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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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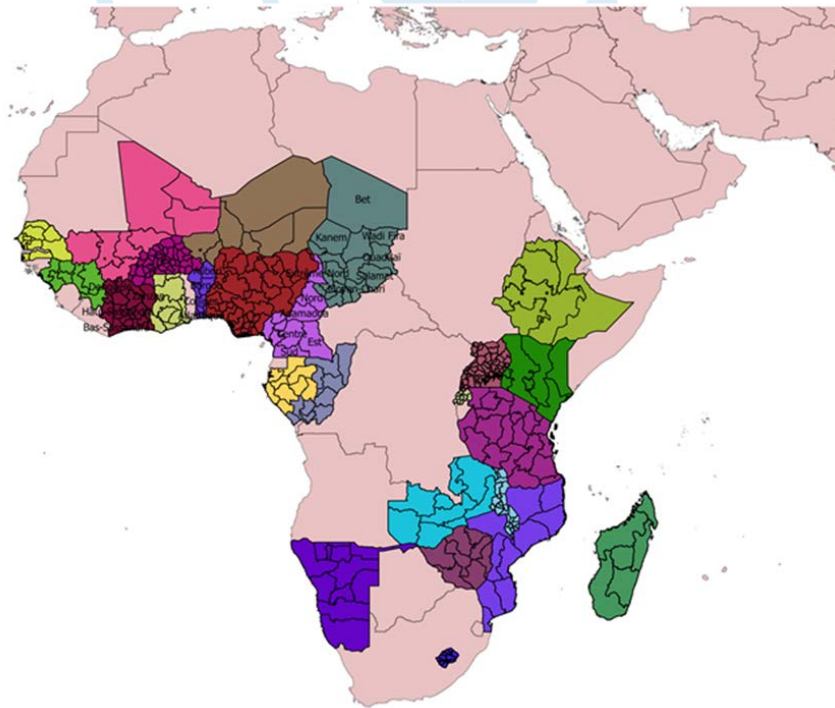
Background

- 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

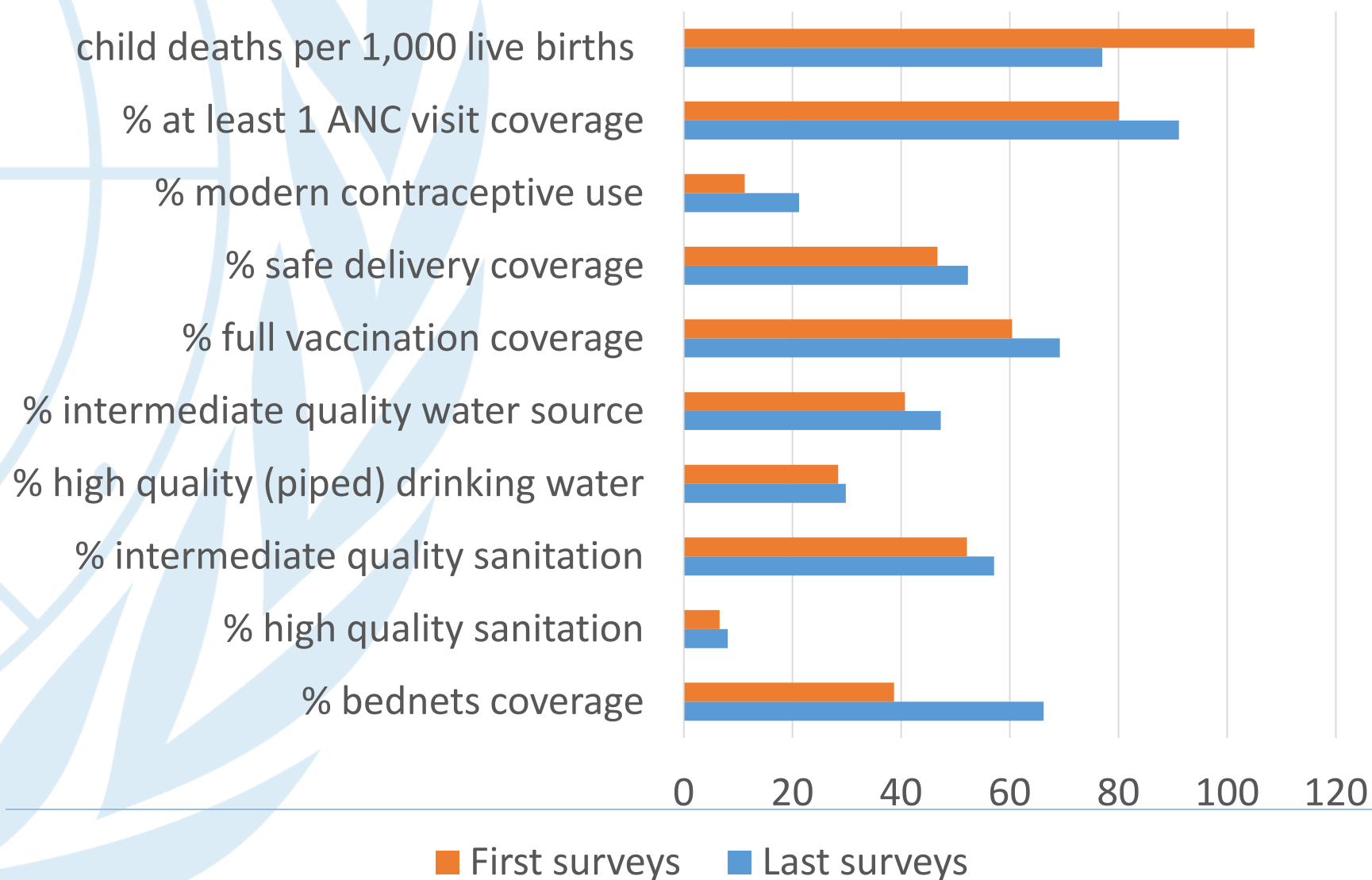
- To estimate regional level changes in intervention coverage
 - To estimate intervention specific contributions to recent improvements in child mortality in SSA
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Data: Demographic and Health Survey (DHS)

