

In-home growth monitoring

A promising intervention
leveraging community health workers
to reduce childhood stunting:

Evidence from Pakistan

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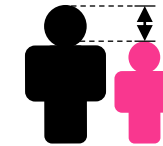
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Background and Motivation

Challenge: Poor Child Health Outcomes



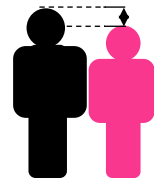
GLOBAL CHALLENGE

- Globally, an estimated 144 million children are stunted and 47 million are wasted (WHO 2020)
- Childhood undernutrition accounts for 45% of deaths among children under five years of age (WHO 2020)



ECONOMIC COST

For South Asia and Africa, the **income penalty of stunting** has been estimated to be as large as **9-10% of GDP per-capita** (Galasso et al. 2016), through multiple pathways.



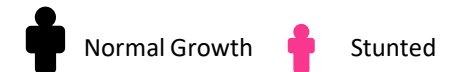
Reduced Height as Adults
-6 cm on average



Reduced Schooling
-1.6 years on average



Lower Cognitive Skills
-0.6 SD on typical test

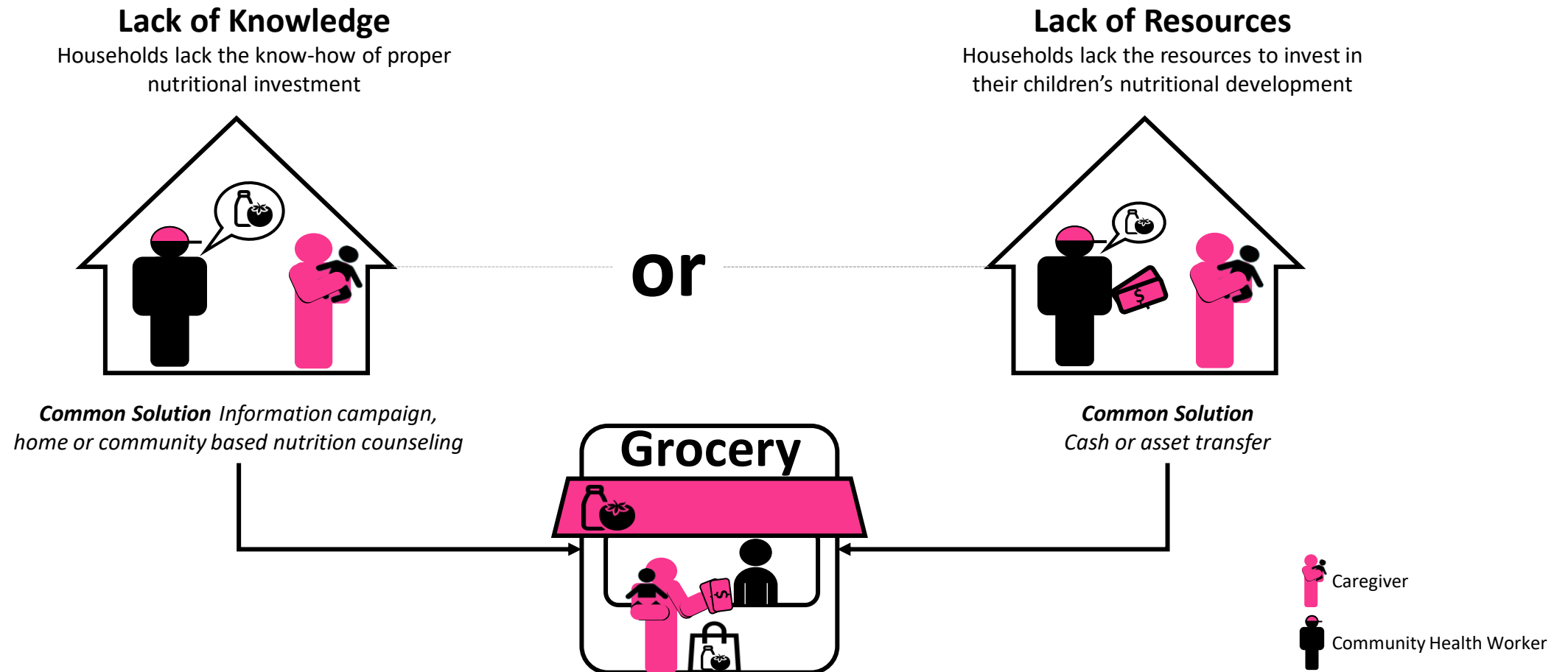


PAKISTAN

In Pakistan 38% of children are stunted (PDHS 2018).

