Community-based intervention '100-dollar-kitchen': a successful way to reduce low-birth-weight prevalence in rural Bangladesh

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Background

- Indoor air pollution is an important and underexplored risk factor for maternal and newborn health

- Mother's exposure to biomass fuels with its substances- TSP, CO, NO_2, and SO_2 have significant influences on pregnancy outcomes

- There is scarce evidence on any environmental intervention to deliver substantive benefits to maternal and newborn health

Emerging innovative solution

A locally-made, simple, inexpensive, prefabricated model **"100-dollar-kitchen"** with clean-combustion improved cookstove to reduce LBW in rural Bangladesh

Hypothesis

The pregnant women who use biomass fuels for cooking in the proposed $100Kc with the improved cookstoves are less likely to have LBW newborns than the pregnant women who do not use the $100Kc in a rural setting of Bangladesh

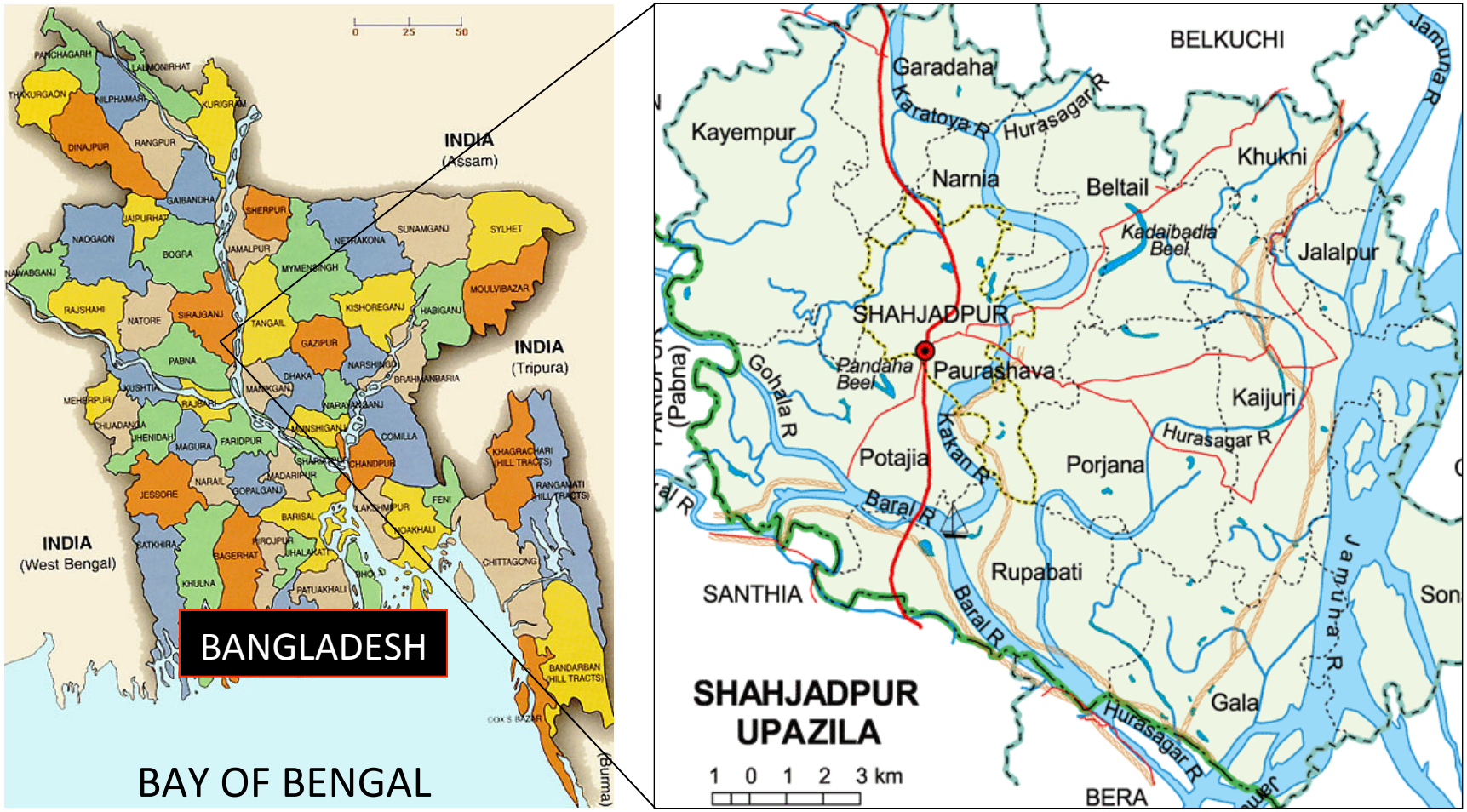
Study objectives

Specific study objectives were-

- to determine whether the $100Kc with the improved cookstove could reduce LBW prevalence from 37% to 22% among the rural newborns

