the lowest proportion of households with improved water in Uganda for 2011.
SUMMARY

All-cause under-5 mortality substantially decreased in West Nile between 1990 and 2011 but nonetheless remained higher than the national average in 2011. The prevalence of childhood underweight fell steeply during the 1990s, but reductions were less pronounced after the early 2000s. Prioritizing efforts to further accelerate gains in child health outcomes, especially childhood underweight, should be considered.

ITNs and the receipt of ACTs were quickly scaled up in West Nile, with ITN ownership rising to among the highest levels in the country in 2011. Immunization coverage largely followed the national trend, but the region’s BCG coverage was one of the highest in Uganda for 2011. West Nile recorded steady gains in skilled birth attendance and the proportion of children who sought care for suspected pneumonia between 1990 and 2011; at the same time, coverage of exclusive breastfeeding began faltering after 2005.

The region documented progress in the proportion of households with access to improved sanitation and water sources. Although there were gains in educational attainment among women of reproductive age, the region’s average consistently remained below the national average.

In 2011, West Nile generally met or exceeded the national average across interventions, with BCG immunization coverage and skilled birth attendance as exceptions. For socio-demographic factors, West Nile largely fell below the national average in 2011, except for household access to improved water sources. In comparison with the national average, West Nile showed higher levels of under-5 mortality and childhood underweight.

Note: Estimates of intervention coverage are for 2011, with better performance reflected by higher levels of coverage.

Note: Estimates of child health outcomes and socio-demographic factors are for 2011. Better performance is shown by lower levels of child health outcomes and higher levels for socio-demographic factors.
From 1990 to 2011, the region of West Nile recorded a significant reduction in all-cause under-5 mortality, dropping 45% from 184 deaths per 1,000 live births in 1990 (95% CI: 154, 217) to 100 in 2011 (95% CI: 78, 128). Despite this progress, the region’s under-5 mortality remained higher than the national average of 85 deaths per 1,000 live births in 2011 (95% CI: 79, 93).

The proportion of children who were underweight in West Nile declined from 36% (95% CI: 25%, 49%) to 17% in 2009 (95% CI: 14%, 21%). The prevalence of underweight children remained at 17% through 2011, slightly higher than the national average of 14% (95% CI: 12%, 15%).

ITN ownership remained below 10% until 2006, after which coverage rapidly rose to 75% in 2011 (95% CI: 49%, 90%). This level of ITN ownership far exceeded the national average of 59% (95% CI: 36%, 79%) and was among the highest in Uganda for that year.

The use of ITNs by children under 5 years old quickly increased from 16% in 2007 (95% CI: 8%, 28%) to 55% in 2011 (95% CI: 38%, 72%). This level of ITN use was much higher than the national average of 39% (95% CI: 27%, 53%) and was one of the highest in Uganda for that year. In this region, the difference between ITN ownership and ITN use by children under 5 (20 percentage points) equaled what was observed at the national level for 2011.

No districts in the region of West Nile had formally implemented IRS as of 2011.

ACTs formally became Uganda’s first-line treatment for uncomplicated malaria in 2006, and the proportion of children in West Nile who received ACTs in response to experiencing a fever rapidly increased thereafter. Receipt of ACTs among febrile children under 5 rose from 13% in 2008 (95% CI: 8%, 19%) to 58% in 2011 (95% CI: 46%, 70%), which was well above the national average of 49% (95% CI: 34%, 65%).

The proportion of pregnant women who received IPTp2 remained below 10% until 2005, after which coverage increased to 32% in 2009 (95% CI: 19%, 47%). IPTp2 coverage remained at 32% through 2010, but slipped to 29% in 2011 (95% CI: 16%, 47%), equaling the national average for that year.
The proportion of children who received the BCG vaccine steadily rose from 81% in 1990 (95% CI: 63%, 92%) to 97% in 2011 (95% CI: 93%, 98%), exceeding the national average of 94% (95% CI: 89%, 97%) and rising to among the highest levels of coverage in Uganda for that year.

Measles immunization increased from 62% in 1990 (95% CI: 36%, 82%) to 83% in 2011 (95% CI: 71%, 91%), which was comparable to the national average of 85% (95% CI: 75%, 91%).