Background and Motivation

Improving Child Health Outcomes: Existing Approaches

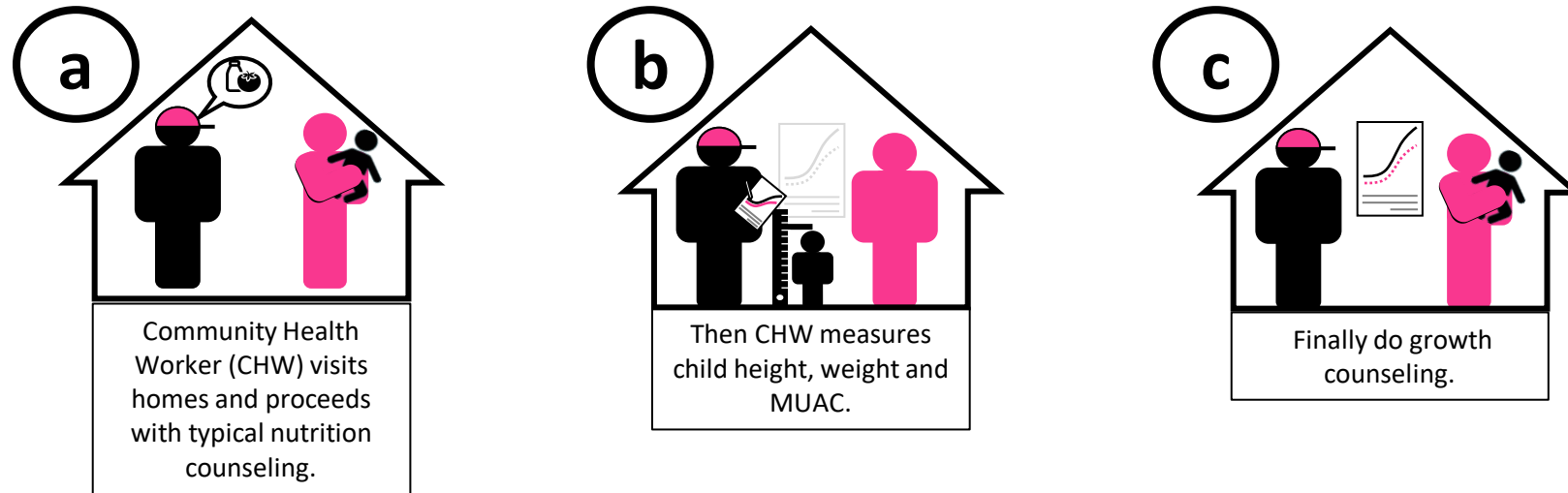


Background and Motivation

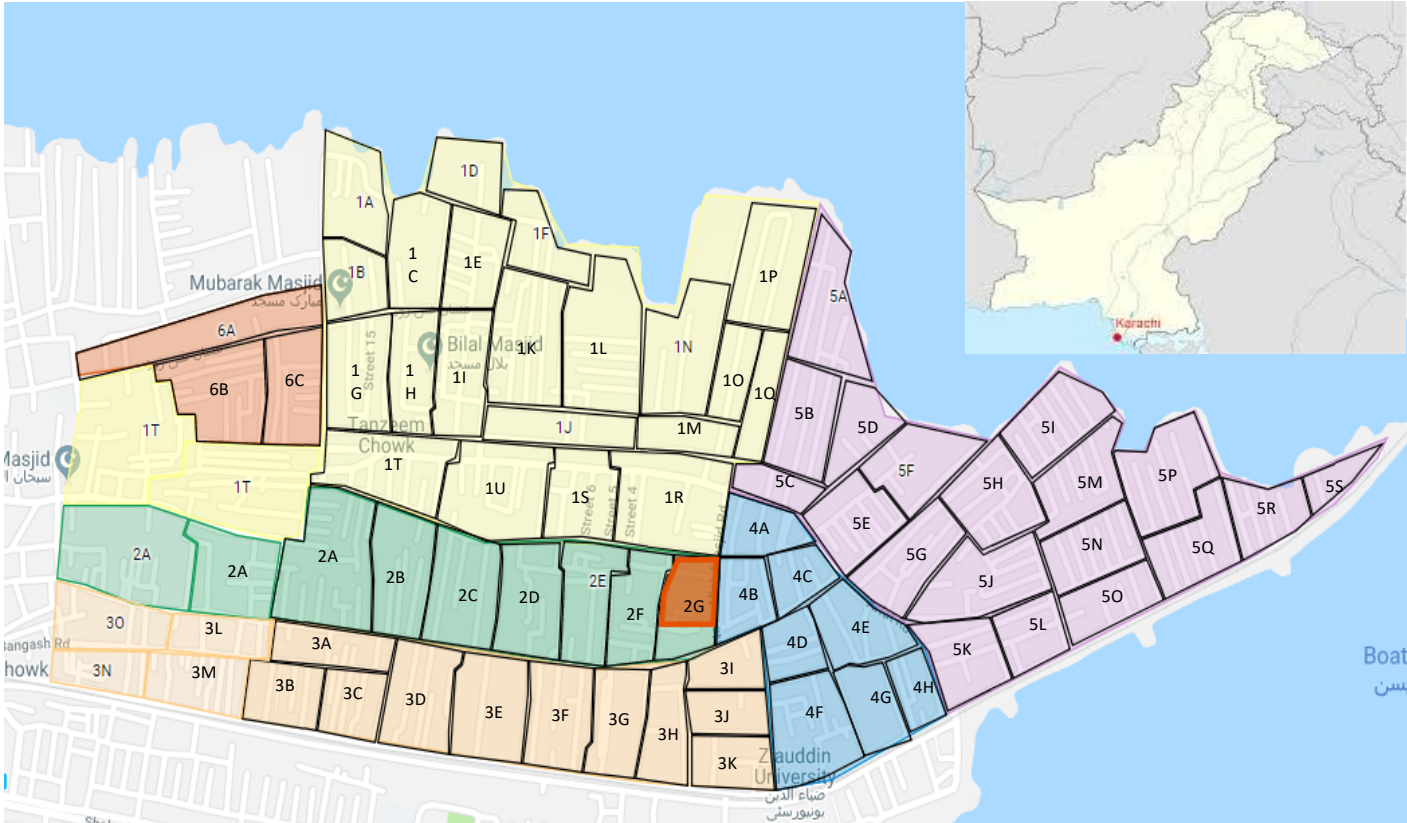
- Caregivers often do not receive adequate feedback
 - in terms of both frequency and content.
- Programs that simply integrate growth charts—without regular growth monitoring—do not see any impact.
- The complementarity between regular growth monitoring and counseling for caregivers is essential.
- Can regular and high frequency in-home growth monitoring and counseling delivered by community health workers (through door-to-door visit) reduce childhood stunting?

Background and Motivation

Intervention: **Regular Growth Monitoring + Counseling**



Study Site: Gulshan-e- Sikandarabad Karachi



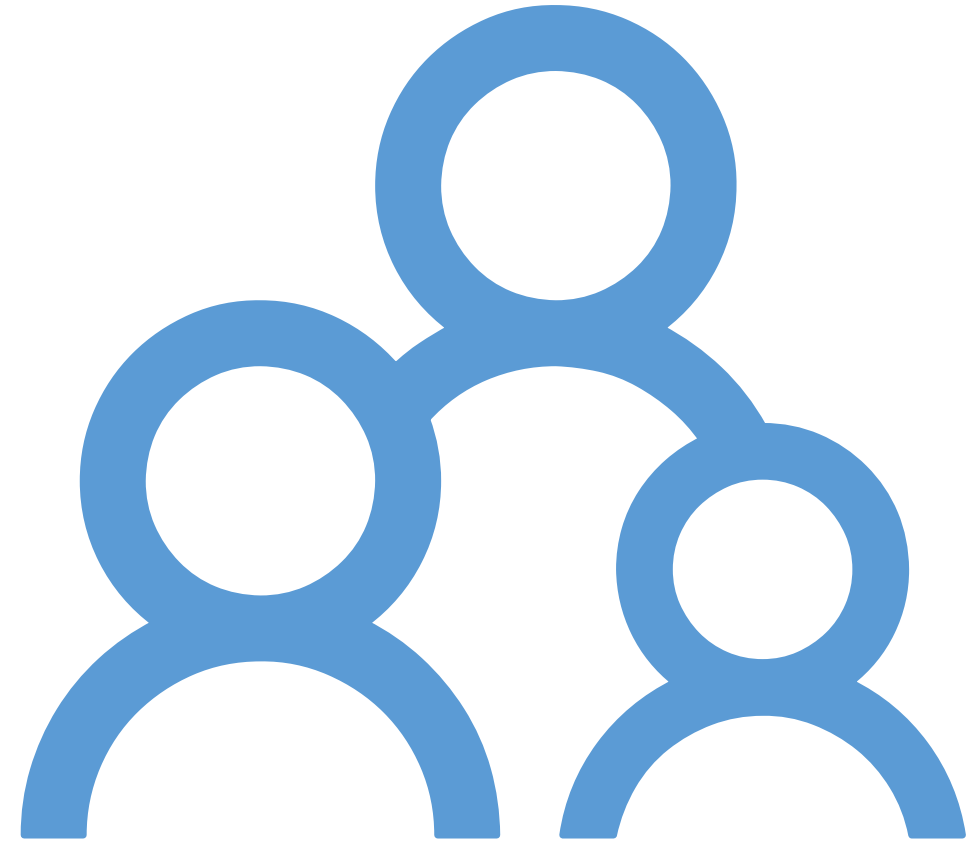
Understanding the Study Population: Focus Group Discussions

- In-depth discussions with mothers, fathers and grandmothers in the study site to:
- Understand how locals think about child nutrition.
- In-depth interviews with a random sample of households to understand how they prepare food and other common feeding practices.
- Try procedures and materials to understand response.



Qualitative Observations from Focus Groups

- A “fat” and “fair” baby is perceived as being a healthy baby.
- People are willing to spend Rs. 40 (\$0.25) on junk food (crisps, biscuits etc.) but families will not pay to buy eggs which cost much less in comparison.
- Mothers were eager on understanding how they could improve the well-being of their older children who had been consuming unhealthy food items.

