Community-Based Strategies for Increasing Childhood Vaccination Coverage:A Secondary Analysis of WHO/UNICEF and MICS Data(Pakistan)

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ABSTRACT

Background: Pakistan continues to face gaps in routine immunization coverage and persistent sub national inequities. Community-based strategies (community health worker outreach, religious/traditional leader engagement, mobile outreach, and reminder systems) are widely promoted but require contextual evidence to guide scale-up. We used publicly available national estimates and MICS/DHS/provincial MICS reports to describe vaccination coverage, equity patterns, and synthesize evidence on community strategies in Pakistan.

Methods: We performed a secondary analysis of WHO/UNICEF national immunization coverage estimates (WUENIC) and published Pakistan MICS/DHS/provincial MICS reports (2017–2021). Primary outcomes: national and provincial coverage for BCG, DTP/Penta1–3, Polio1–3, MCV1 and *full basic immunization* (BCG + DTP/Penta1–3 + Polio1–3 + MCV1) among children aged 12–23 months as reported in those sources. We extracted national trends (WUENIC) and dis-aggregated tables (MICS/DHS). Because only aggregated published tables were used, the analysis is descriptive; intervention effectiveness is synthesized from peer-reviewed and program literature.

Results: WUENIC (2023 summary) reports Pakistan DTP1 ≈ **94%** and DTP3 ≈ **86%** (2023), with an estimated ~396,000 zero-dose children in 2023 (i.e., missing DTP1). Provincial and survey reports show marked heterogeneity: Punjab and Khyber Pakhtunkhwa report substantially higher full-immunization proportions (Punjab often >80–90% in provincial MICS snapshots) while Balochistan and parts of Sindh show much lower coverage (Balochistan reported as low as **~38%** fully immunized in some assessments). Socioeconomic gradients are consistent: lower maternal education and poorest wealth quin tiles have the lowest coverage. Evidence synthesis shows CHW outreach (including Pakistan's Lady Health Worker model), community mobilization with religious/traditional leaders, and targeted outreach sessions are among the most promising community strategies to increase uptake when combined with reliable supply and data systems.

Conclusions: Pakistan's published national and sub national data show strong overall progress but persistent pockets of under-coverage and inequity. Scaling community-based strategies — CHW outreach, faith/traditional leader engagement, targeted mobile outreach, and context-appropriate reminders — in high-burden districts should be central to national immunization recovery and equity strategies. For causal evaluation and quantification of effect sizes, analysis of microdata (MICS/DHS child files) or implementation trial data is recommended.

Keywords: immunization, Pakistan, MICS, WUENIC, community health workers, outreach, secondary data analysis

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1. INTRODUCTION

Immunization remains one of the most cost-effective public health interventions for child survival. Pakistan has made notable gains in routine immunization over the past decades, but large sub national gaps and clusters of under-immunized and zero-dose children persist — hampering disease control and equity goals. National monitoring through WHO/UNICEF estimates (WUENIC) and periodic household surveys (Pakistan Demographic and Health Survey [PDHS], Multiple Indicator Cluster Surveys [MICS], and provincial MICS/NICS) provide the principal evidence base for tracking coverage and guiding program priorities. World OrganizationDHS Program.

Community-based strategies — including community health worker (CHW) outreach, engagement of religious and traditional leaders, mobile outreach clinics, reminder/recall systems (SMS or community mobilizers), and community mobilization campaigns — are frequently recommended to address both access and demand barriers. Several Pakistan-specific program evaluations and reviews indicate these strategies can increase uptake when well-resourced and aligned with supply-side capacities (cold chain, vaccine stock, and session planning). This paper synthesizes national estimates and published survey tables to describe the current coverage landscape in Pakistan (national and subnational), and summarizes evidence on community strategies that are most relevant to Pakistan's context. World BankUNICEF

2. METHODS

Data sources

We used three classes of publicly available data and documents:

1. **WUENIC (WHO/UNICEF Estimates of National Immunization Coverage).** We extracted national trend estimates for DTP1, DTP3 (Penta3 where applicable), MCV1, and zero-dose counts from the WHO/UNICEF country summaries and related UNICEF country briefs (latest available published summary through 2023/2024). World Health OrganizationUNICEF