- to determine the differences in carboxyhemoglobin (SpCO) level in the blood of rural pregnant women

Study area: Shahjadpur sub-district



Population characteristics of Shahjadpur

Total population	561,076 (population census 2011)
Women's formal education level	63.9%
Occupation	Weaving, Farming
Monthly cash income (per person)	Tk.1068
Biomass fuels used in traditional cookstoves	84.0%

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Traditional cookstoves, biomass fuels and cooking practices in Shahjadpur sub-district

Shahjadpur sub-district

Experimental plan

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“100-dollar-kitchen” intervention

Outcome variables

The major outcomes are-

- proportion of newborns with LBW between the intervention and control groups

- comparison of carboxyhemoglobin (SpCO) level in blood of all the enrolled pregnant women in the intervention and control groups

Results of the study

Number of pregnancies enrolled, identified, and newborns birth-weight measured in the study by intervention and control groups

	% (#) of pregnant women enrolled		
	Intervention	Control	Total
Pregnant women identified	**n=628**	**n=639**	**n=1267**
Abortion	5.1 (32)	3.4 (22)	4.3 (54)
Lost to follow-up	11.8 (74)	6.8 (44)	9.3 (118)
Birth outcomes identified	**n=526***	**n=576#**	**n=1102**
Live births	95.6 (503)	96.9 (558)	96.3 (1061)
Still births	4.4 (23)	3.1 (18)	3.7 (41)
Single births	98.5 (518)	99.0 (570)	98.7 (1088)
Multiple births	1.5 (8)	1.0 (6)	1.3 (14)
Birth-weight (BW) taken	**n=503**	**n=558**	**n=1061**
BW taken within 72-hrs of delivery	93.2 (469)	89.4 (499)	91.2 (968)
BW taken after 72-hrs of delivery	6.6 (33)	7.9 (44)	7.3 (77)
Live births but birth-weight not taken due to neonatal death	0.2 (1)	2.7 (15)	1.5 (16)

*4 pregnancies outcomes had twin births in intervention group
#3 pregnancies outcomes had twin births in control group