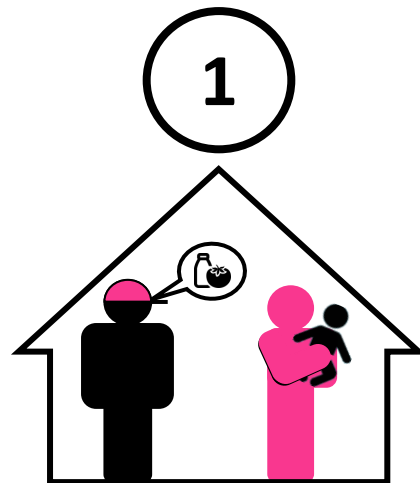


Design

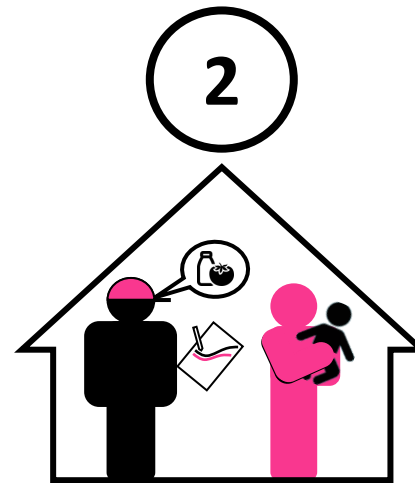
Original Experimental Design

Three-arm randomized trial, with randomization at the household level

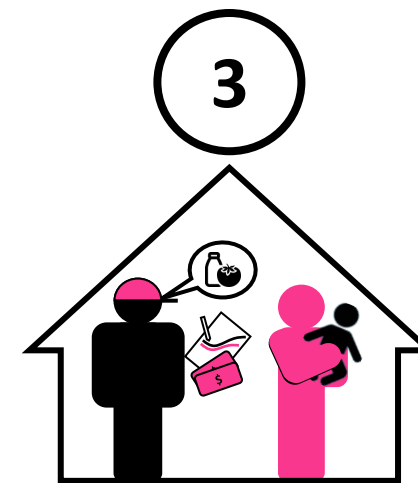
- **Treatment-1** (396 Households): In-Home Growth Monitoring + Counseling (IHGMC)
- **Treatment-2** (396 Households): IHGMC + Growth Monitoring Chart (GroMoTo)
- **Treatment-3** (396 Households): IHGMC + GroMoTo + (labeled) Cash Transfer



Treatment-1:
Monthly home-visit-based
nutrition counseling + Growth
Monitoring
Households: 396



Treatment-2:
Nutrition Counseling + Growth
Monitoring + GroMoTo
Households: 396



Treatment-3:
Nutrition Counseling + Growth
Monitoring + GroMoTo + Labeled
Cash Transfer
Households: 396

Background and Motivation

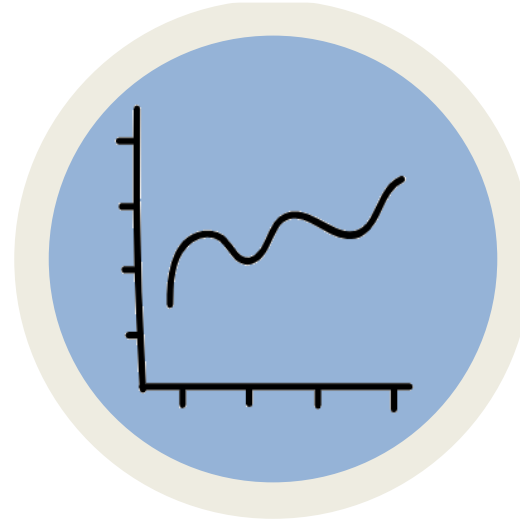
Intervention Components



Counseling



Monitoring

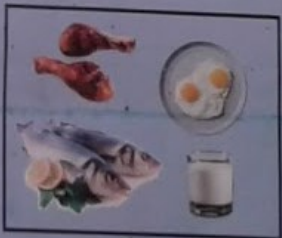
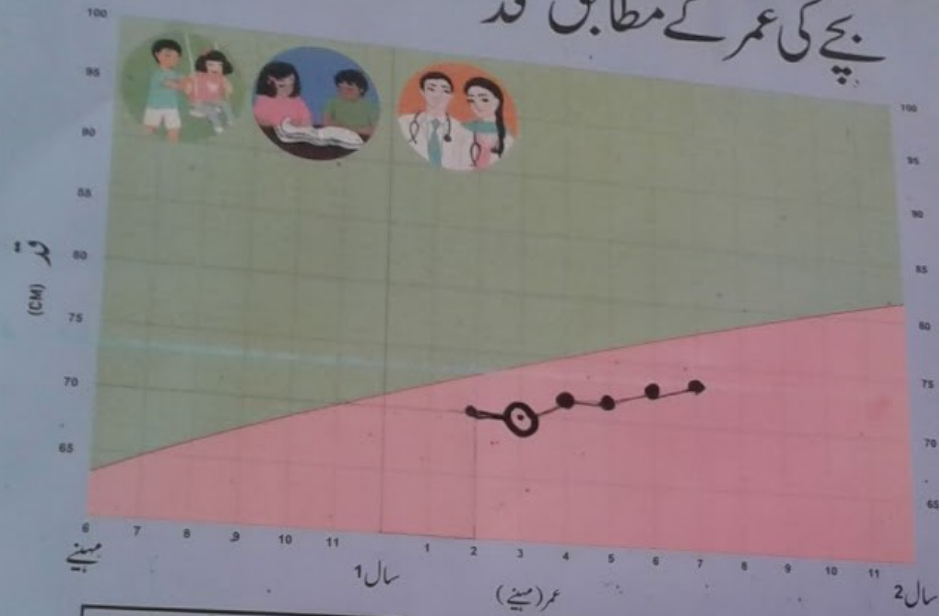