2. **Pakistan MICS and provincial MICS reports (2017–2021)** and **PDHS 2017–18** final report. We extracted antigen-level and "full basic immunization" point estimates and state/provincial disaggregation (Punjab MICS 2017–18; Balochistan MICS 2019–20; Azad Jammu & Kashmir/GB snapshots; and national MICS summaries where available). These are publicly available PDF reports with dis-aggregated tables. bos.punjab.gov.pkmics.unicef.orgpndajk.gov.pkDHS Program

3. **Program and academic literature** (peer-reviewed articles, World Bank/UNICEF program reports) describing community strategies in Pakistan and neighbouring contexts to synthesize likely effectiveness and implementation considerations. World BankUNICEFPMC

Outcome definitions

Full basic immunization: the standard survey definition — receipt of BCG, three doses of DTP/Penta (DTP1–3), three doses of polio (excluding campaign-only doses where surveys distinguish), and at least one dose of measles-containing vaccine (MCV1) by age 12–23 months. This mirrors definitions used in MICS/DHS reports. DHS Program

Zero-dose child: defined as a child who has received **no dose of DTP/Penta** (operational definition used by Gavi/partners and in WUENIC briefs). UNICEF

Analysis approach

We extracted national-level WUENIC estimates (time-series for DTP1/DTP3/MCV1 and zero-dose counts), and tabulated MICS/DHS/provincial MICS reported coverage for full immunization and selected antigens. Where reports provided state/province tables (e.g., Punjab, Balochistan), we extracted those values to demonstrate sub national heterogeneity.

The analysis is descriptive because only aggregated published tables and published estimates were used; no individual-level microdata or new statistical modeling was performed. We complemented descriptive findings with a targeted literature synthesis summarizing evidence for community-based strategies relevant to Pakistan.

Ethics

All sources are public, de-identified, and aggregated; no human subjects approval was required for this secondary analysis of published data.

3. RESULTS

National trends (WUENIC)

WUENIC and UNICEF country briefs indicate strong recent progress in Pakistan for several key indicators: DTP1 coverage remained high (≈ **94%** in 2023) and DTP3 coverage in 2023 was reported around **86%**, with an estimated ~396,000 zero-dose children in 2023 (i.e., children missing any DTP dose). These estimates reflect the program's recovery and scale-up

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efforts but indicate remaining gaps. UNICEF

National and subnational coverage (MICS/DHS/provincial MICS)

Published provincial/sectoral reports show wide variation in full immunization and antigen-specific coverage:

Punjab: Provincial MICS snapshots and World Bank summaries report very high coverage in Punjab in recent provincial assessments (Punjab often reported >80% and in some summaries up to ~90% fully immunized). WashdataWorld Bank

Khyber Pakhtunkhwa (KP): KP generally reports relatively high coverage in more recent assessments (examples of ~60–70% full immunization in some provincial surveys), though variation exists between districts. World Bank

Sindh and Balochistan: Coverage is lower, especially in Balochistan where some assessments report full immunization near **~38%** (Balochistan MICS/TPVICS snapshots). Urban pockets like Karachi may have heterogeneous slum vs non-slum patterns with very low coverage in some slums. mics.unicef.orgUNICEF

National PDHS 2017–18 / survey literature: PDHS and subsequent analyses document national incomplete immunization proportions and clustering of under-immunization in specific regions; some peer-reviewed spatial analyses report geographic clustering of incomplete immunization consistent with provincial report patterns. DHS ProgramPMC

(Table 1 presents a concise synthesis of published national/provincial estimates extracted from the cited reports.)

Table 1. Selected published coverage estimates for Pakistan (sources: WUENIC 2023 / PDHS 2017–18 / provincial MICS 2017–21)

Indicator	Published estimate (source)
DTP1 (2023, WUENIC)	**~94%**. UNICEF
DTP3 / Penta3 (2023, WUENIC)	**~86%**. UNICEF
MCV1 (WUENIC)	~ (see UNICEF/WUENIC country brief for year-specific value). UNICEF
Full basic immunization (provincial snapshots)	**Punjab:** >80–90%; **Balochistan:** as low as **~38%** in some reports; **Sindh:** variable with urban slum pockets low. WashdataWorld Bankmics.unicef.org
Zero-dose estimated count (2023)	**~396,000** children missing any DTP (UNICEF country brief citing WUENIC). UNICEF

Equity patterns

Across provincial reports and PDHS/MICS tables, children in the poorest wealth quintiles and children of mothers with no formal education consistently have lower coverage across antigens and for full immunization. Rural-urban gaps persist but vary by province. Spatial analyses and district-level surveys confirm concentrated under-immunized clusters in remote and marginalized districts. PMCmics.unicef.org

