



Norwegian Institute of Public Health

UiO seminar

January 2021



**eRegistries
Initiative**

Welcome and introduction

J. Frederik Frøen

eRegistries?

What, who & how?

- Unifying concept for use-cases pushing the limits of Tracker with UiO since 2013
- Digital Health Interventions (DHIs) for Universal Health Coverage (UHC)
- Longitudinal individual data from generation to effective use of DHIs
- NIPH: public health & implementation. UiO: systems. Together: Science & Capacity
- Workshops, support and collaboration with local HISP groups and UiO
- Generic meta-databases and global goods with UiO
- Science: Interventions; Implementations; Registry-based epidemiology



3 GOOD HEALTH AND WELL-BEING



“Public health and clinical care cannot be delivered safely, with high quality, and in a cost-effective manner, without seamless, sustainable, and secure data and information exchanges at all levels of the health system.”

WHO, World Bank, USAID 2015

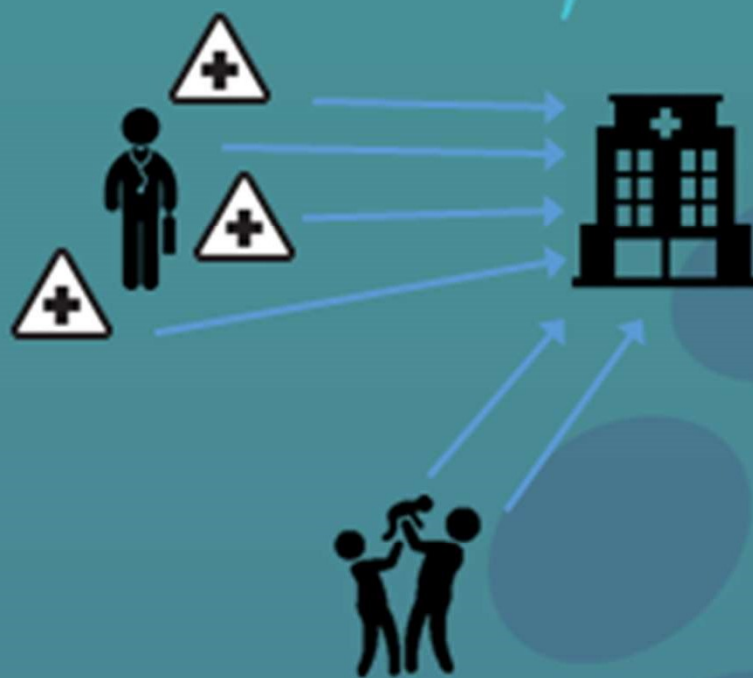


Photo: Mike Frost, eRegistries.org

www.eregistries.org



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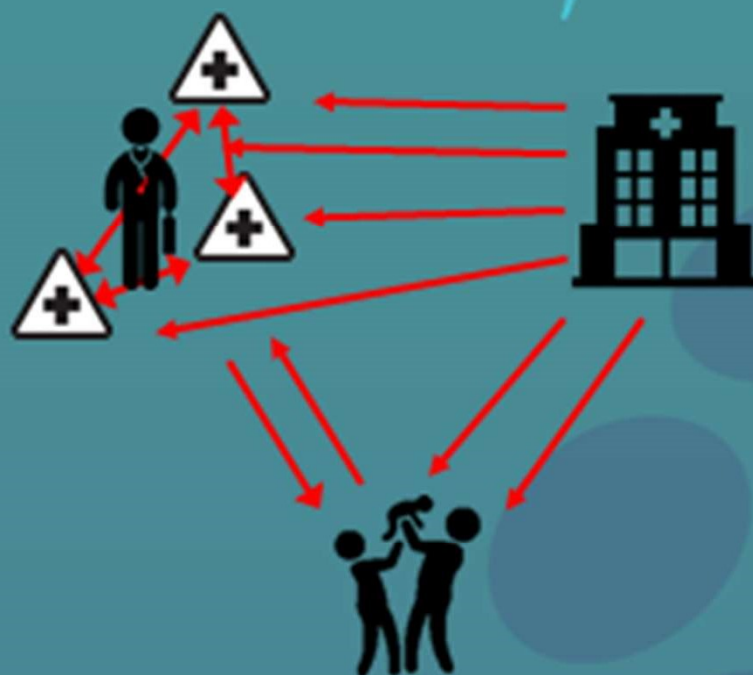
3 GOOD HEALTH AND WELL-BEING



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*Uniform individual level longitudinal data,
digitized at the point of generation,
exchanged seamlessly and securely at all levels of
the health system,
to support the care provider, the clients and
patients, and the routine reporting needs.*