GroMoTo



Cash Transfer

بچے کی عمر کے مطابق قد



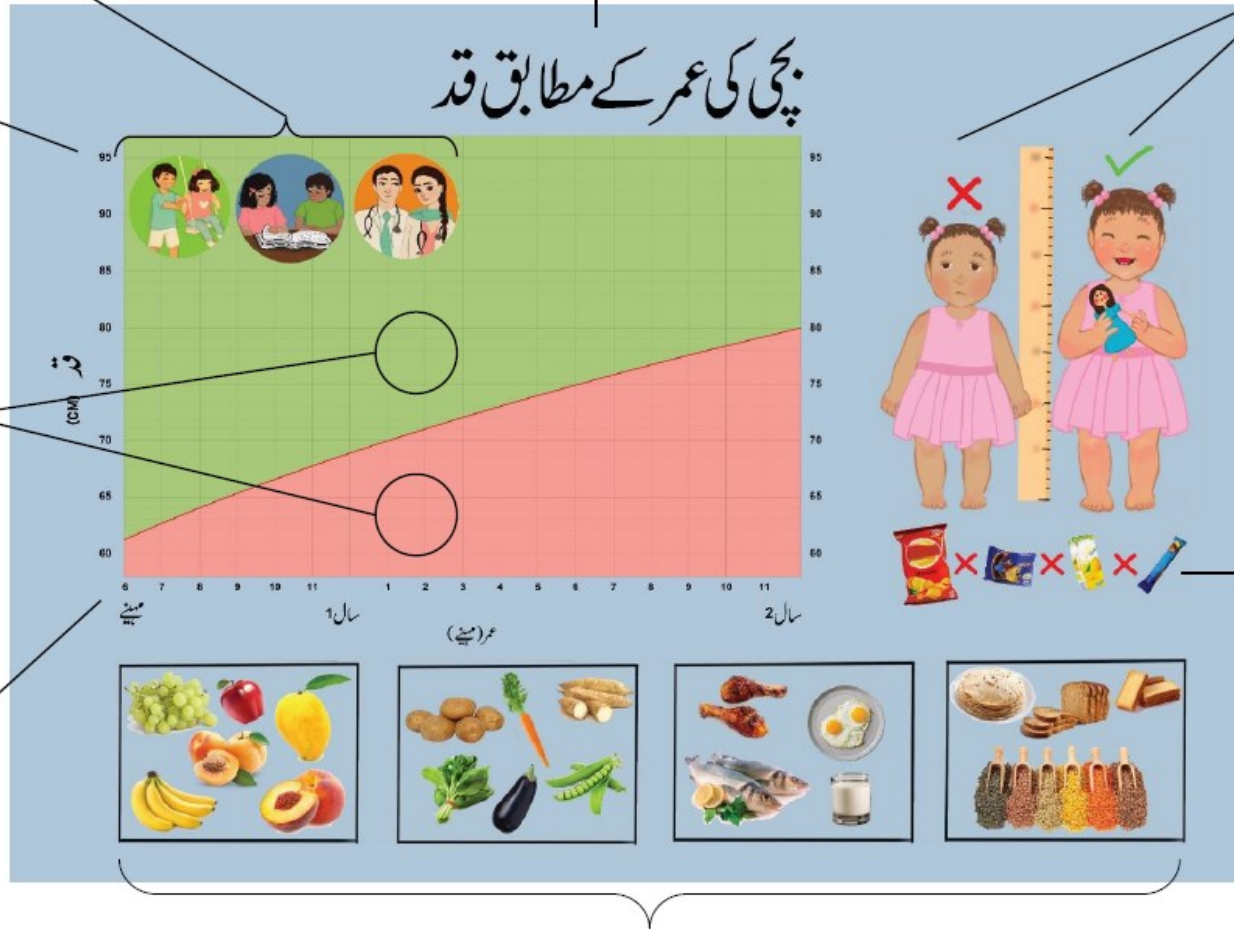
Images of encouragement that link our emphasis on nutrition with long-term outcomes including play and physical development, education and employment.

Child's measured height, in cm.

Growth chart to record child growth trajectory (height over time). The upper, green-zone lets the caregiver know that their child's growth trajectory is healthy. In contrast, the red-zone lets the caregiver know that their child's growth trajectory is not healthy i.e. has fallen two-standard deviations below and is considered stunted.

Child's age, in months.

Poster heading, reads "Child's height according to their age"



Images to demonstrate a poor growth trajectory (left) and a healthy growth trajectory (right). The images show visibly different children in terms of their health and well-being. The emphasis is on height. The gender of the child is based on the gender of the child in the household we recruited.

Suggested foods to avoid. These suggestions are carefully calibrated to the kinds of junk-food that community members may buy for their children.

Suggestions on food types to include in household meals. All suggestions are based on and carefully calibrated to what the community eats and what is available for them locally.

Sample Selection

Households with at least 1 child aged 3 to 21 months were eligible.

Survey team listed 4166 households >> found 1823 of them to be eligible for the trial >> administered the baseline survey until we got 1188 households.

Households were randomly allocated to 1 of 3 treatment arms (1:1:1) entailing 396 households in each group.

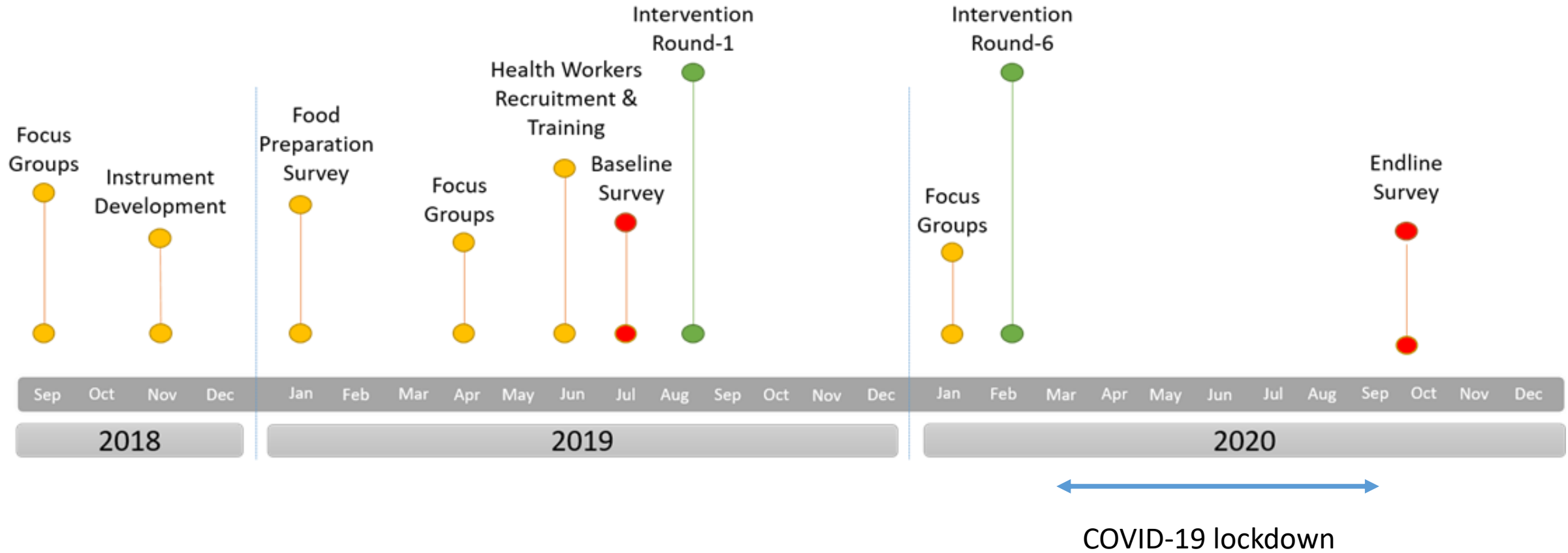
This intervention continued for 6 months (September 2019–February 2020).

Fieldwork Challenges

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- Absence of CNICs (National ID card).
- Cash transfer issue (no bank or MFS)
- Language barriers (Pashtun population living in Karachi)
- Difficulty in location identification.
- Reinterview for floating population.

Timeline of project activities



Sample Selection

Endline survey was administered 13 months after the start of intervention

- with a no-contact period of 7 months.

At the endline, we added a pure control group by surveying an additional 451 households

- Recruited from the subset of eligible households in the original list of 4166 households
- Same eligibility criteria of having a child aged 3 to 21 month at baseline.