Evidence synthesis on community-based strategies

We synthesized findings from program reports, peer-reviewed studies, and implementation briefs to summarize evidence for the most relevant community strategies:

1. **Community Health Worker (CHW) outreach — Lady Health Worker (LHW) model and variants:** Pakistan's LHW program and community outreach models have been instrumental in other maternal-child health gains. Program and review evidence suggests CHWs increase awareness, perform defaulter tracing, and facilitate referrals to vaccination sessions — improving uptake when CHWs are trained on immunization messaging and supported logistically. The evidence suggests substantial potential benefits in under-served districts but requires sustained supervision and integration with immunization session planning. World BankPMC

2. **Engagement of religious and traditional leaders:** In areas where religious leaders are trusted authorities, targeted engagement and public endorsement can reduce vaccine hesitancy and increase demand. Pakistan programs have used mosque announcements, Friday sermon engagement, and training of faith leaders with positive local effects in some pilot areas. Evidence quality varies but consistent positive associations are reported in the literature. UNICEF

3. **Mobile outreach and fixed-outreach integration:** Outreach sessions and mobile vaccination clinics help reach remote settlements and conflict-affected areas. Implementation reports indicate outreach must be reliably scheduled and supported by cold chain and transport capacity to be effective. Balochistan and remote districts of Sindh benefit most from

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well-resourced outreach strategies. World Bank

4. **Reminder/recall systems (SMS, community mobilizers):** SMS reminders show mixed effectiveness in Pakistan-like contexts, with impact limited by phone ownership and network access in poor and remote households; however, when combined with CHW follow-up and community mobilization, reminders can improve timely attendance. UNICEF

4. DISCUSSION

Principal findings

Using publicly available WUENIC and MICS/DHS/provincial MICS reports, Pakistan demonstrates strong national coverage on some indicators (high DTP1 and relatively high DTP3 in WUENIC 2023), but persistent subnational inequities remain — notably low full immunization in Balochistan and hotspots in Sindh urban slums. Wealth and maternal education gradients are consistent with global patterns and highlight the children most likely to be zero-dose or partially vaccinated. UNICEFWorld Bank

Implications for community strategies

Prioritize CHW outreach in high-burden districts. CHWs (LHWs and other cadres) have a proven presence and can be leveraged for defaulter tracing, caregiver education, and mobilization for outreach sessions. Investments in CHW supervision, transport, and data linkage to routine immunization planning would amplify benefits. World Bank

Use religious and traditional leaders for demand generation. Engaging mosque networks and influential community figures is a feasible, culturally appropriate pathway to reduce hesitancy where trust in formal health systems is low. Evidence from local program evaluations is encouraging. UNICEF

Targeted outreach and supply-side strengthening. Outreach sessions linked to fixed-site improvements (cold chain, vaccine availability) are essential in Balochistan and other low-coverage provinces. Outreach should be data-driven (using microplanning and mapping of zero-dose pockets). World Bank

Combine digital reminders with interpersonal outreach. SMS and telephonic reminders can help where phone ownership is adequate, but in low-connectivity areas, CHW and leader-led reminder systems are more reliable. UNICEF

Strengths and limitations

Strengths: Uses authoritative, publicly accessible national estimates (WUENIC) and recent provincial/national survey reports to provide a policy-relevant, evidence-based synthesis.

Limitations: Reliance on aggregated published tables prevents individual-level multi variable analyses and formal causal inference about effectiveness of community strategies. Some provincial estimates come from different years and methodologies (provincial MICS vs national PDHS vs WUENIC), which complicates direct comparisons; readers should consult the cited reports for exact survey methodologies and years. DHS Programmics.unicef.org

5. CONCLUSION

Pakistan's published national and provincial monitoring data show both substantial progress and clear, persistent inequities in childhood immunization. Community-based strategies — particularly CHW outreach (including LHW strengthening), engagement of religious and traditional leaders for demand creation, and targeted outreach sessions — offer pragmatic, context-appropriate options to reach zero-dose and under-immunized children. Policymakers should prioritize these strategies in high-burden provinces, paired with supply-side strengthening and improved subnational data to guide microplanning. For definitive effect estimates and program optimization, future work should analyze microdata (MICS/DHS child files) and evaluate scaled implementation with rigorous designs.

6. ACKNOWLEDGEMENTS

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