3 GOOD HEALTH AND WELL-BEING



10 KEY DHIS IN EREGISTRIES

Client identification and registration: unique IDs for enrolment based on national ID, generation of health systems IDs, or biometric algorithms

Client health records: longitudinal point-of-care tracking and management of clients' health records and routine indicators across the continuity of services and programs

Healthcare provider decision support: interactive checklists with risk screening, and guidance, prompts and alerts for adherence to evidence-based protocols

Referral coordination: workflow support and management of referrals and continuity of appropriate access to health records across services

Health worker activity planning and scheduling: scheduling of appointments, and identify and prioritize clients in need or with missed appointments

Targeted client communication (SMS): behavior change communication individualized by demographic and health status, alerts of health events and test results, and appointment reminders to clients' mobile devices

Healthcare provider communication: communication channels from care provider to supervisors, and automated and individualized performance feedback to providers

Human resource management: ID and listing of workforce cadres and performance monitoring

Data collection, management, and use: demographic, health, service and equity data storage, aggregation, synthesis, visualization in dashboards, and automated analyses and forecasts

Data coding: curation of coded datasets and automated classification of diseases based on crude dates and demographic and health data

eRegistries?

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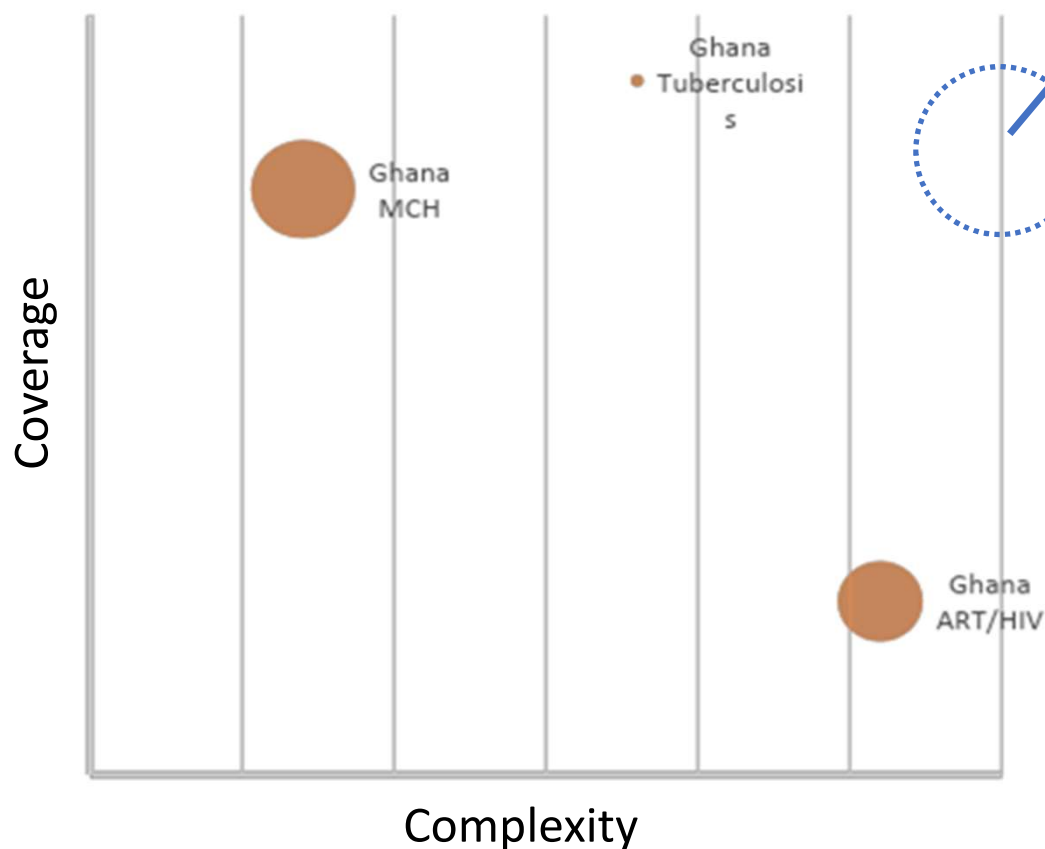
Context is King: eRegistries Implementation Lessons

Brian O'Donnell

Akuba Dolphyne

“Isn’t eRegistries just Tracker?”

Categorizing Tracker Configurations



eRegistries

‘Individual data from an identified population digitized at the point of generation, used to support the care provider the patient, and routine data needs.’

