

The effects of Performance-Based Financing on neonatal health outcomes in Burundi, Lesotho, Senegal, Zambia and Zimbabwe

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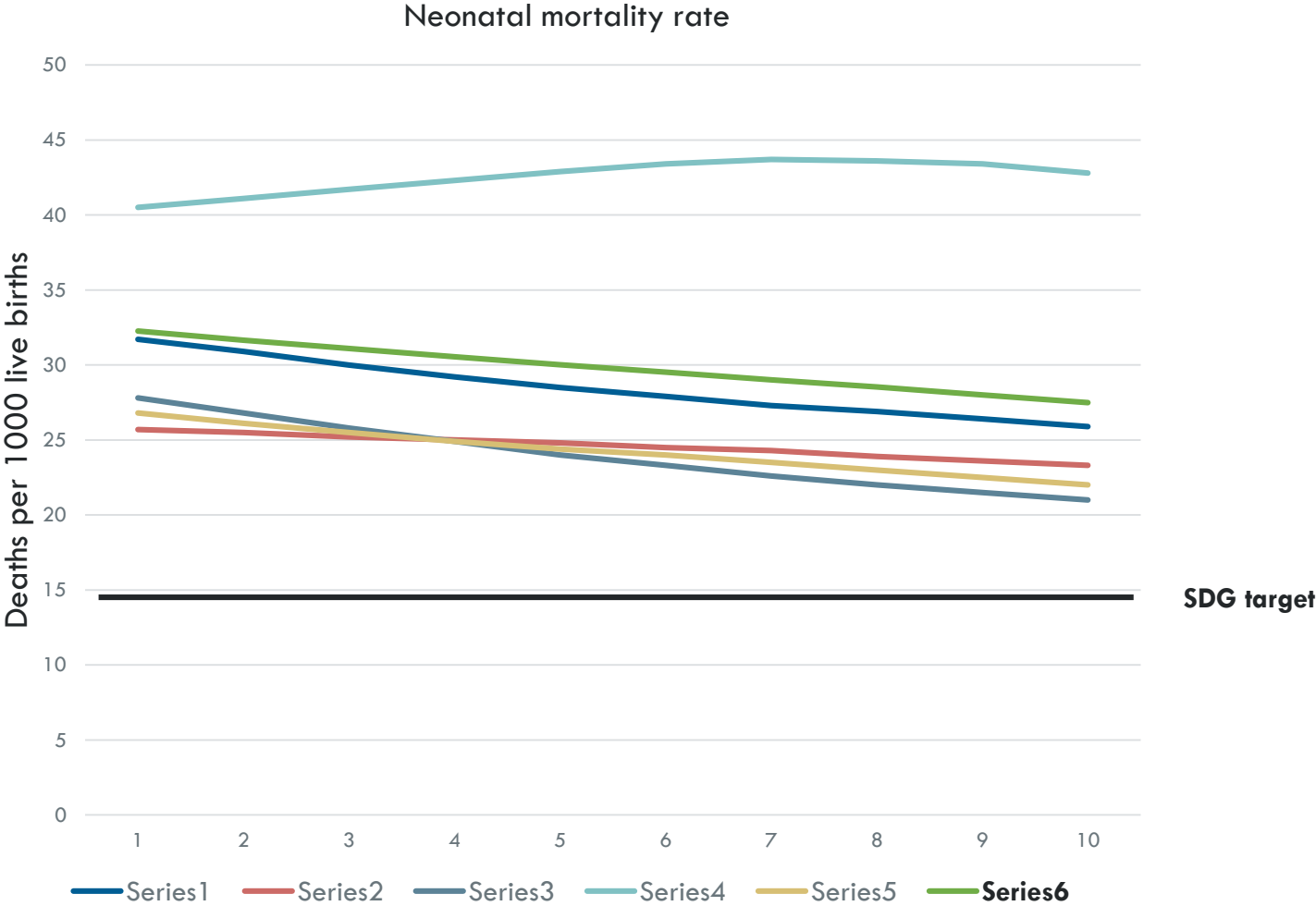
Special thanks to Jed Friedman, Margaret Kruk, Hannah Leslie, Mirabel Levine, Ronald Mutasa for their contributions and help.