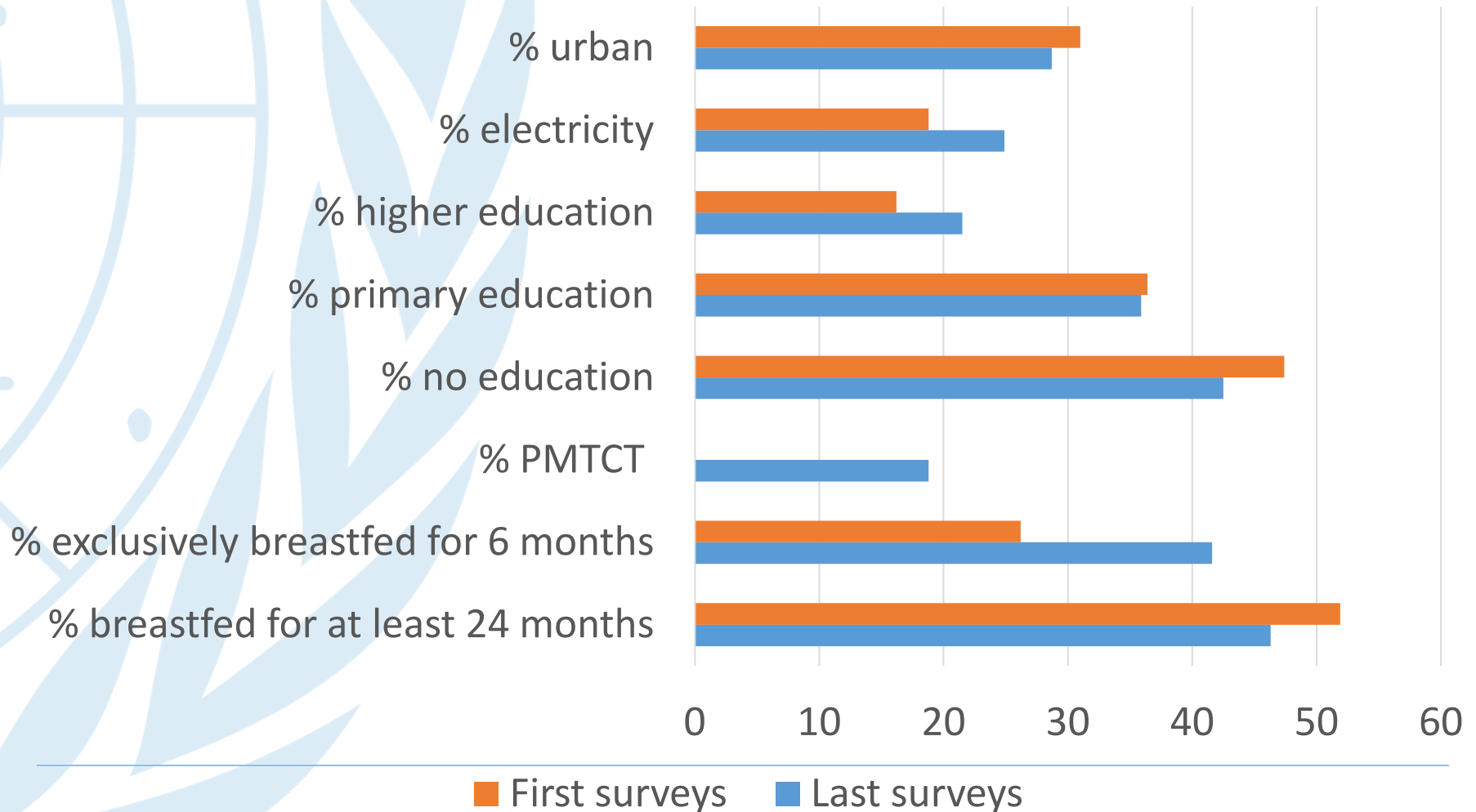


- 24 countries and 241 sub-regions
- 78 surveys
 - at least 2 surveys from each country
- Survey years: 1990-2014
- Total number of 562,896 individual child records
- Total number of 769 region-year observations
