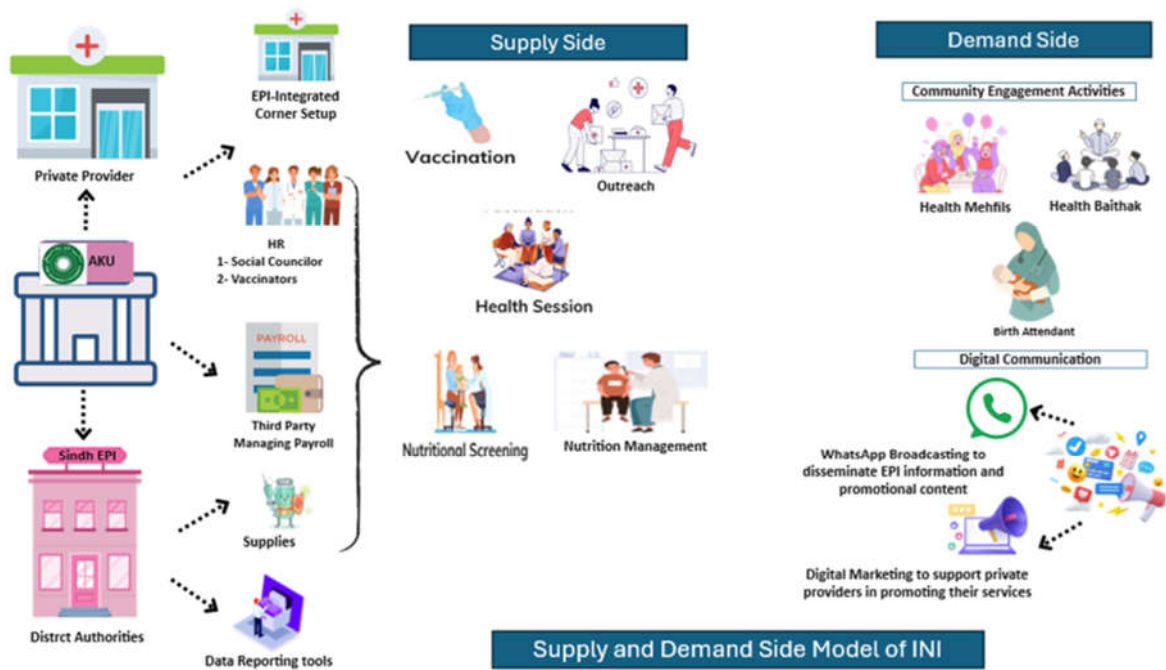


Supplementary Figure S1: Project Design



Supplementary Table S1a: Binary Logistic Regression Results for Age-Appropriate Antigen Uptake from Baseline to Endline Among Children Aged 4–11 Months.

Age-appropriate vaccines	Unadjusted (OR) OR (95% CI)	Adjusted (OR) OR (95% CI)
At Birth		
BCG	6.96 (2.38–20.31)	6.47 (2.63–15.92)
OPV0	1.82 (0.68–5.45)	1.28 (0.55–2.97)
6 Weeks (2nd Visit)		
OPV-1	5.39 (3.15–9.21)	5.64 (3.92–8.12)
Pentavalent 1	4.99 (2.93–8.53)	5.12 (3.48–7.54)
PCV-1	5.04 (2.93–8.64)	5.28 (3.51–7.74)
Rotavirus 1	4.98 (2.89–8.57)	5.15 (3.49–7.59)
10 Weeks (3rd Visit)		
OPV-2	4.60 (2.84–7.43)	4.95 (3.62–6.77)
Pentavalent 2	4.63 (2.88–7.45)	4.93 (3.61–6.75)
PCV-2	4.67 (2.90–7.542)	5.01 (3.63–6.91)
Rotavirus 2	4.67 (2.92–7.49)	4.98 (3.65–6.79)
14 Weeks (4th Visit)		
OPV-3	4.39 (2.66–7.24)	4.83 (3.72–6.28)
Pentavalent 3	4.28 (2.67–6.87)	4.55 (3.55–5.82)
PCV-3	4.21 (2.61–6.79)	4.46 (3.48–5.71)
IPV-1	3.92 (2.43–6.34)	4.08 (3.25–5.21)
9 Months (5th Visit)		
MR-1	1.52 (1.17–2.08)	3.67 (2.37–5.67)
IPV-2	1.49 (1.13–2.02)	3.66 (2.39–5.59)
TCV	1.44 (1.06–1.96)	3.44 (2.27–5.21)

Notes: a. Binary logistic regression was conducted separately for each antigen, treated as an individual outcome, and is presented as unadjusted and adjusted odds ratios (95% confidence intervals) with reference category for each antigen as baseline

b. Adjusted models controlled for age of the child, sex of the child, mother's education, father's education, mother's occupation, father's occupation, and ethnicity

