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**Associations between Key Intervention
Coverage and Child Mortality: An Analysis of
241 Sub-national Regions of sub-Saharan Africa**



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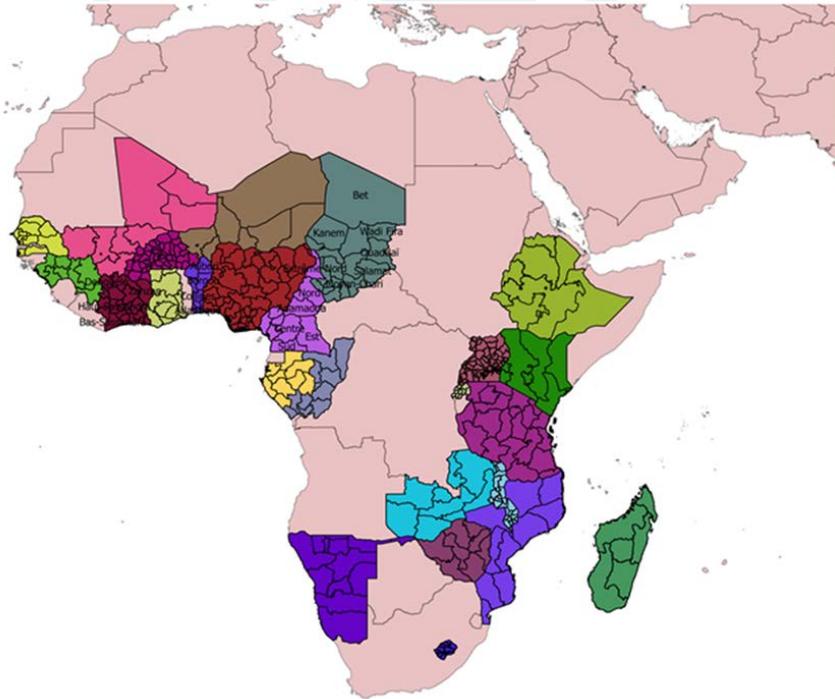
Background

- Remarkable progress over the last 25 years in reducing child mortality
- Substantial increases in global health investment led to large increases in the coverage of key interventions
- Relatively little is known regarding the impact of the interventions when rolled at scale

Objective of the paper

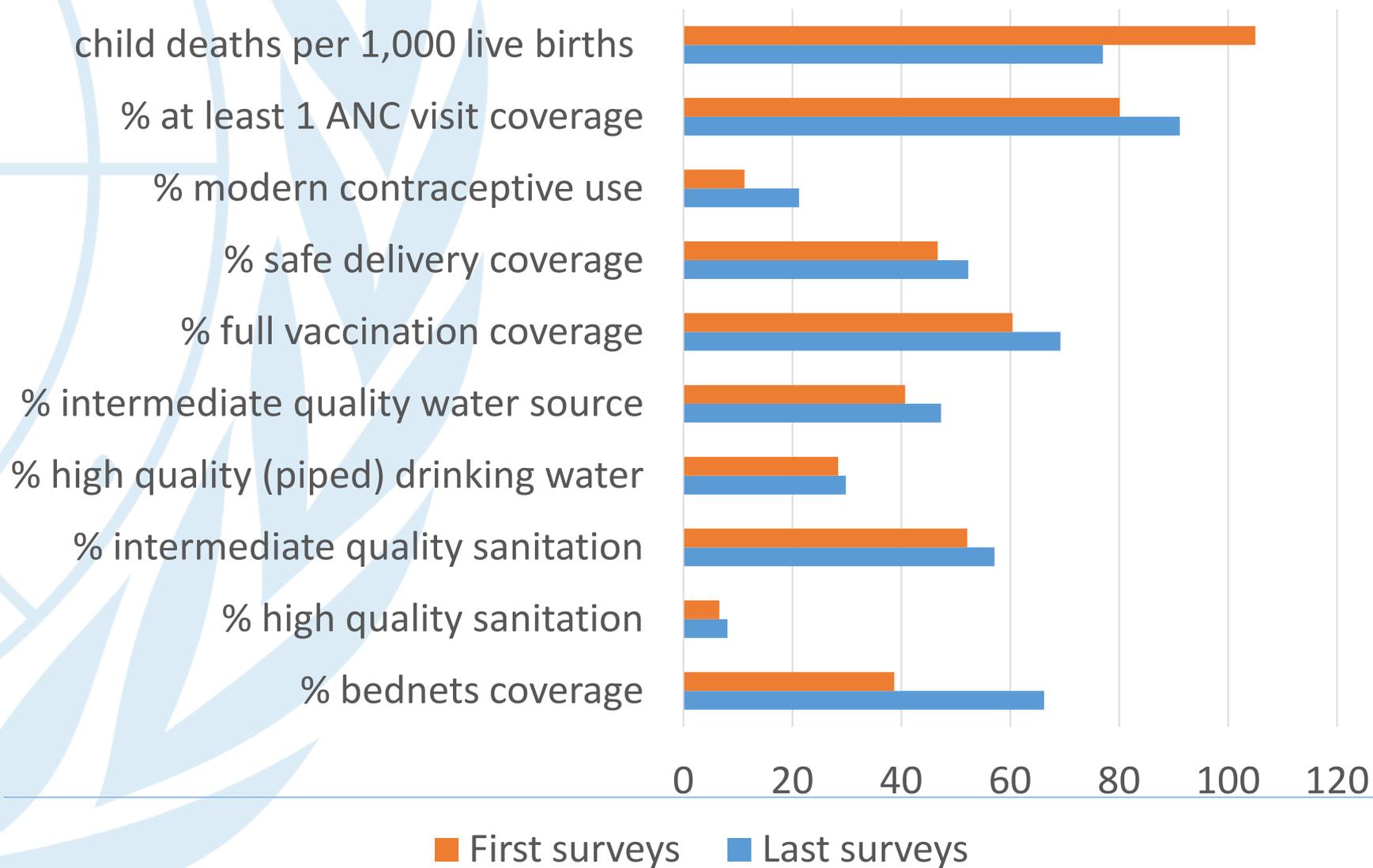
- To estimate regional level changes in intervention coverage
 - To estimate intervention specific contributions to recent improvements in child mortality in SSA
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Data: Demographic and Health Survey (DHS)