- **Coverage:** the proportion of your population of interest who are included in Tracker.
- **Complexity:** from paper on screen to interdependent functionalities (messages, feedback dashboards, interactions with users through program rules)

CLASSIFICATION OF DIGITAL HEALTH INTERVENTIONS v1.0

A shared language to describe the uses of digital technology for health

9.1 Client education and behavior change

9.2 Point of care diagnostics

9.3 Client information systems

9.4 Data collection and reporting

9.5 Service delivery

9.6 Provider training and education

9.7 Human resource engagement

9.8 Supply chain management

9.1.1 Untargeted
digital communication

9.2.1 In-device
diagnostics

9.3.1 Electronic health
records

9.4.1 Data collection
and management

9.5.1 Electronic
decision support

9.6.1 Assessment of
capacity needs

9.7.1 Health workforce
monitoring and
performance feedback

9.8.1 Cold chain
management

9.1.2 Targeted digital
communication

9.2.2 Sensors &
wearables

9.3.2 Digital service
records

9.4.2 Data reporting,
management, and
visualization

9.5.2 Provider to
provider
communication

9.6.2 Digital delivery of
training materials

9.7.2 Human resource
registry and capability

9.8.2 Stockout
management

9.1.1.1
Tailored digital
communication

9.2.3 Medical devices

9.3.3 Birth and death
notification

9.4.3 Surveillance

9.5.3 Client to provider
communication
(telemedicine)

9.8.3 Drug quality
assessment

9.1.1.2
Untailored digital
communication

9.3.4 Digital
enumeration

9.4.4 Citizen-based
accountability reporting

9.5.4 Provider work
planning and
scheduling

9.8.4 Maintenance of
equipment

9.1.3 On demand
information service

9.5.6 Emergency
transport coordination

9.5.7 Lab result
notification

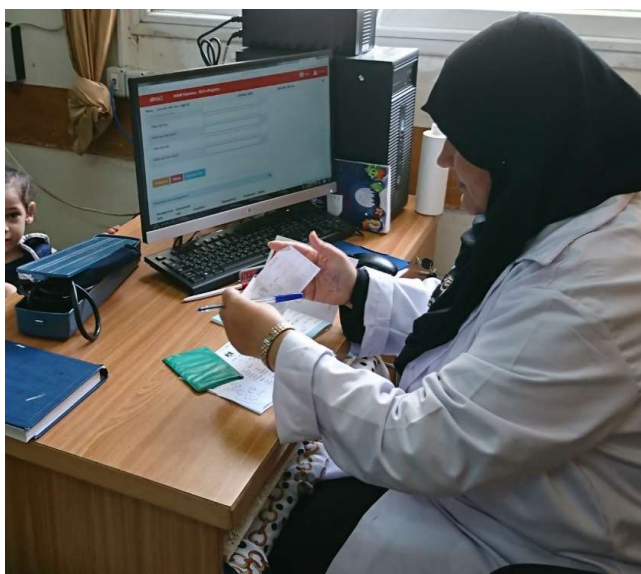
MCH eRegistry

Digital Health Research at Scale

Context is King

Palestine (West Bank & Gaza)

- Over 140,000 pregnancies registered
- National roll-out began 2016



Bangladesh (Chandpur District, Matlab)

- Over 8,000 pregnancies registered
- Collaborating since 2016
- Includes Android deployment