Adding this pure control group allowed us to compare the treatment impact with a no-intervention scenario:

- Going beyond the ambit of the original randomized controlled trial

Methods

- **Revised Experimental Design**
- Three treatment arms and a matched control
 - **T1: Treatment-1:** Monthly In-Home Growth Monitoring + Counseling (IHGMC)
 - **T2: Treatment-2:** IHGMC + GroMoTo.
 - **T3: Treatment-3:** T2 + (labeled) Cash Transfer (fixed amount of Rs 400 [\$11.91 in purchasing power parity]).
 - **C: Control:** 451 additional household information collected during end-line.

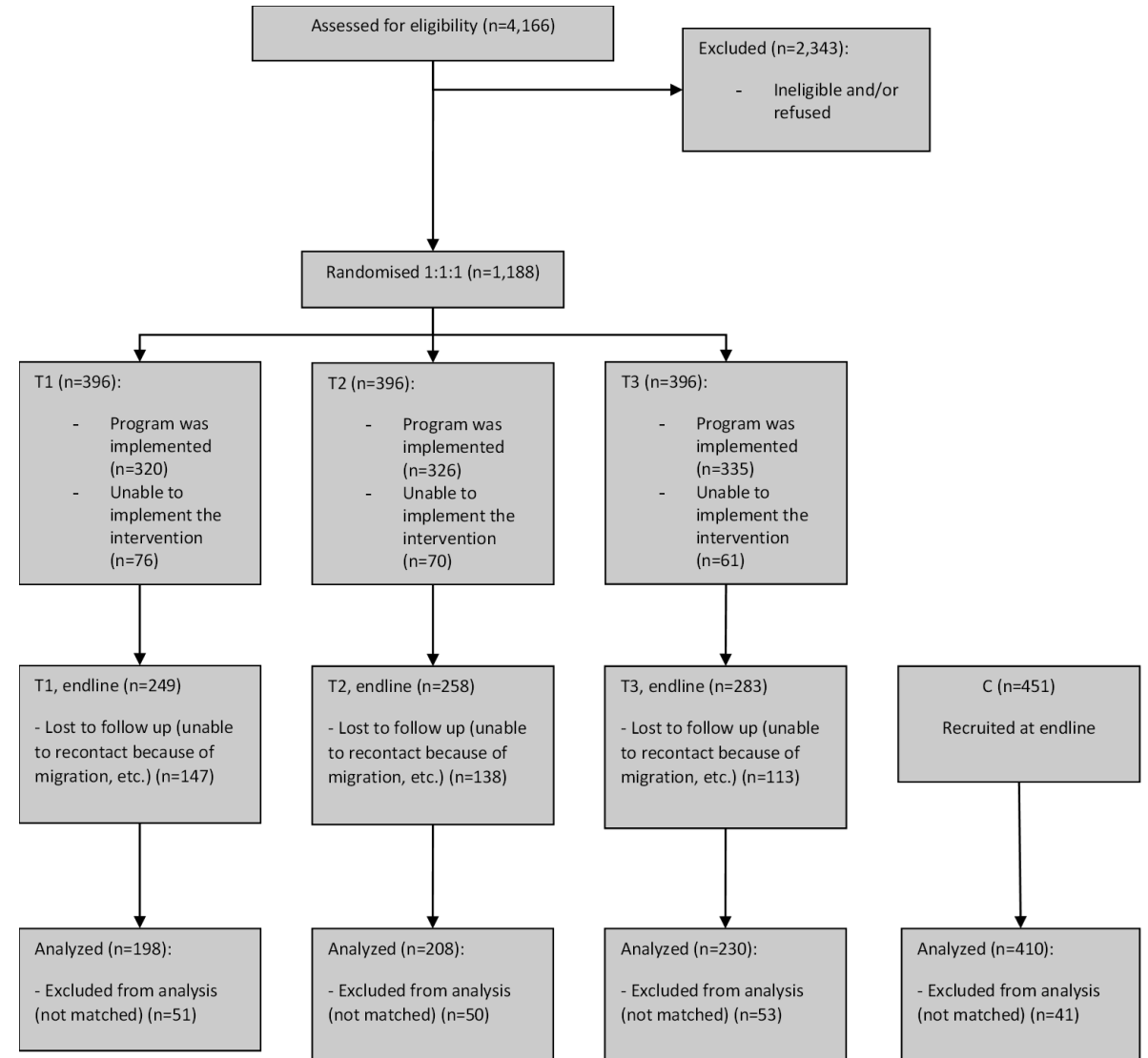
Estimation

We used coarsened exact matching (CEM) method to **select our sample for analysis** from the treatment and control groups.

We used CEM to match on household size, child's age at baseline, father's education, mother's education, and language.

CEM yielded a **total sample of 1046 households across the control and treatments** (198 in T1, 208 in T2, 230 in T3, and 410 in the control), with a matching control:T1:T2:T3 ratio of 1:0.48:0.51:0.56.