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Neonatal mortality reductions are lagging in Sub-Saharan Africa

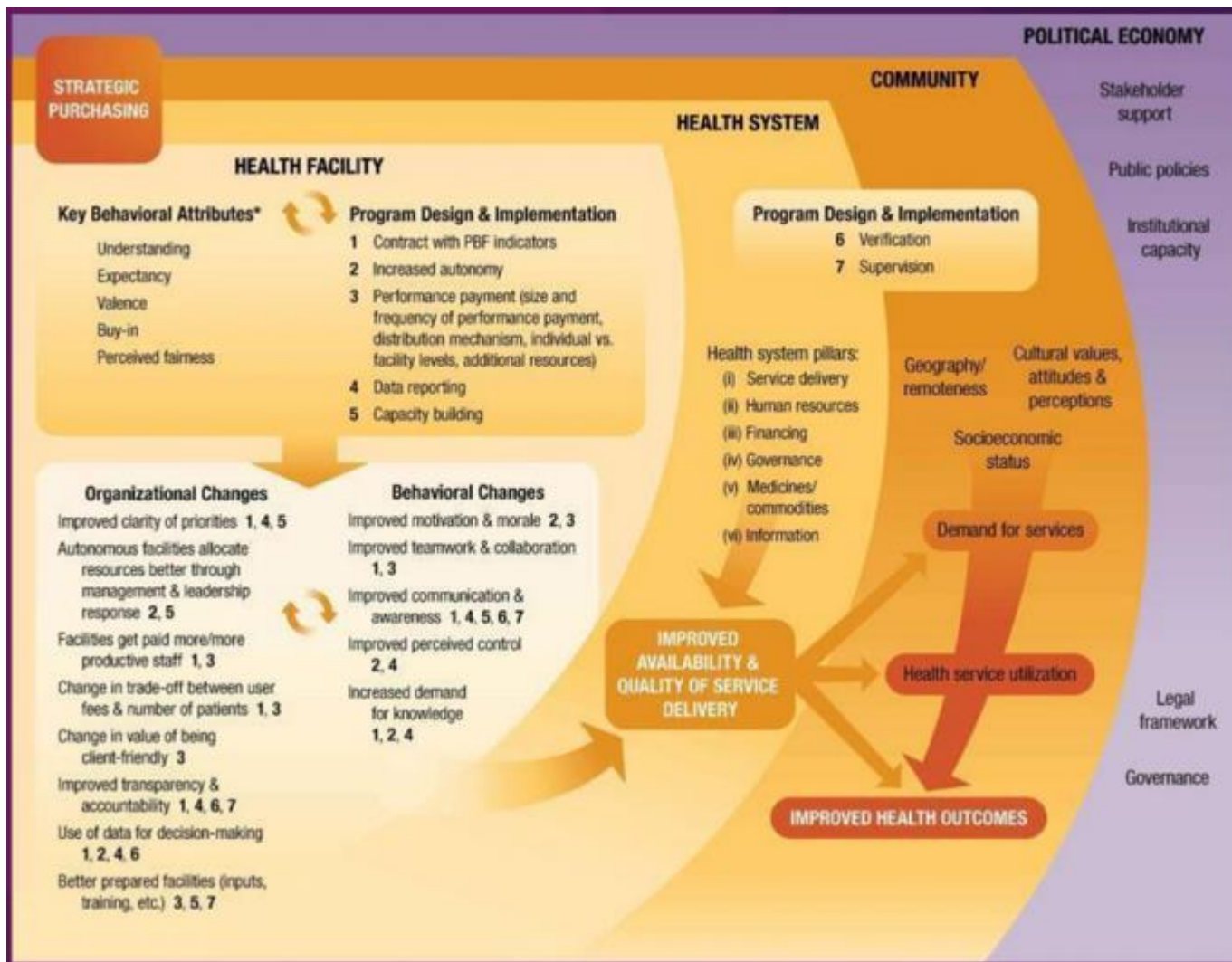


Performance Based Financing in Sub-Saharan Africa



- Maternal and newborn health are common focus of PBF programs
- Incentivize quantity and quality
- Existing research has found mixed success in improving intermediate outputs

Why measure impact on health outcomes directly?