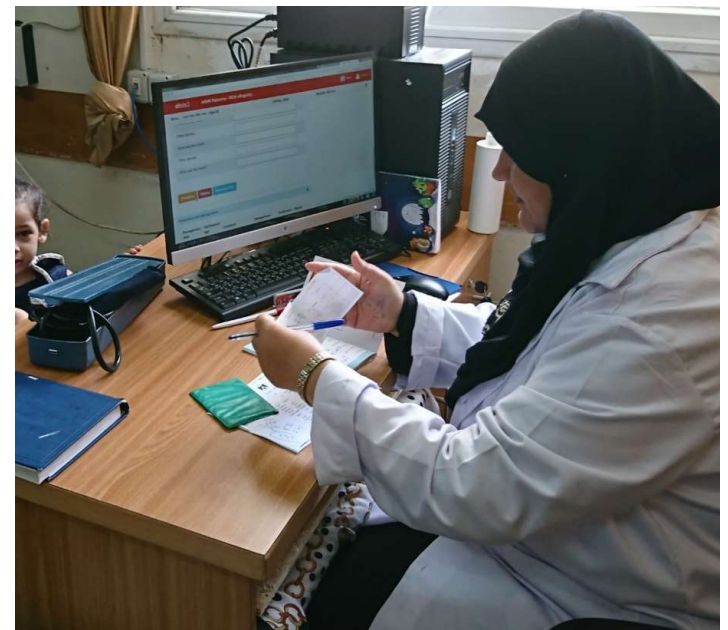
Context of Palestinian MCH System

- 99% institutional deliveries
- 14 MoH hospitals for labor and delivery
- 395 primary health centers (PHC) in the West Bank and 54 PHC in Gaza
- 84 Primary Healthcare Centers have facility for high risk conditions in pregnancy
- Some issues
 - Relatively ineffective antenatal care content despite frequent visits (5 per woman)
 - Significant portion of daily work of healthcare workers spent in reporting



DHIS2 in Palestine

- Three ongoing RCTs to determine impact and effectiveness of MCH eRegistry
- The success of the eRegistry has led the Ministry of Health to adopt DHIS2 for routine reporting and disease surveillance, including Covid-19 and Family Practice



eRegistries in Palestine

Context is King

- Has:
 - National MCH eRegistry at all primary care sites
 - ANC, PPC, NBC
- Does not have:
 - Care at birth
 - Integration with hospital EMR
 - First 1000 days
 - Outreach coverage to Bedouin communities
 - Android
 - Updated MCH guidelines