Coverage of polio immunization remained somewhat consistent from 1990 to 2011, ranging from 68% in 1990 (95% CI: 38%, 88%) to 79% between 2001 and 2006. In 2011, polio immunization coverage was 75% (95% CI: 48%, 89%), which was comparable to the national average of 76% (95% CI: 52%, 90%).

The pentavalent vaccine was formally introduced in Uganda in 2002, after which coverage in West Nile rapidly increased from 34% in 2004 (95% CI: 12%, 67%) to 83% in 2011 (95% CI: 60%, 93%). This level of pentavalent vaccine coverage was slightly higher than the national average of 77% (95% CI: 51%, 92%).
Among women of reproductive age (15 to 44 years old) in West Nile, the average years of education attained more than doubled between 1990 and 2011, rising from 2.1 years in 1990 (95% CI: 1.8, 2.6) to 4.7 years in 2011 (95% CI: 4.2, 5.3). Despite this progress, West Nile’s level of educational attainment was much lower than the national average in 2011, which was 6.2 years (95% CI: 5.9, 6.4).

Household access to improved sanitation (a flush toilet or covered pit latrine) steadily rose from 48% of households with improved sanitation in 1990 (95% CI: 24%, 74%) to 72% in 2011 (95% CI: 62%, 80%). This was lower than the national average of 79% (95% CI: 76%, 81%).

The proportion of households with access to improved water sources (e.g., piped water, protected wells, protected springs) steadily increased in West Nile, rising from 56% in 1990 (95% CI: 37%, 74%) to 79% in 2011 (95% CI: 72%, 84%). This level of access to improved water sources was slightly higher than the national average for 2011, which was 76% (95% CI: 73%, 79%).
**SUMMARY**

All-cause under-5 mortality substantially decreased in Western between 1990 and 2011 but nonetheless remained higher than the national average in 2011. Less progress was recorded for reducing the prevalence of childhood underweight over time. Prioritizing efforts to accelerate gains in child health outcomes, especially childhood underweight, should be considered.

ITN ownership and the receipt of ACTs were quickly scaled up in Western, but the use of ITNs by children under 5 lagged slightly behind the national trend. Immunization coverage largely followed the national trend, but the region’s measles coverage was one of the highest in Uganda for 2011. Western recorded steady gains in the proportion of children who sought care for suspected pneumonia between 1990 and 2011, whereas progress for other maternal and child health interventions was much more gradual.

The region documented a rise in the proportion of households with access to improved sanitation and improved water sources. Although there were gains in educational attainment among women of reproductive age, the region’s average consistently remained below the national average.

In 2011, Western generally met or exceeded the national average across interventions, with ITN use by children under 5 and skilled birth attendance as exceptions. For socio-demographic factors, Western largely fell below the national average in 2011, except for household access to improved sanitation. In comparison with the national average, Western showed higher levels of under-5 mortality and similar levels of childhood underweight.

**Note:** Estimates of child health outcomes and socio-demographic factors are for 2011. Better performance is shown by lower levels of child health outcomes and higher levels for socio-demographic factors.
From 1990 to 2011, the region of Western recorded a significant reduction in all-cause under-5 mortality, dropping 40% from 165 deaths per 1,000 live births in 1990 (95% CI: 141, 192) to 99 in 2011 (95% CI: 80, 122). Despite this progress, the region’s under-5 mortality remained higher than the national average of 85 deaths per 1,000 live births in 2011 (95% CI: 79, 93).

The proportion of children who were underweight in Western remained between 16% and 18% from 1990 to 2011. In 2011, Western’s prevalence of childhood underweight was 16% (95% CI: 13%, 20%), which was comparable to the national average of 14% (95% CI: 12%, 15%). The region’s relatively minimal progress in reducing childhood underweight is cause for concern.

ITN ownership remained below 10% until 2007, after which coverage rapidly rose to 63% in 2011 (95% CI: 36%, 84%). This level of ITN ownership was higher than the national average of 59% (95% CI: 36%, 79%).

The use of ITNs by children under 5 years old quickly increased from 12% in 2008 (95% CI: 7%, 21%) to 35% in 2011 (95% CI: 21%, 54%). This level of ITN use was lower than the national average of 39% (95% CI: 27%, 53%). In this region, the difference between ITN ownership and ITN use by children under 5 (28 percentage points) was higher than what was observed at the national level (20 percentage points) for 2011.