1. Intermediate outputs may not yield health outcomes
2. Mixed intermediate effects
3. Indirect effects
4. Ultimate goal of programs

Study aims

1. Estimate the effect of PBF in five countries on early neonatal mortality and low birthweight
2. Estimate the effect on intermediate outputs: ANC utilization and quality, facility delivery utilization and quality and c-section rates
3. Assess the impact for poor women and women with high-risk births

Data and programs

- Included HRITF-funded programs in countries with DHS and MICs data
- Programs implemented at district level, most were not randomized
- Births 3 years before and 2 years after PBF implementation in treatment or control districts



PBF in study countries

- Maternal and newborn care was a focus in all study countries
- Quantity targets
 - Volume of facility deliveries by skilled birth attendant
 - Antenatal care visits
- Quality targets
 - Structure: water and soap available in delivery room
 - Process: correct use of partograph
- Concurrent interventions
 - Lesotho: incentives for district teams for good quality of supervision and support to PBF project
 - Senegal: demand-side vouchers provided for four ANC visits and skilled delivery
 - Zimbabwe: national elimination of user fees for targeted services

Dependent variables

Early neonatal death	Death \leq 7 days
Low birthweight	Weight \leq 2500 grams, imputing missing values
Facility delivery ¹	Delivery at health facility
Delivery quality ²	Receipt of all: breastfeeding \leq 1 hour delivery, postnatal check before discharge, delivery with qualified provider
C-section ²	Mother's report of c-section
ANC 4 visits ¹	Attended at least 4 antenatal care visits
ANC quality ²	Receipt of all: tetanus toxoid vaccine, iron supplementation, blood sample test, qualified provider

¹ Incentivized in all programs

² Incentivized in some programs

Analysis

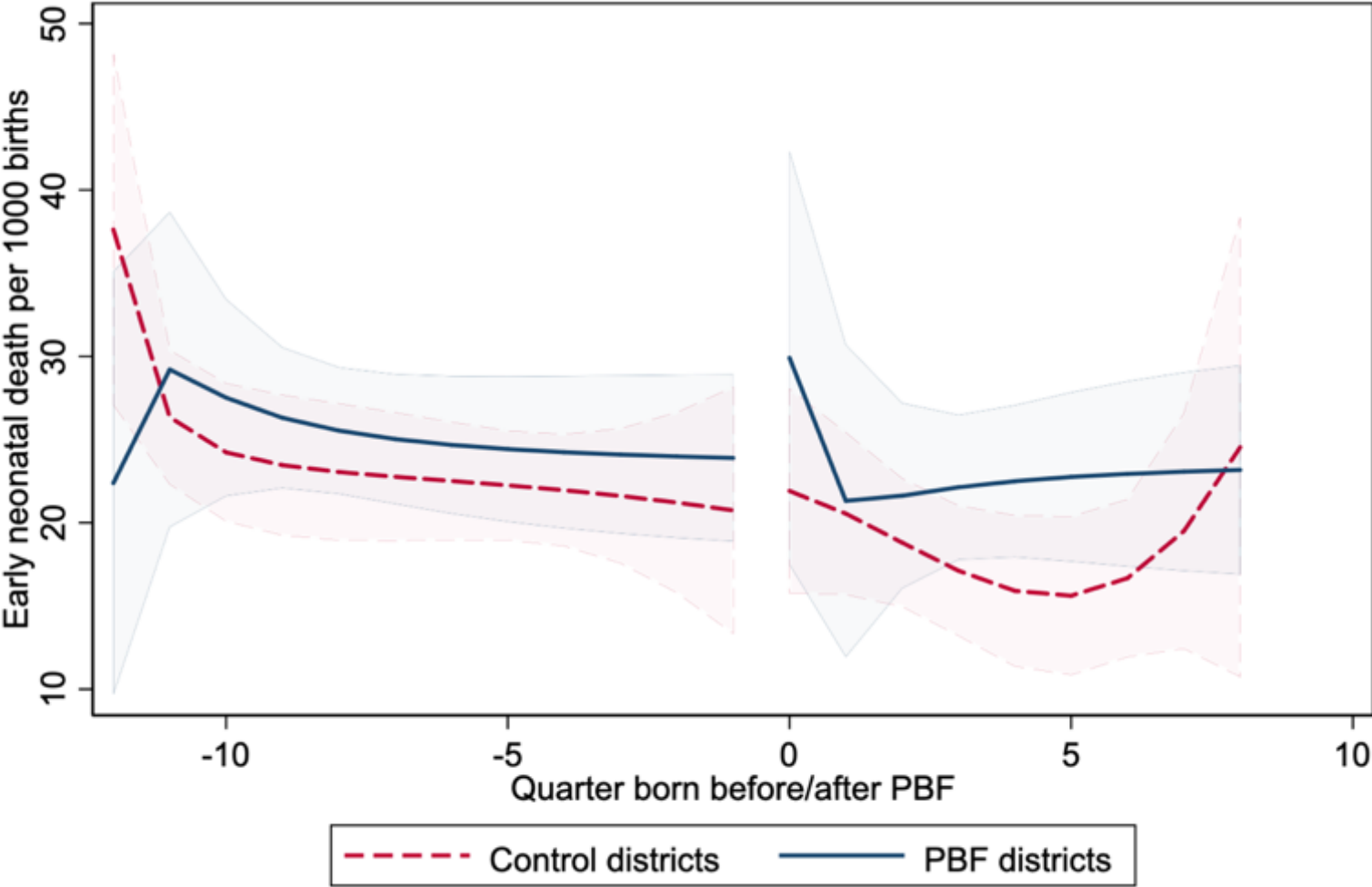
- Pooled Difference-in-Differences approach, controlling for full set of district and month fixed effects and individual covariates
 - Results are similar if we use the canonical DD approach¹
- Coarsened exact matching to control for imbalance: multiple birth, primipara, maternal age, year of birth, mother's completion of primary education, urban, household wealth
- Linear probability models, SEs clustered by district
- Subgroup analysis on high-risk births: primipara, maternal age <18 or >34, or multiple births