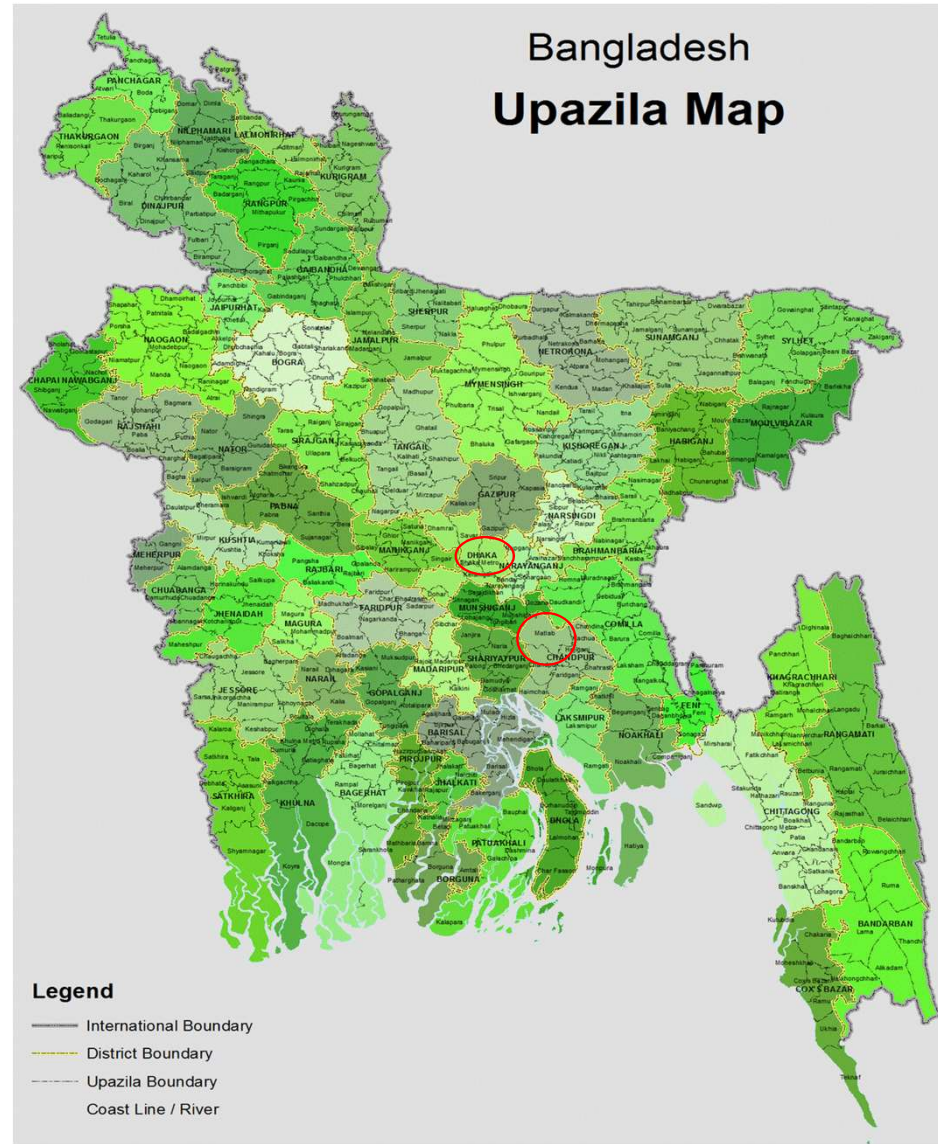


Bangladesh DHIS2

Context is King

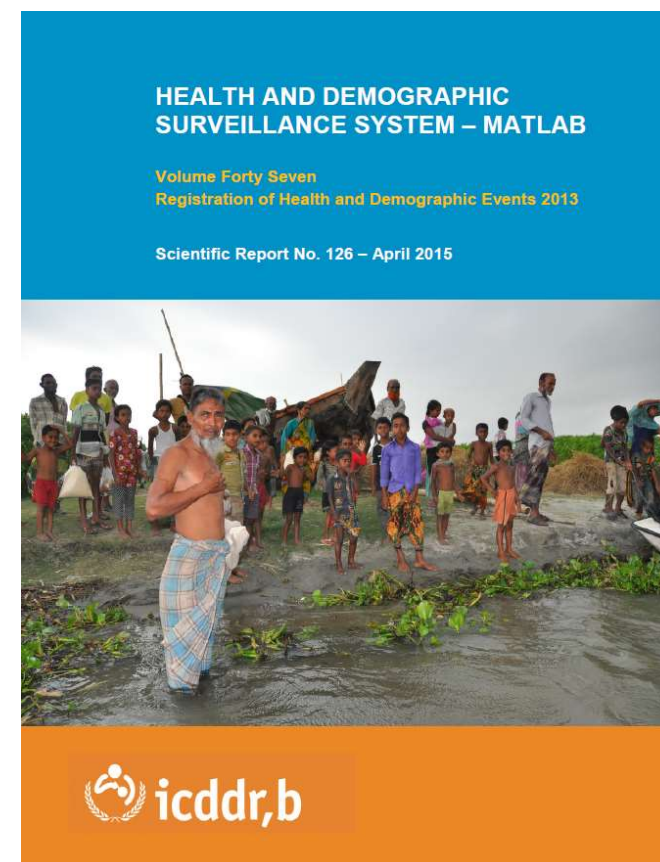
- Used to report and analyze aggregate health data from ~15,000 health facilities
- Used for longitudinal antenatal care health records (7.8 million mothers and children registered)
- Serves as a national data warehouse, combining data from 33 separate electronic health systems





What is in 'Matlab'?

- Chittagong Division
 - Chandpur District
 - Matlab Uttar Upazila (North)
 - Matlab Dakshin Upazila (South)
 - 2 municipalities (Matlab and Chengarchar)
 - 18 wards
 - 72 mahallas
 - 22 union parishads
 - 244 mouzas
 - 407 villages
- Health surveillance site for icddr,b