Flow-Chart



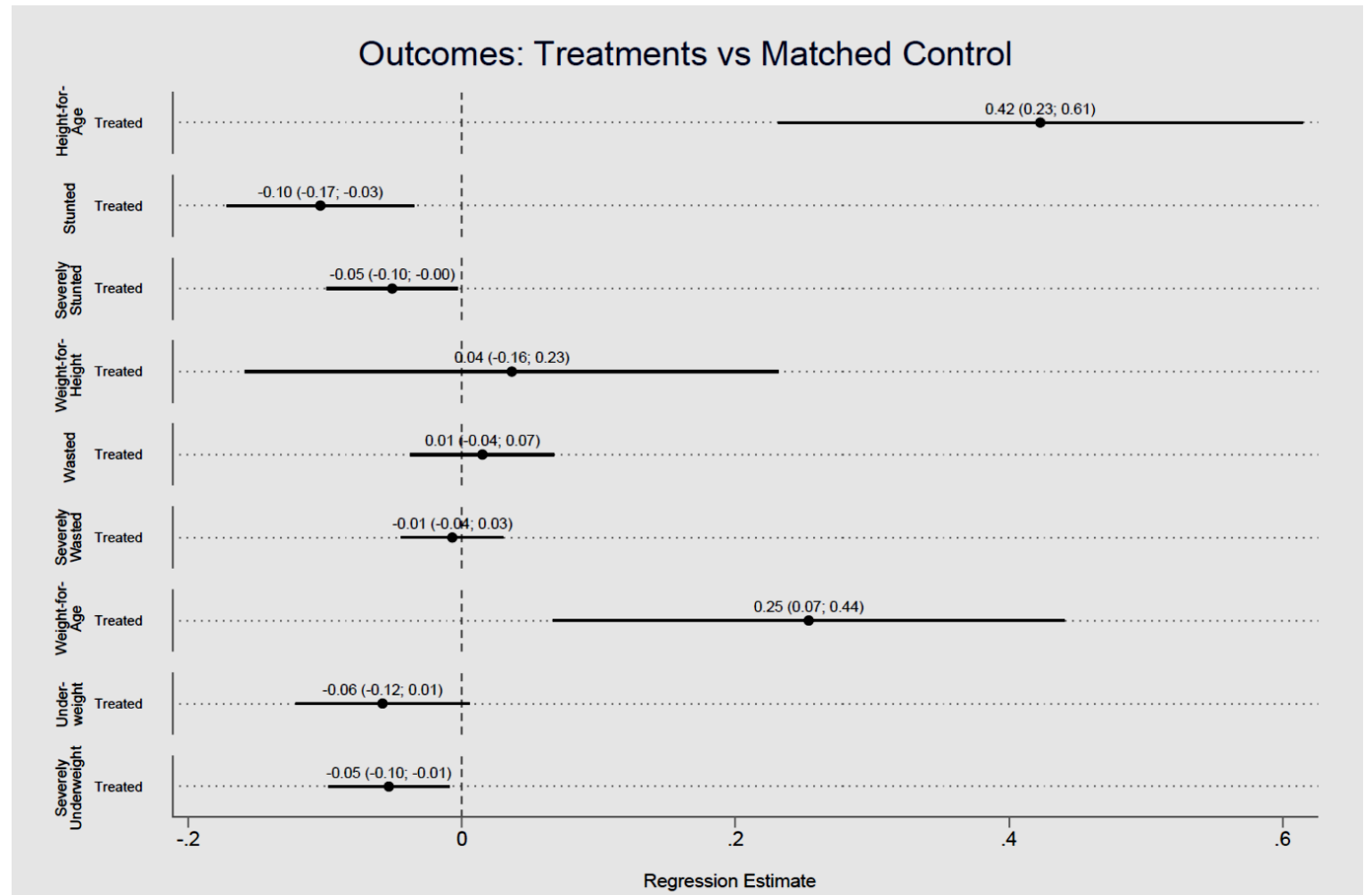
Outcomes

- **Outcome Variables**
 - Height-for-Age (HAZ) z-score
 - Binary versions of this variable, which capture Stunting ($HAZ < -2$ SD) and
 - Severe Stunting ($HAZ < -3$ SD)
 - Weight-for-Height (WHZ) z-score
 - Binary versions of this variable, which capture Wasting ($WHZ < -2$ SD) and
 - Severe Wasting ($WHZ < -3$ SD).
 - Weight-for-Age (WAZ) z-score
 - Binary versions of this variable, which capture Underweight ($WAZ < -2$ SD) and
 - Severe Underweight ($WAZ < -3$ SD)
 - Dietary diversity