¹ Thanks to Eeshani and Jed for the suggestion.

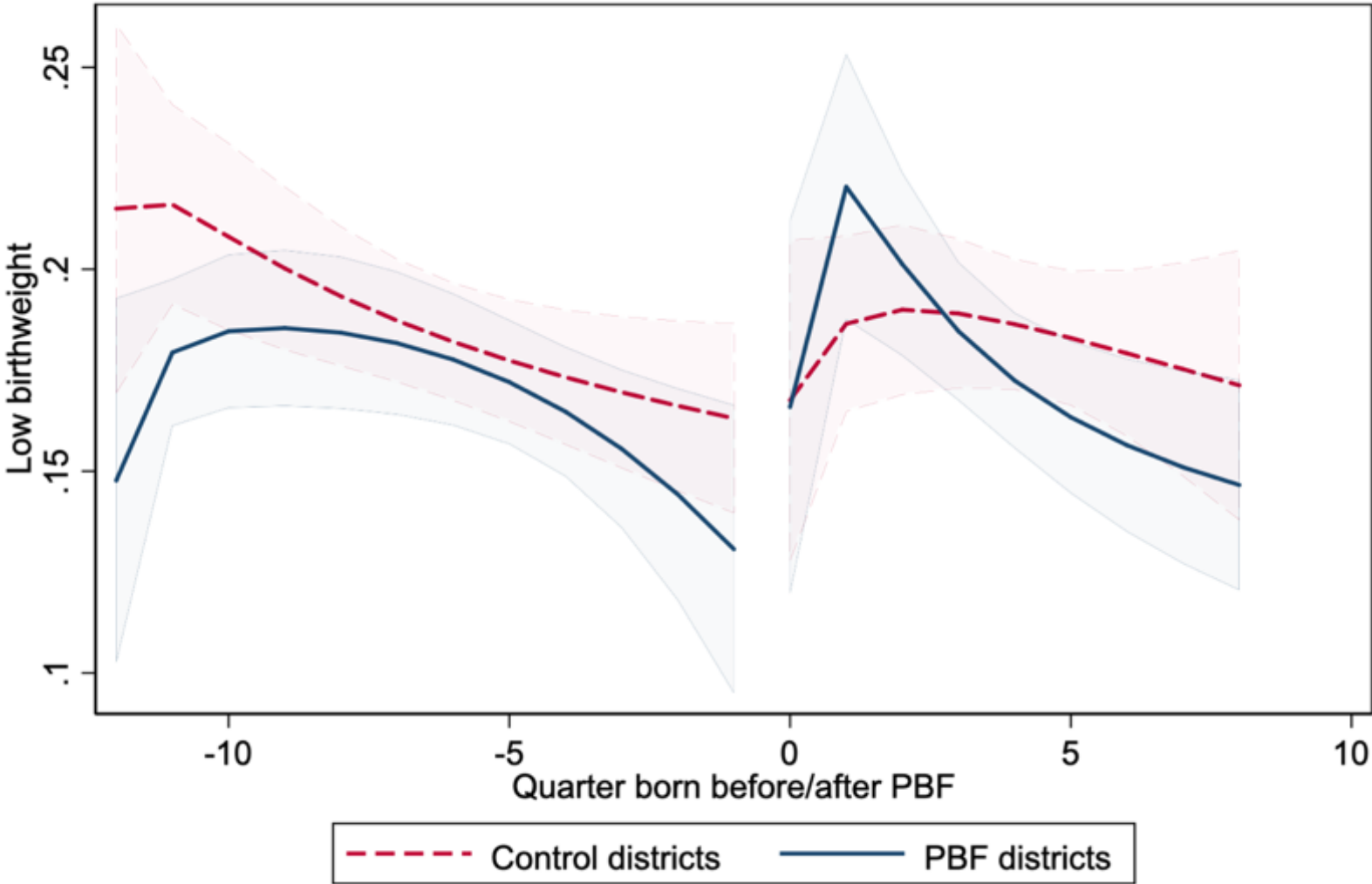
Matched sample

	Districts		Births	
	PBF	Control	PBF	Control
Burundi	3	6	2,774	5,514
Lesotho	4	4	1,398	1,440
Senegal	2	4	4,743	6,876
Zambia	10	10	1,601	1,533
Zimbabwe	16	16	1,619	1,121
Total	35	40	12,135	16,484

Trends in early neonatal death



Trends in low birthweight



Effects of PBF on outcomes across all study countries

Outcome	Percent at baseline	Percentage point change	95% CI	N
Early neonatal death	2.3	0	(-1, 1)	28,619
Low birthweight	16	1	(-2, 3)	28,619
Facility delivery	59	3	(-1, 7)	21,471
Delivery quality	60	-5	(-14, 4)	13,054
C-section	3.7	0	(-1, 1)	21,424
ANC 4 visits	55	4	(-2, 10)	14,383
ANC quality	46	2	(-4, 9)	14,510

Subgroup analyses

Outcome	Poor women			High risk births		
	Percentage point change	95% CI	N	Percentage point change	95% CI	N
Early neonatal death	0	(-1,2)	9680	0	(-1,2)	10887
Low birthweight	0	(-3,3)	9680	1	(-4,5)	10887
Facility delivery	2	(-4,9)	8051	3	(-2,9)	8222
Delivery quality	-5	(-16,6)	3476	-7	(-18,5)	5570
C-section	-1	(-2,1)	8034	-1	(-3,1)	8205
ANC 4 visits	8	(0,17)	5122	4	(-2,10)	5771