Tracker for MCH in Matlab

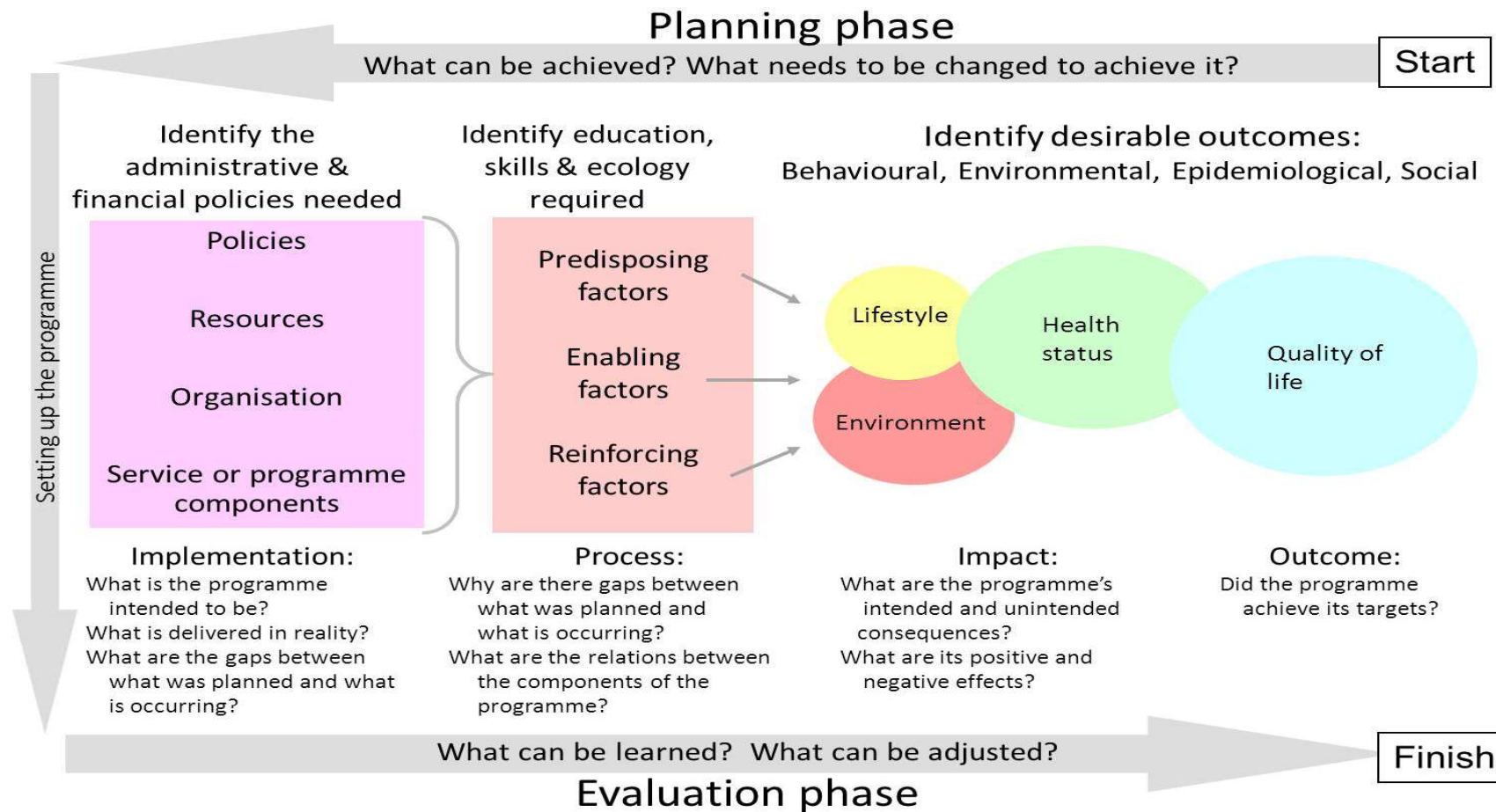
- Has:
 - National MCH Tracker for one cadre CHCPs
 - MCH eRegistry in research sites (Matlab)
 - Includes community health
 - Includes biometric ID and Android
- Does not have:
 - Care at birth
 - Integration with hospital EMR
 - First 1000 days
 - Updated MCH guidelines



Designing eRegistries' Digital Health Tools

Context is King

Formative Research: PRECISE-IMPAC



Adapted from: Green L. <http://www.lgreen.net/precede.htm> (Accessed May, 2009)

Part 1: Health system structure

- Organogram
- Referral Mapping
- Reporting Hierarchy



DHIS2 Structure

- OU hierarchy
- User groups/roles
- Key dashboard indicators

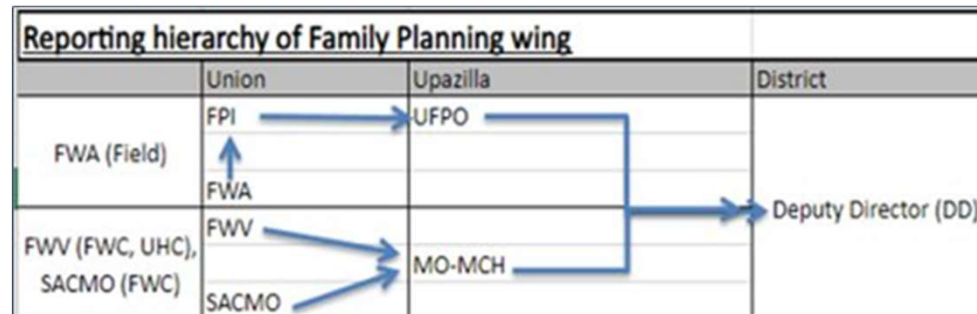


Table 2: Descriptions and responsibilities of healthcare providers in the study area

Health worker cadre*	Tasks	Pre-service Training	Health System Venue
Family Welfare Visitor (FWV)	Antenatal care Family planning Childbirth care Postnatal care	18 months	DGFP Facility based
Community Health Care Provider (CHCP)	Antenatal care Postnatal care	3 months	DGHS Facility based
	Antenatal care Childbirth care Postnatal care	3 months plus 6 months CSBA†	
Health Assistant (HA)	Vaccination support Counseling for care services	8 weeks	DGHS Community based
	Vaccination support Counseling for care services Childbirth care	8 weeks plus 6 months CSBA†	
Family Welfare Assistant (FWA)	Family Planning Pregnancy registration Counseling for care services	8 weeks	DGFP Community based
	Family Planning Pregnancy registration Childbirth care Counseling for care services	8 weeks plus 6 months CSBA†	

* Some areas also have female sub-assistant community medical officers who can provide maternal health care services. †CSBA: Community Skilled Birth Attendant.