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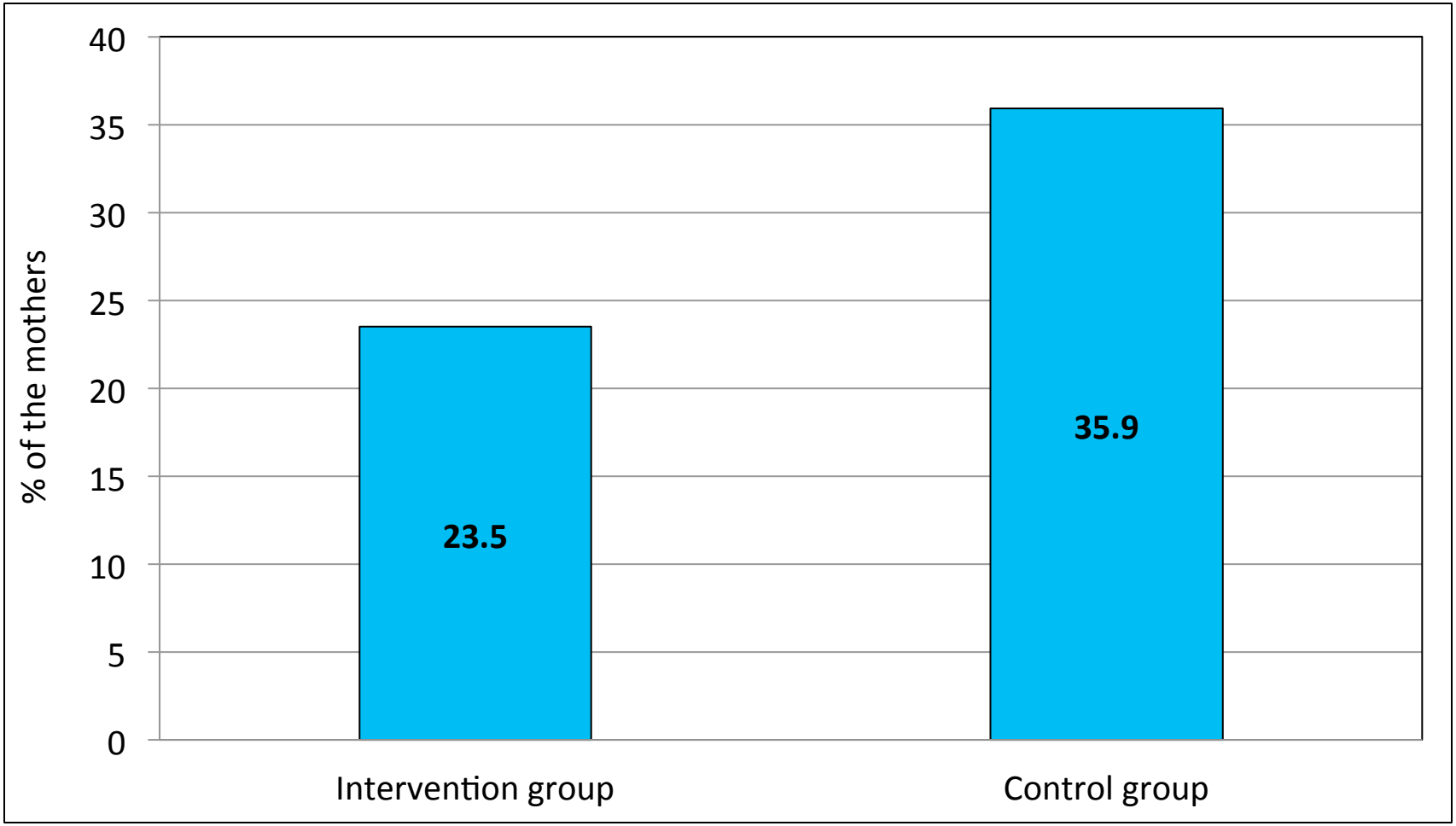
Mother's characteristics by intervention and control groups

	% (#) of pregnant women enrolled			
	Intervention	Control	Total	p-value
Mother's characteristics	n=469	n=499	n=1061	
Mean age (in years) of the mothers	23.2	23.9	23.6	0.07
Median education (in years) of the mothers	5	4	5	-
Mean age at marriage of the mothers	18.6	18.6	18.6	0.61

Percentages of the mothers having LBW newborns by intervention and control groups