No districts in the region of Western had formally implemented IRS as of 2011.

ACTs formally became Uganda’s first-line treatment for uncomplicated malaria in 2006, and the proportion of children in Western who received ACTs in response to experiencing a fever rapidly increased thereafter. Receipt of ACTs among febrile children under 5 rose from 9% in 2008 (95% CI: 6%, 13%) to 50% in 2011 (95% CI: 37%, 63%), which was similar to the national average of 49% (95% CI: 34%, 65%).

The proportion of pregnant women who received IPTp2 remained below 10% until 2004, after which coverage increased to 33% in 2010 (95% CI: 20%, 49%). IPTp2 coverage remained at 33% through 2011, slightly exceeding the national average of 29% (95% CI: 15%, 50%).

MALARIA INTERVENTIONS
The proportion of children who received the BCG vaccine steadily rose from 79% in 1990 (95% CI: 61%, 90%) to 95% in 2011 (95% CI: 90%, 97%), which was similar to the national average of 94% (95% CI: 89%, 97%).

Measles immunization increased from 63% in 1990 (95% CI: 37%, 83%) to 93% in 2011 (95% CI: 86%, 96%), which far exceeded the national average of 85% (95% CI: 75%, 91%) and was among the highest levels of coverage in the country.

Coverage of polio immunization gradually increased from 73% in 1990 (95% CI: 47%, 90%) to 86% in 2001 (95% CI: 71%, 93%). This level of coverage was sustained through 2005, but fell to 80% in 2011 (95% CI: 59%, 92%). Nonetheless, Western’s polio immunization coverage remained slightly higher than the national average for 2011, which was 76% (95% CI: 52%, 90%).

The pentavalent vaccine was formally introduced in Uganda in 2002, after which coverage in Western rapidly increased from 38% in 2004 (95% CI: 14%, 69%) to 83% in 2009 (95% CI: 65%, 93%). This level of pentavalent vaccine coverage was sustained through 2010, after which coverage slipped to 82% (95% CI: 61%, 94%); nonetheless, Western’s coverage of the pentavalent vaccine was higher than the national average of 77% (95% CI: 51%, 92%).

ANC4 coverage remained below 40% through 2007, after which coverage gradually rose to 49% in 2011 (95% CI: 36%, 61%). This level of ANC4 was similar to the national average of 47% (95% CI: 41%, 54%).

Skilled birth attendance steadily climbed from 28% in 1990 (95% CI: 11%, 56%) to 53% in 2011 (95% CI: 33%, 69%), but remained lower than the national average of 60% (95% CI: 47%, 73%).

The proportion of children who were exclusively breastfed gradually rose from 49% in 1990 (95% CI: 26%, 73%) to 69% in 2011 (95% CI: 54%, 80%), which was higher than the national average of 61% (95% CI: 54%, 67%).

Serving as proxy for health system access, the proportion of children under 5 who sought care for suspected pneumonia substantially increased from 26% in 1990 (95% CI: 13%, 47%) to 79% in 2011 (95% CI: 71%, 86%). This level of health-care-seeking behavior was comparable to the national average of 77% (95% CI: 76%, 78%).
Among women of reproductive age (15 to 44 years old) in Western, the average years of education attained nearly doubled between 1990 and 2011, rising from 2.7 years in 1990 (95% CI: 2.3, 3.4) to 5.3 years in 2011 (95% CI: 4.7, 5.9). Despite this progress, Western’s level of maternal educational attainment was lower than the national average in 2011, which was 6.2 years (95% CI: 5.9, 6.4).

Household access to improved sanitation (a flush toilet or covered pit latrine) steadily rose from 57% of households with improved sanitation in 1990 (95% CI: 30%, 78%) to 83% in 2010 (95% CI: 76%, 88%). This level of improved sanitation was sustained through 2011, slightly exceeding the national average of 79% (95% CI: 76%, 81%).

The proportion of households with access to improved water sources (e.g., piped water, protected wells, protected springs) steadily increased in Western, rising from 43% in 1990 (95% CI: 26%, 63%) to 69% in 2011 (95% CI: 60%, 76%). This level of household access to improved water nonetheless remained lower than the national average for 2011, which was 76% (95% CI: 73%, 79%).