SHARED patient records

DIFFERENT duties



Part 2: Clinical Algorithms

- Screenings
- Referrals
- Clinical Actions



Program Structure

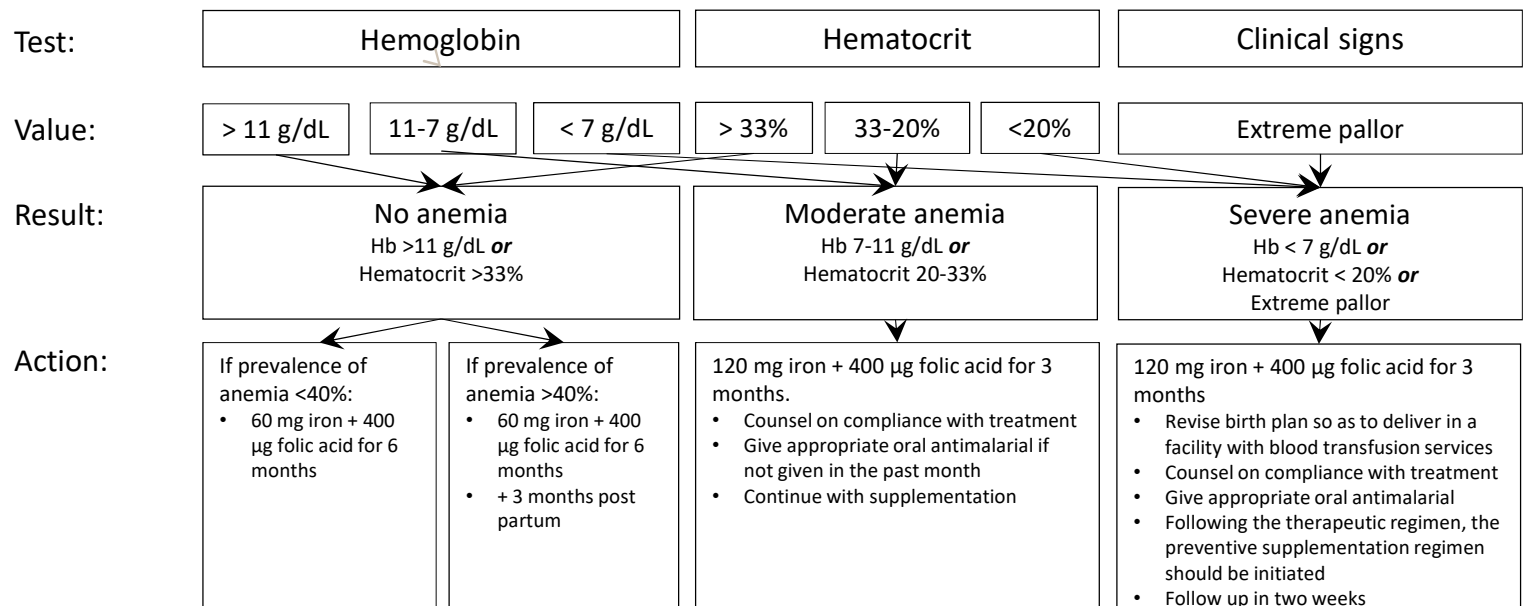
- Stages
- Program Rules
- Warnings, Errors, and “iButtons”
- Managements

Iron and folic acid supplementation during pregnancy (1,2,3)

Level of care: Community/Primary/Referral

All health workers

First antenatal care visit



All subsequent antenatal care visits

Hemoglobin or hematocrit measures if moderate or severe anemia has been identified at previous ANC, or if screening has not been performed at previous ANC. Follow decision flow-chart as for ANC1.