ANC quality	6	(-3,14)	5152	0	(-6,7)	5824

Comparison with prior evaluations

	Burundi		Zambia		Zimbabwe	
	Prior eval	This study	Prior eval	This study	Prior eval	This study
Early neonatal death	N/A	Not sig	N/A	Not sig	N/A	Not sig
Low birthweight	N/A	Not sig	N/A	Not sig	N/A	Not sig
Facility delivery	22 pp	8 pp	13 pp	Not sig	13 pp	Not sig
Delivery quality	17 pp	Not sig	57 pp	Not sig	Not sig	Not sig
C-section	N/A	Not sig	N/A	Not sig	7 pp	Not sig
ANC visits	Not sig	Not sig	Not sig	Not sig	Not sig	Not sig
ANC quality	17 pp	Not sig	Mixed*	9 pp	Mixed*	Not sig
N obs	845	8,288	4,488	3,134	2,694	2,740

Not sig: no significant effect detected

N/A: Not assessed

*Found improvement on some, but not all, ANC quality indicators

Conclusions

- No detectable impact on neonatal health outcomes in study countries
- Limited impact on intermediate outputs in specific countries
- Potential explanations for limited effects:
 - Facilities already at capacity
 - Positive and negative unintended consequences
 - Incentives may not be properly targeted
- Limitations:
 - Potential misclassification
 - Limited quality measures
 - Unable to look at a longer time frame

Thank you!