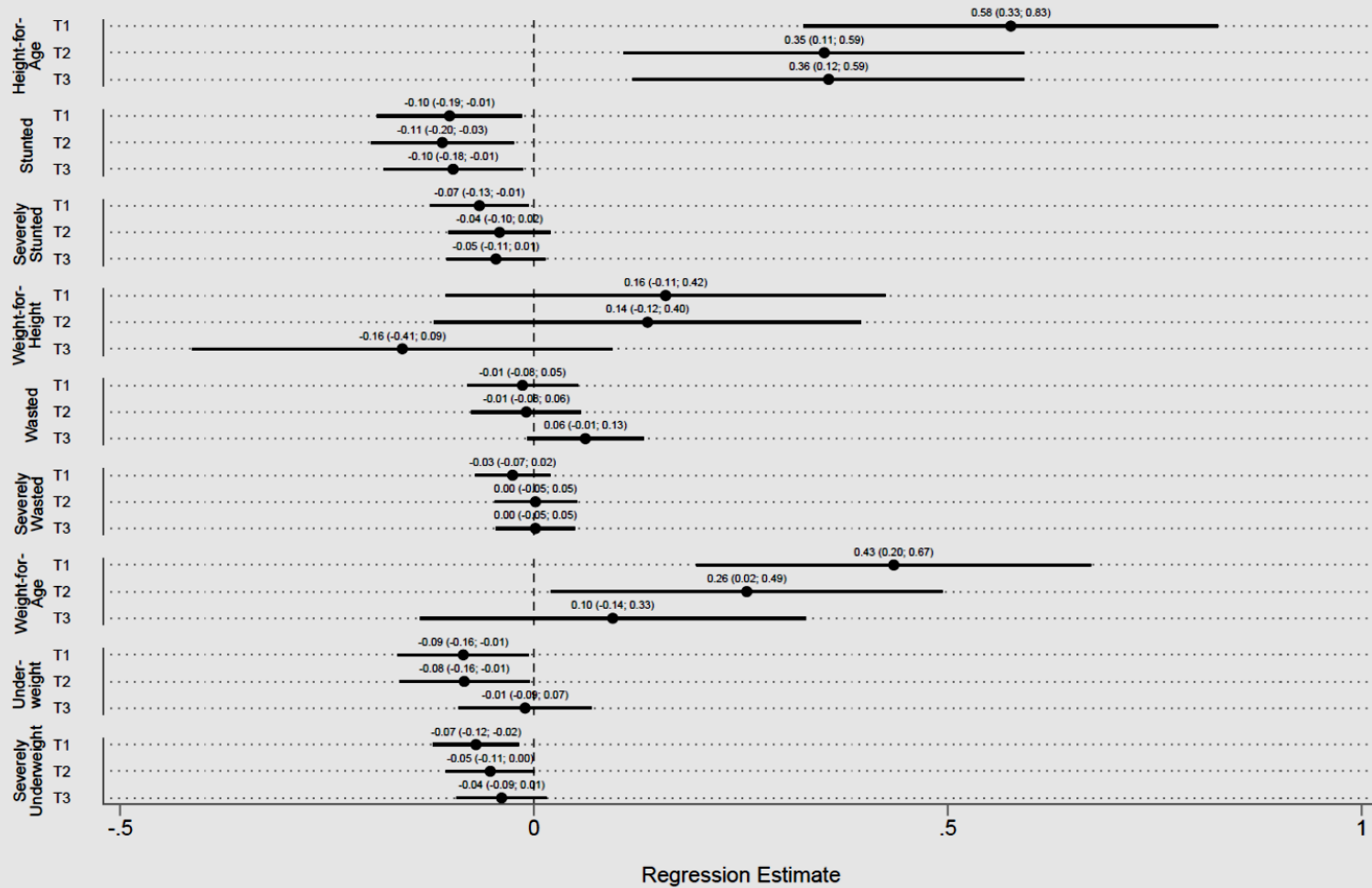
Balance

	Control Group, Mean \pm SD or No. (%)	Treatment Group, Mean \pm SD or No. (%)			
		T1	T2	T3	All Treatments
Household size, no.	7.84 \pm 4.32	8.73 \pm 4.44	9.09 \pm 4.55	8.50 \pm 4.15	8.77 \pm 4.38
Child's age, y	25.70 \pm 6.80	26.11 \pm 5.73	25.48 \pm 5.68	25.53 \pm 5.81	25.69 \pm 5.74
Father's education					
Not literate ^a	223 (54.52)	91 (46.19)	104 (50.24)	101 (44.10)	296 (46.76)
Literate	186 (45.48)	106 (53.81)	103 (49.76)	128 (55.90)	337 (53.24)
Mother's education					
Not literate ^a	278 (67.80)	135 (68.18)	144 (69.23)	152 (66.09)	431 (67.77)
Literate	132 (32.20)	63 (31.82)	64 (30.77)	78 (33.91)	205 (32.23)
Neighborhood					
Neighborhood 1	158 (38.73)	70 (35.35)	77 (37.02)	73 (31.74)	220 (34.59)
Neighborhood 2	66 (16.18)	31 (15.66)	42 (20.19)	55 (23.91)	128 (20.13)
Neighborhood 3	32 (7.84)	25 (12.63)	19 (9.14)	23 (10.00)	67 (10.53)
Neighborhood 4	77 (18.87)	36 (18.18)	40 (19.23)	43 (18.70)	119 (18.71)
Neighborhood 5	75 (18.38)	36 (18.18)	30 (14.42)	36 (15.65)	102 (16.04)
Language					
Urdu	3 (0.73)	2 (1.01)	2 (0.96)	2 (0.87)	6 (0.94)
Sindhi	6 (1.46)	3 (1.52)	2 (0.96)	1 (0.44)	6 (0.94)
Punjabi	56 (13.66)	16 (8.08)	19 (9.14)	18 (7.83)	53 (8.33)
Pashto	278 (67.80)	146 (73.74)	166 (79.81)	179 (77.83)	491 (77.20)
Saraiki	64 (15.61)	30 (15.15)	19 (9.14)	29 (12.61)	78 (12.26)
Other	3 (0.73)	1 (0.51)	0 (0.0)	1 (0.44)	2 (0.31)
Child's gender					
Female	184 (44.88)	104 (52.53)	87 (41.83)	112 (48.70)	303 (47.64)
Male	226 (55.12)	94 (47.47)	121 (58.17)	118 (51.30)	333 (52.36)
Marginalized ethnicity					
Other	307 (74.88)	146 (73.74)	162 (77.88)	170 (73.91)	478 (75.16)
Marginalized	103 (25.12)	52 (26.26)	46 (22.12)	60 (26.09)	158 (24.84)
Total sample	410	198	208	230	636

Any Treatment vs Matched Control

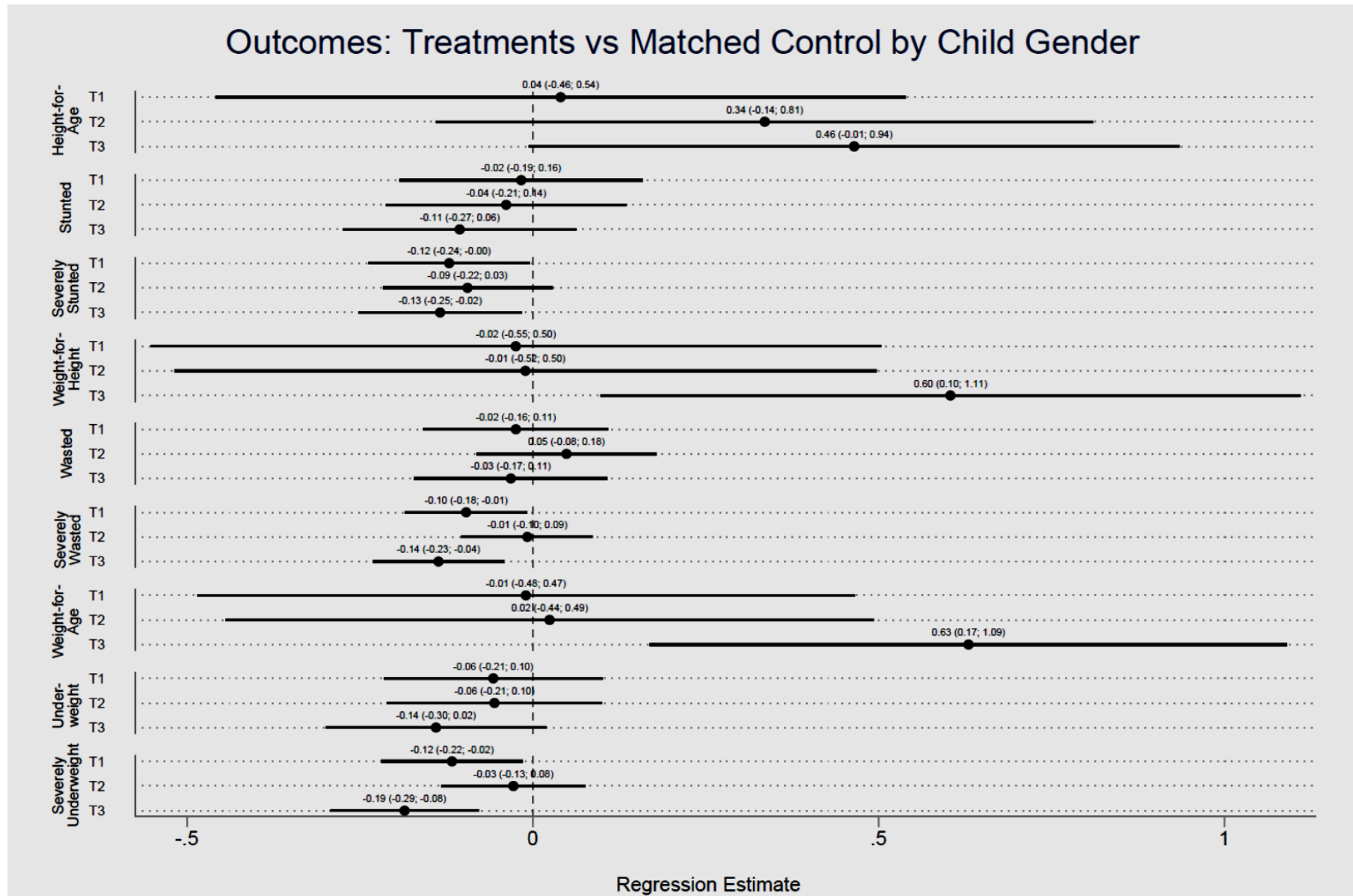


Outcomes: Treatments vs Matched Control



Treatments
vs Matched
Control
(COVID
round, 2020)

Treatments vs Matched Control: Male Child





Main Findings

- We effectively served households in an informal urban settlement. These communities are typically underserved.
- One of the first studies demonstrating the impact of regular IHGMC on young children (0.43 SD gain)
 - The gains in height are especially significant because these were realized during the COVID-19 pandemic.
- Simple IHGMC intervention contributed the most to child anthropometric outcomes.



Main Findings

- Having IHGMC alone (T1) resulted in a 0.58 SD gain in HAZ, but layering a growth chart and unconditional cash transfer on top of IHGMC yielded positive albeit lower gains in child health.
 - households reported limited use (14%) of the growth chart questionable
 - 60% failed to explain how the chart worked.
- Cash arm (T3) had a gendered effect: male children in the cash transfer arm differentially benefited on almost all anthropometric measures.
 - The simple IHGMC and the IHGMC was neutral.
- Any program that chooses to add cash transfers must carefully consider gender dynamics in their respective settings.