Abbreviations: OR=odds ratio, CI=Confidence Interval

p-value of adjusted model: <0.001

Supplementary Table S1b: Variance Inflation Factors (VIF) Assessing Multicollinearity

Variable	VIF	Tolerance (1/VIF)
<i>Mother Education</i>	1.03	0.969
Primary	1.26	0.791
Secondary & Higher	1.79	0.558
<i>Ethnicity</i>		
Balochi	1.23	0.814
Sindhi	2.19	0.456
Pushto	1.37	0.731
Punjabi	2.13	0.469
Siraiki	1.68	0.594
Other	1.28	0.782
<i>Father Education</i>		
Primary	1.25	0.797
Secondary & Higher	1.66	0.602
<i>Father Occupation</i>	1.18	0.851
<i>Sex of child</i>	1.00	0.996
Mean VIF	1.47	-

Notes: All VIF < 3; highest = 2.19. No multicollinearity seen

Supplementary Table S1c: Results of multinomial logistic regression for sociodemographic factors associated with immunization status among children without vaccination card (recall)

Variable	Fully Immunized		Partially Immunized	
	Multivariate RRR (95% CI)	p-value	Multivariate RRR (95% CI)	p-value
<i>Time</i>				
Baseline	Reference	-	Reference	-
Endline	6.27 (2.23–17.62)	0.001	1.42 (0.53–3.81)	0.477
<i>Mother Education</i>				
No education	Reference	-	Reference	-
Primary	1.20 (0.31–4.62)	0.793	0.70 (0.19–2.58)	0.586
Secondary & Higher	2.28 (0.61–8.54)	0.216	1.34 (0.33–5.43)	0.681
<i>Father Education</i>				
No education	Reference	-	Reference	-
Primary	2.13 (0.60–7.63)	0.240	1.76 (0.49–6.28)	0.378
Secondary & Higher	7.27 (1.84–28.80)	0.005	5.05 (1.36–18.82)	0.017
<i>Father Occupation</i>				
Unskilled	Reference	-	Reference	-
Skilled	2.41 (1.15–5.05)	0.020	1.98 (0.94–4.15)	0.072
<i>Ethnicity</i>				
Urdu	Reference	-	Reference	-
Baluchi	0.12 (0.01–1.85)	0.126	0.17 (0.01–2.10)	0.164
Sindhi	0.26 (0.02–3.15)	0.285	0.39 (0.03–4.90)	0.460
Pushto/Hindko	0.07 (0.01–0.91)	0.042	0.16 (0.01–1.97)	0.151
Punjabi	0.16 (0.01–2.51)	0.190	0.18 (0.01–2.85)	0.220
Siraiki	0.23 (0.02–3.11)	0.264	0.35 (0.03–4.51)	0.418
Other	0.07 (0.01–0.76)	0.029	0.13 (0.01–1.52)	0.102

Supplementary Table S1d: Results of multinomial logistic regression for sociodemographic factors associated with immunization status among children with vaccination card

Variable	Fully Immunized		Partially Immunized	
	Multivariate RRR (95% CI)	p-value	Multivariate RRR (95% CI)	p-value
<i>Time</i>				
Baseline	Reference	-	Reference	-
Endline	7.56 (2.84–20.14)	<0.001	2.05 (0.82–5.11)	0.120
<i>Mother Education</i>				
No education	Reference	-	Reference	-
Primary	1.31 (0.35–4.87)	0.685	0.79 (0.22–2.86)	0.714
Secondary & Higher	1.33 (0.49–3.61)	0.566	0.87 (0.31–2.40)	0.778
<i>Father Education</i>				
No education	Reference	-	Reference	-
Primary	2.38 (0.65–8.72)	0.188	1.96 (0.53–7.20)	0.307
Secondary & Higher	6.18 (1.91–20.00)	0.003	4.38 (1.43–13.43)	0.010
<i>Father Occupation</i>				
Unskilled	Reference	-	Reference	-
Skilled	2.87 (1.41–5.82)	0.004	2.30 (1.14–4.65)	0.021
<i>Ethnicity</i>				
Urdu	Reference	-	Reference	-

Baluchi	0.08 (0.01–1.11)	0.060	0.10 (0.01–1.17)	0.066
Sindhi	0.20 (0.02–2.38)	0.199	0.33 (0.03–4.06)	0.379
Pushto/Hindko	0.06 (0.01–0.77)	0.031	0.14 (0.01–1.66)	0.117
Punjabi	0.07 (0.01–0.91)	0.042	0.09 (0.01–1.24)	0.072
Siraiki	0.16 (0.01–2.11)	0.162	0.28 (0.02–3.46)	0.314
Other	0.05 (0.00–0.52)	0.013	0.10 (0.01–1.20)	0.069