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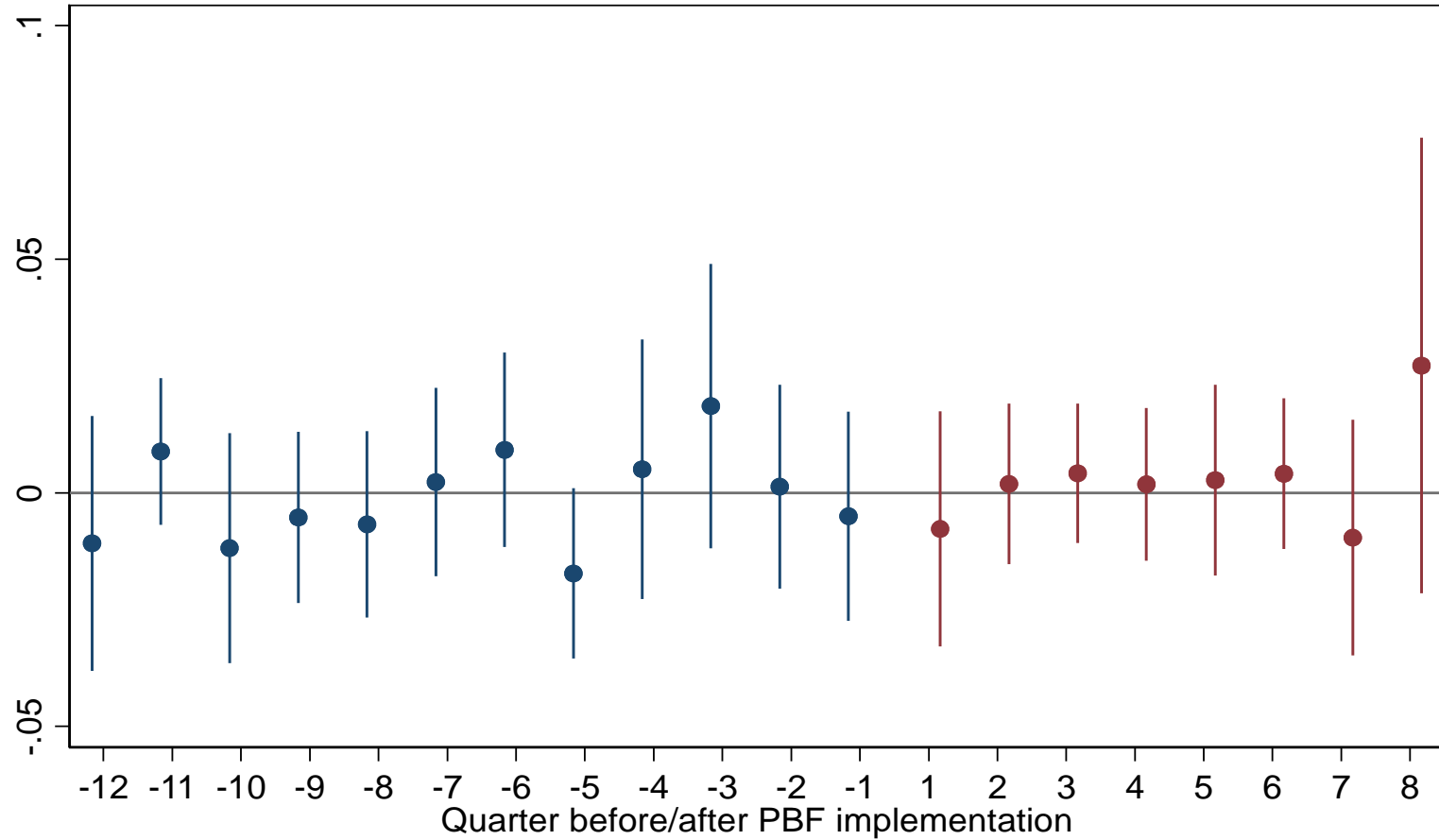
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PBF characteristics and data sources