 - Key health intervention coverage estimates

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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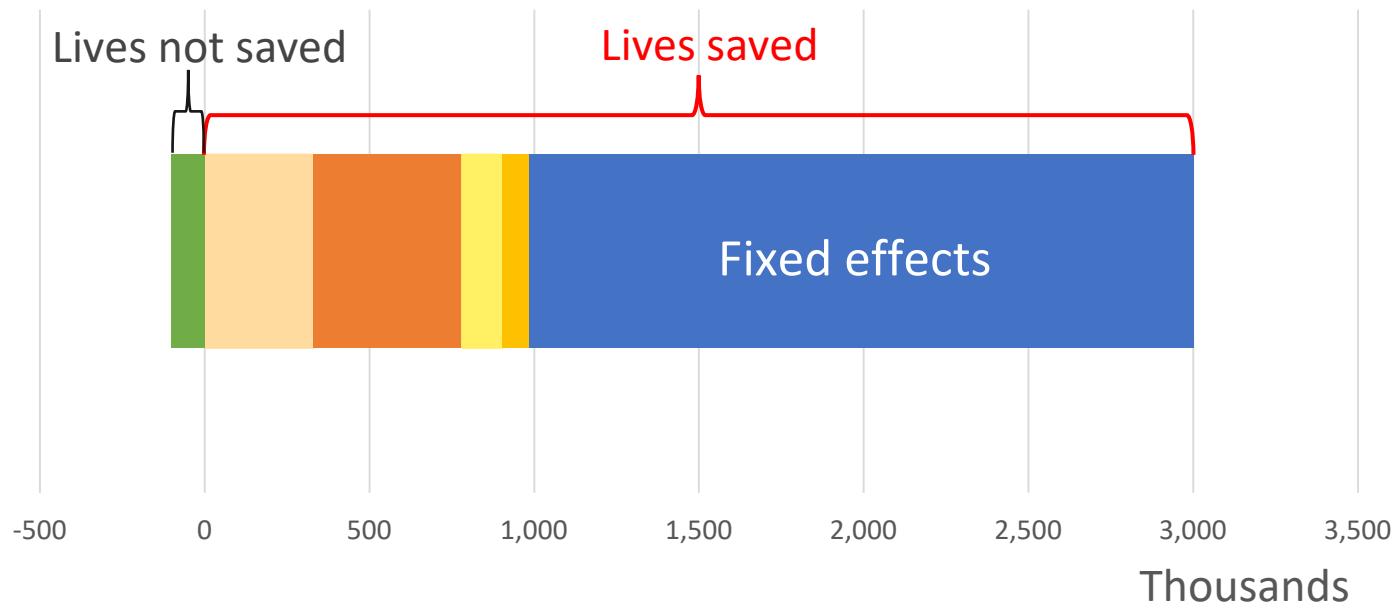
Helsinki, Finland

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