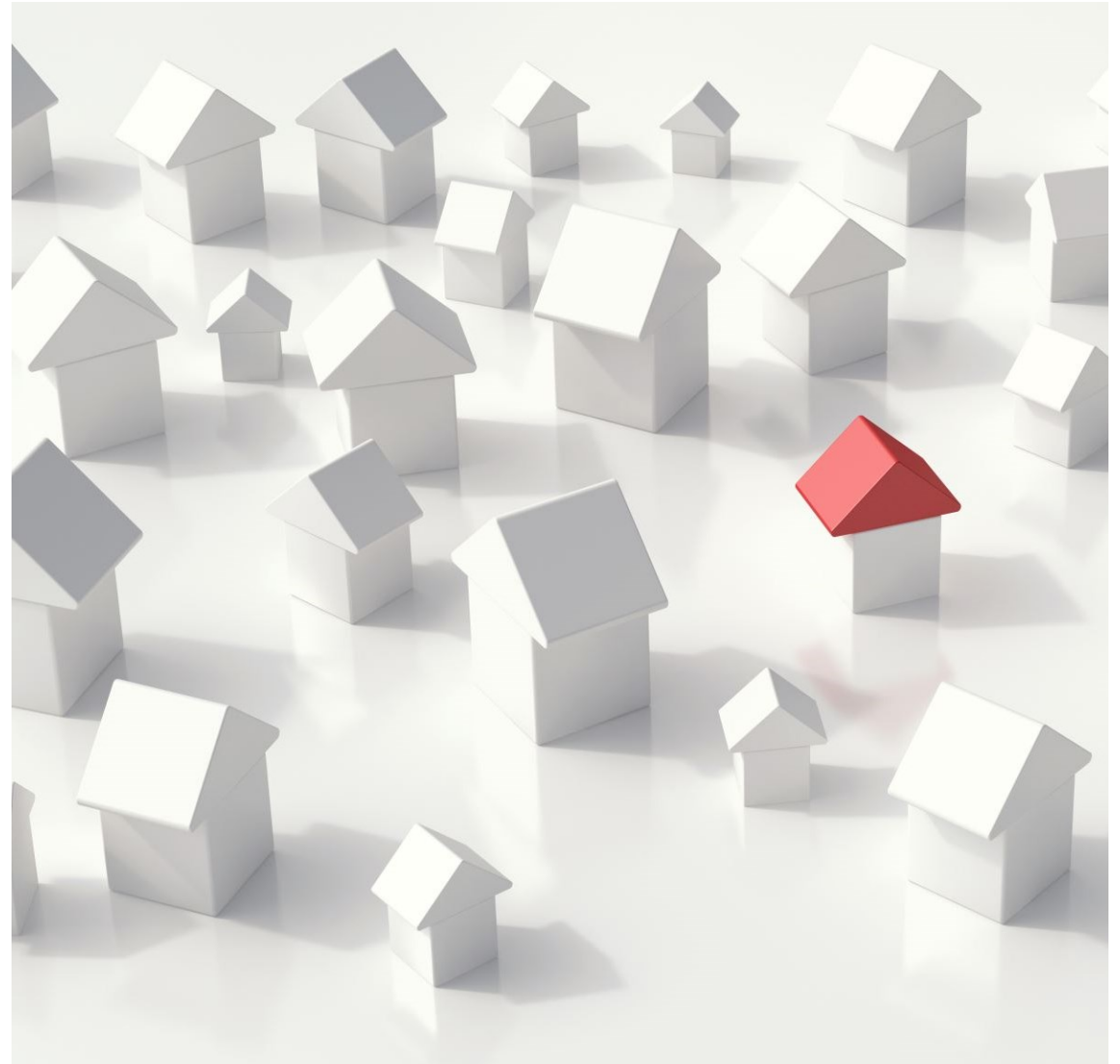
Scalability and Cost Effectiveness



OUR INTERVENTION HAS THE POTENTIAL FOR SCALE, PARTICULARLY IN DENSE URBAN SETTINGS WHERE HOMES ARE CLOSE TO EACH OTHER AND HEALTH WORKERS DO NOT NEED TO CARRY EQUIPMENT FOR LONG DISTANCES.



OUR PROGRAM IS COST EFFECTIVE: **THE TOTAL MONTHLY COST OF IMPLEMENTATION PER CHILD IN THE IHGMC ARM (T1) WAS \$18 (INCLUDING INTERVENTION, IMPLEMENTATION, AND ADMINISTRATIVE COSTS); THE BENEFIT PER CASE OF STUNTING AVERTED BY THE INTERVENTION WAS \$360.**



Publication

A Community Health Workers (CHW) Based Intervention on Anthropometric Outcomes of Children Aged 3–21 Months in Urban Pakistan, 2019–2021. *American Journal of Public Health*. [Volume 113, no. 1, 2023, 105–114]

A Community Health Worker–Based Intervention on Anthropometric Outcomes of Children Aged 3 to 21 Months in Urban Pakistan, 2019–2021

Abu S. Shonchay, PhD, Agha A. Akram, PhD, Mahrugh Khan, BSc, Hina Khalid, PhD, Sidra Mazhar, MSc, Akib Khan, MS, and Takashi Kurosaki, PhD

Objectives. To evaluate the impact of a community health worker–based “in-home growth monitoring with counseling” (IHGMQ) intervention on anthropometric outcomes in Pakistan, where 38% of children younger than 5 years are stunted.

Methods. We used an individual, single-blind, step-wedge randomized controlled trial and a pure control group recruited at endline. We based the analysis on an intention-to-treat estimation using the coarsened exact matching (CEM) method for sample selection among treatments and the control. We conducted the baseline in July 2019 and completed endline in September–October 2021. We recruited 1639 households (treated: 1188; control: 451) with children aged 3 to 21 months who were residing in an urban informal settlement area. The CEM sample used for analysis numbered 1046 (treated: 636; control: 410). The intervention continued for 6 months.

Results. Compared with the control group, the height-for-age z-score in the IHGMQ group increased by 0.58 SD (95% confidence interval [CI] = 0.33, 0.83; $P = .001$) and the weight-for-age z-score by 0.43 SD (95% CI = 0.20, 0.67; $P < .01$) measured at endline.

Conclusions. IHGMQ substantially improved child anthropometric outcomes in disadvantaged localities, and this impact persisted during the COVID-19 pandemic.

Trial Registration. AER-RCT registry (AEARCTR-0003248). (*Am J Public Health*. 2023;113(1):105–114. <https://doi.org/10.2105/AJPH.2022.307111>)

Globally, 1 in 4 children younger than 5 years suffers from linear growth faltering,¹ with the highest prevalence in South Asia and sub-Saharan Africa.² Stunting (low height-for-age z-score [HAZ] < -2) remains a critical public health challenge as it reduces lifetime earnings, hinders cognitive development, and leads to high mortality rates.³ The COVID-19 pandemic has raised concerns about reversals to improvements in childhood nutrition.⁴ These concerns have been met with a

renewed emphasis on the importance of mobilizing resources for nutrition⁵ and an urgency to increase resilience to malnutrition during times of crises,⁶ such as a pandemic.

Research suggests that primary caregivers play a key role in child development.⁷ Caregivers are the first point of contact for children, and their engagement is crucial to ensure adequate physical, cognitive, social, and emotional development. Consequently, community health worker (CHW) programs, globally⁸

and in Pakistan,⁹ leverage regular contact with primary caregivers to improve child health outcomes. Existing CHW-based public health delivery programs, which have shown promise in maternal and child health¹⁰ by encouraging health-care-facility utilization by caregivers, have produced modest gains in child health (typically lower than a 0.25 SD gain in HAZ).^{11–13}

Several limitations remain, as these programs predominantly focus on resource and knowledge constraints

Ongoing Work: Optimizing community-health- worker resources to scale promising child nutrition programs in rural Pakistan



- Cluster-RCT with households in rural Sindh testing two versions of home-based-growth-monitoring (HBGM)
- Treatment 1 – HBGM -heavy: 60 villages (900 children)
- Treatment 2 – HBGM-lite: 60 villages (900 children): substituting CHW with IVR messages and easy to use life-size growth chart for monitoring.

Thank you!

Comments are welcome.