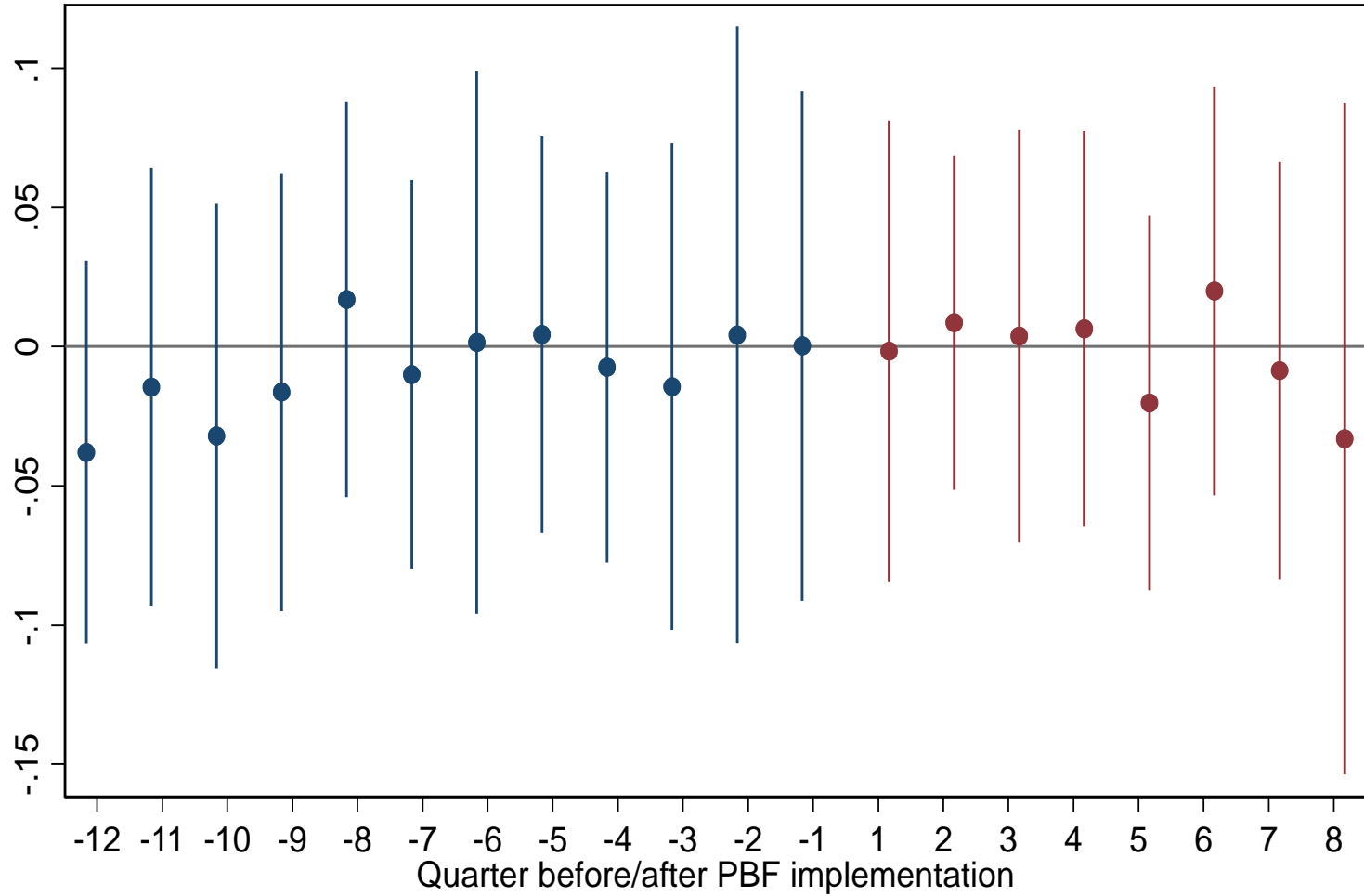
	Burundi	Lesotho	Senegal	Zambia	Zimbabwe
First implementation date	December 2006	July 2016	April 2012	April 2012	March 2012
Second implementation date	October 2008	Oct 2016	N/A	N/A	N/A
Additional rollout	Expanded to control regions in April 2010	N/A	Expanded to control regions in May 2016	Expanded to 39 districts in October 2016	Expanded to 44 districts in 2015
Pre-implementation survey	DHS 2010 ^a	DHS 2014	DHS 2011	DHS 2007	DHS 2010-2011
Post-implementation survey	DHS 2010 and DHS 2017	MICS 2018	Continuous DHS 2013-2017	DHS 2014 and DHS 2018	DHS 2015
Payment adjustment on other dimensions	Remoteness, poverty, staff and facility needs	Remoteness		Remoteness	Remoteness
Allocation of PBF payment					
Health facility	70%	50%	25%	40%	75%
Staff incentives	30%	50%	75%	60%	25%