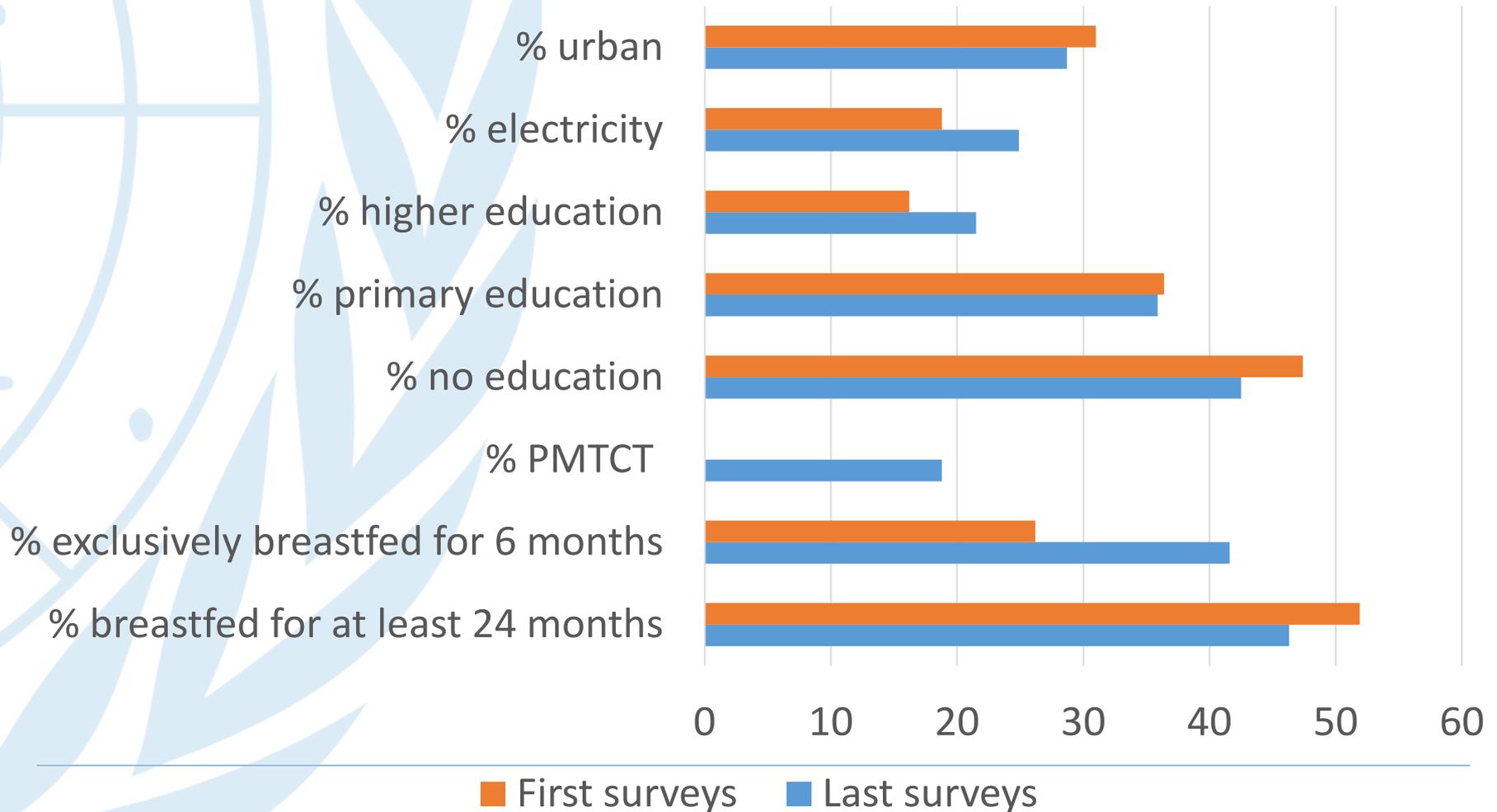


- 24 countries and 241 sub-regions
- 78 surveys
 - at least 2 surveys from each country
- Survey years: 1990-2014
- Total number of 562,896 individual child records
- Total number of 769 region-year observations
 - Key health intervention coverage estimates