p-value<0.01

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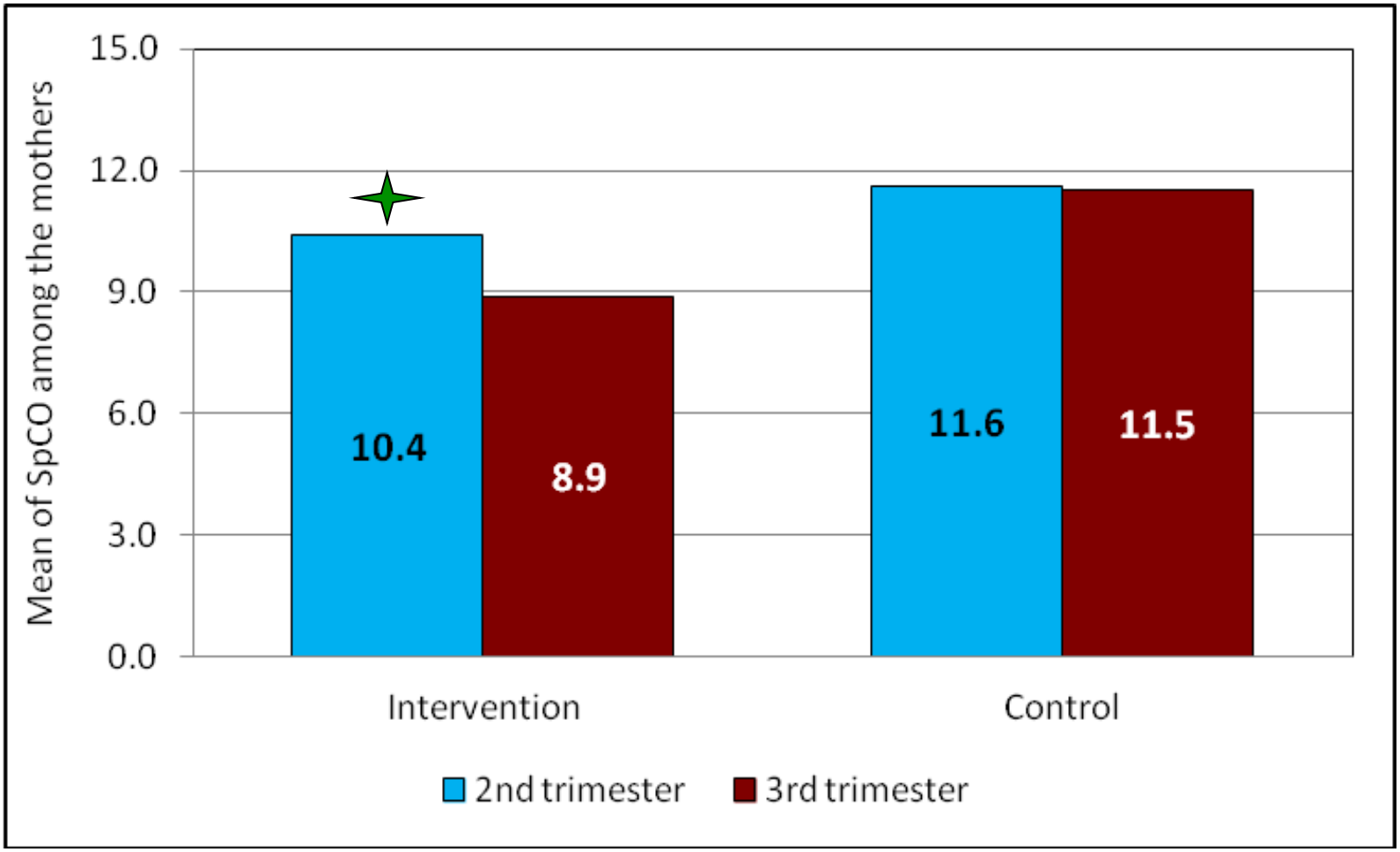
Logistic Regression Models adjusting other cofounding factors

Total n=965	Adj. OR	p-value	Lower Limit	Upper Limit
Model 1				
Conrtol	**1.83**	0.00	1.38	2.42
Model 2				
Conrtol	**1.91**	0.00	1.43	2.54
Maternal Age	1.00	0.90	0.96	1.03
Maternal Parity	0.94	0.48	0.80	1.11
BMI	0.97	0.22	0.93	1.02
Model 3				
Conrtol	**1.76**	0.00	1.31	2.38
Maternal Age	1.00	0.96	0.96	1.04
Maternal Parity	0.97	0.69	0.82	1.14
BMI	0.97	0.26	0.93	1.02
Maternal Gestational Age	0.79	0.15	0.58	1.08
Maternal Education	1.03	0.16	0.99	1.09
SES Scores (PCA)	0.99	0.80	0.93	1.06
Time spend for cooking	0.87	0.08	0.74	1.02
Husband Smoking	1.33	0.06	0.99	1.79
SpCO (1st trimester)	1.05	0.10	0.99	1.11

Mean of carboxyhemoglobin (SpCO) level in blood of the pregnant women during their 2nd and 3rd trimester by intervention and control group



✦ p-value<0.01

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Summary

- Use of ‘$100Kitchen’ along with the improved cookstove during antennal period resulted 34% reduction of LBW prevalence among the rural newborns

- Mothers in the control group were about 2 times (adj. OR: 1.76) more likely to have LBW newborns as compared to the mothers in the intervention group

- Significant mean-differences of carboxyhemoglobin level (SpCO: 8.9 vs 11.5) in the blood of pregnant women between the intervention and control groups

Next Plan?

Certain critical questions on how and to what degree the intervention reduces the biomass fuels' exposure that are required for reducing adverse pregnancy outcomes like PTBs, LBW newborns still remain unanswered due to-

a)direct measure of HAP exposure,

b)information on epigenetic profiles and associated biomarkers to understand the mechanisms.

Acknowledgment

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Thank You

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