		Pooled	Burundi	Lesotho	Senegal	Zambia	Zimbabwe
Early neonatal death	Coef.	0.00	0.00	0.02	0.00	-0.01	0.00
	95% CI	(-0.01,0.01)	(-0.01,0.01)	(-0.01,0.05)	(-0.01,0.01)	(-0.04,0.01)	(-0.02,0.03)
	N	28619	8288	2838	11619	3134	2740
Low birthweight	Coef.	0.01	0.01	-0.05	0.03	0.00	-0.02
	95% CI	(-0.02,0.03)	(-0.12,0.13)	(-0.14,0.03)	(-0.01,0.08)	(-0.06,0.06)	(-0.1,0.06)
	N	28619	8288	2838	11619	3134	2740
Facility delivery	Coef.	0.03	0.08	0.03	0.03	0.03	-0.02
	95% CI	(-0.01,0.07)	(0.02,0.14)	(-0.04,0.09)	(-0.03,0.08)	(-0.06,0.12)	(-0.1,0.06)
	N	21471	2140	1849	11619	3123	2740
Delivery quality	Coef.	-0.05	-0.05	-0.09	-0.05	-0.05	-0.03
	95% CI	(-0.14,0.04)	(-0.16,0.06)	(-0.24,0.06)	(-0.11,0.01)	(-0.16,0.06)	(-0.14,0.09)
	N	13054	1219	1558	6275	2026	1976
C-section	Coef.	0.00	0.01	-0.01	0.00	0.00	-0.02
	95% CI	(-0.01,0.01)	(-0.03,0.05)	(-0.11,0.09)	(-0.01,0.01)	(-0.03,0.04)	(-0.05,0.01)
	N	21424	2145	1849	11564	3128	2738
ANC 4 visits	Coef.	0.04	-0.06	0.12	0.02	0.06	0.00
	95% CI	(-0.02,0.10)	(-0.18,0.07)	(0.01,0.22)	(-0.1,0.15)	(-0.02,0.13)	(-0.12,0.13)
	N	14383	793	1840	7383	2157	2210
ANC quality	Coef.	0.02	0.09	-0.03	0.03	0.09	-0.03
	95% CI	(-0.04,0.09)	(-0.05,0.24)	(-0.14,0.08)	(-0.1,0.16)	(0.01,0.17)	(-0.16,0.09)
	N	14510	796	1869	7445	2172	2228

Estimated effect of PBF on Early neonatal death



Estimated effect of PBF on Low birthweight



Outcome	Percentage point change	95% CI	N
Low birthweight (recorded observations only)	0.012	(-0.02,0.04)	11226
Delivery quality (mean) ^a	-0.019	(-0.05,0.01)	13054
ANC quality (mean) ^a	0.015	(-0.01,0.04)	14510
Birthweight recorded ^b	0.011	(-0.1,0.12)	28619

Pooled impact on alternative quality measures and birthweight measurement

^aDefined as the percent of delivery or ANC items received

^bDefined as whether birthweight copied from a record (as opposed to mother's report)