Levels in mortality and intervention coverage (1)



Levels in mortality and intervention coverage (2)



Methods: Multivariable logistic model

$$CM_{irct} = \alpha + \beta X_{irct} + \gamma I_{rct} + \delta_r + \delta_{ct} + \varepsilon_{irct}$$

- CM_{irct} : binary indicator for whether or not child i from region r in country c and period t has died by the time of the interview
- I_{rct} : a vector of intervention coverage variables for the respective region
- δ_r, δ_{ct} : region and country-survey-year fixed effects
- X_{irct} : a vector of individual level controls
 - including maternal education level, urban residence and household electricity, child age, gender, and maternal risk factors

Results: Logistic regression results

| Variable | Adjusted Associations with Fixed Effects | | |
|---------------------------------------|--|---------------|---------------|
| | Beta | 95% CI | |
| % Bednets coverage | 1.048 | [0.884 | 1.244] |
| % High quality sanitation | 0.881 | [0.619 | 1.254] |
| % Intermediate quality sanitation | 0.974 | [0.813 | 1.167] |
| % High quality (piped) drinking water | 0.813* | [0.663 | 0.996] |
| % Intermediate quality water source | 0.86 | [0.727 | 1.017] |
| % Full vaccination coverage | 0.674*** | [0.546 | 0.832] |
| % Safe delivery coverage | 0.988 | [0.761 | 1.282] |
| % Modern contraception | 1.265 | [0.961 | 1.666] |
| % At least 1 ANC visit coverage | 0.767* | [0.590 | 0.997] |
| % Breastfed at least 24 months | 0.761** | [0.643 | 0.900] |
| % Exclusive breastfeeding | 1.01 | [0.847 | 1.205] |
| % PMTCT coverage | 0.385 | [0.023 | 6.573] |
| % Primary education | 0.941*** | [0.918 | 0.964] |
| % Secondary and higher education | 0.719*** | [0.692 | 0.746] |
| % Electricity | 0.823*** | [0.796 | 0.851] |
| % Urban | 0.919*** | [0.894 | 0.944] |
| Teenage mother | 1.495*** | [1.444 | 1.548] |

Notes: All coefficients represent odds ratios with 95% confidence intervals. Unadjusted estimates control for other intervention coverage only. Fully adjusted models control for region and country-survey-year fixed effects. * $p < .05$, ** $p < .01$, and *** $p < .001$

Discussion: Interpretation

- The mortality decline observed from our data is about 30 per 1,000 live births
 - Of these 30 deaths avoided, our estimates suggest that 3.29 can be attributed to vaccination, 4.52 to ANC, 1.22 to maternal education, and 0.81 to electricity
- If U5M rates did not change since 1990, we would have seen 3 million more child deaths per year in SSA
 - 25% of improvements can be attributed to vaccination and ANC at the regional level, corresponding to 750,000 child deaths per year



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Results: Estimated contribution to child mortality

| | Estimated impact of factor | | | Observed change in average coverage | Estimated contribution to child mortality (per 1,000 live births) | | |
|----------------------------------|----------------------------|--------|--------|-------------------------------------|---|--------|-------|
| | Beta | 95% CI | | (%) | Contribution | 95% CI | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| % Full vaccination coverage | -0.037*** | -0.055 | -0.020 | 8.8 | -3.29 | -4.81 | -1.77 |
| % At least 1 ANC visit | -0.041*** | -0.063 | -0.019 | 11 | -4.52 | -6.96 | -2.09 |
| % Breastfed 24m | -0.018** | -0.032 | -0.004 | -5.6 | 1.02 | 1.80 | 0.24 |
| % Primary education | -0.006*** | -0.008 | -0.004 | -0.5 | 0.03 | 0.02 | 0.04 |
| % Secondary and higher education | -0.023*** | -0.026 | -0.020 | 5.3 | -1.22 | -1.37 | -1.07 |
| % Electricity | -0.013*** | -0.016 | -0.011 | 6.1 | -0.81 | -0.97 | -0.65 |
| % Urban | -0.007*** | -0.009 | -0.005 | -2.3 | 0.16 | 0.11 | 0.21 |

Notes: Column 1 shows estimated OLS coefficient from multivariable model shown in appendix; column 4 shows mean changes (Table 2); column 5 shows estimated total impact. Only statistically significant results are shown here

Discussion: Rough estimates of lives saved and attributes of specific interventions



■ vaccination

■ maternal education

■ fixed effects

■ ANC

■ electricity

■ breastfeeding duration

Discussion: Limitations

- Fixed effects mean that we only pick up impact if interventions are rolled out *differentially within a country*
 - Example: Mass distribution of bednets may be absorbed in country-survey-year fixed effects
- Our results are likely an *underestimate* of contributions to child mortality by interventions
 - Because we completely shut down country-time trends in order to avoid omitted variable bias