(1) Guidelines for the Use of Iron Supplements to Prevent and Treat Iron Deficiency Anemia. Washington: International Anaemia Consultative Group (INACG); 1998

(2) Guidelines for Essential Interventions, WHO; Pregnancy, Childbirth, Postpartum and Newborn Care: a guide to essential practice

(3) Definition of severe anaemia and recommended treatment regimens from Stoltzfus & Dreyfuss. Guidelines for the Use of Iron Supplements to Prevent and Treat Iron

Deficiency Anaemia. Washington: International Nutritional Anaemia Consultative Group (INACG); 1998. p.19 and 23

Collect data points from all sources

Context is King

- Facility registers, electronic systems, client cards, notebooks

The screenshot shows an Excel spreadsheet titled "Tracker_Master_All data elements.xlsx" with a green header bar. The ribbon includes File, Home, Insert, Draw, Page Layout, Formulas, Data, Review, View, and Help. The spreadsheet is organized into columns for different data sources: DHIS2, CHCP, FWV, FWA, Client cards, UHC Nurse, SACMO, and HA. Each source column has a specific color and a label indicating the source (e.g., "HISp Bangladesh M.H", "Online Preg reg", "ANC reg (options included, column W)", "Couple register", "Injectable PP card", "Delivery reg", "ANC reg", "Woman's EPI and TT", "Pregn registration (in own notebook - Non CSBA HA)", "CSBA-HA Preg registration notebook", "Options) written in page notebook"). The rows are organized into sections: "Data elements/data collectors" (rows 41-59), "Past pregnancy history" (rows 51-59), and "High BP" (rows 56-59). The data elements include LMP date, EDD, Gravida, Para, # live births, Number of alive baby (living children), # female children, # male children, Age of last child, Date of previous delivery, Mode of Previous Delivery, Outcome of Previous Delivery, Gender of previous pregnancy, Complications during pregnancy, High BP, Convulsions, Abortion, and Diabetes. The data is entered as 'X' for yes/true and blank for no/false.

	DHIS2	CHCP	FWV	FWA	Client cards	UHC Nurse	SACMO	HA
41 LMP date	X	X	X	X	X	X	X	X
42 EDD	Gen'x	Gen'x	Gen'x	Gen'x	Gen'x	Gen'x	Gen'x	Gen'x
43 Gravida/total pregs/number of current pregnancy	Gen'x	Gen'x	Gen'x	Gen'x	Gen'x	Gen'x	Gen'x	Gen'x
44 Para	Gen'x	Gen'x	Gen'x	Gen'x	Gen'x	Gen'x	Gen'x	Gen'x
45 # live births	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed
46 Number of alive baby (living children)	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed
47 # female children	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed
48 # male children	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed
49 Age of last child	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed	Gen'ed
50 Past pregnancy history								
51 Date of previous delivery								
52 Mode of Previous Delivery/ Previous H/O C-section	X	X	X	X	X	X	X	X
53 Outcome of Previous Delivery: Live birth/ Still birth	X	X	X	X	X	X	X	X
54 Gender of previous pregnancy	X	X	X	X	X	X	X	X
55 Complications during pregnancy	X	X	X	X	X	X	X	X
56 High BP	X	X	X	X	X	X	X	X
57 Convulsions	X	X	X	X	X	X	X	X
58 Abortion	X	X	X	X	X	X	X	X
59 Diabetes	X	X	X	X	X	X	X	X

Detailed algorithms for each data point

Context is King

F) Medical history

- Asthma
- Rubella vaccination status
- TT vaccination status
- Diabetes mellitus (1 or 2)
- Chronic hypertension
- Heart disease
- Tuberculosis

Referral rules

Blood pressure/
hypertension show/hide
and referral rules

Data elements (form name)	Data entry Options and format	Rules for Show/Hide	Urgent ANC referral	Not-urgent ANC referral	Flag: Facility birth recom	Flag: High risk pregnanc	Management: Counselin	Supplements/T	Management: (Man
Risks related to medical conditions									
49 Do you have asthma?	Yes/No	Always Show		IF "Yes" Refer to UHC/MCWC/Chandpur district hospital	IF referred				Asthma
50 Have you ever been told that you have asthma?	Yes/No	Always Show		IF "Yes" Refer to UHC/MCWC/Chandpur district hospital	IF referred				Heart disease
51 Have you ever been diagnosed with diabetes mellitus (1 or 2)?	Yes/No	Always Show		IF "Yes" Refer to referral center/UHC/BIRDEM/ Chandpur district hospital	IF referred				Pre-existing diabetes
52 Have you ever been told that you have diabetes mellitus (1 or 2)?	Yes/No	Always Show		IF "Yes" Refer to UHC/MCWC/Chandpur district hospital	IF referred				Chronic hypertension
53 Have you had any previous abdominal surgery?	Yes/No	Always Show							
54 Do you have tuberculosis or suspect that you have tuberculosis?	Yes/No	Always Show		IF "Yes" Refer to UHC/MCWC/Chandpur district hospital	IF referred				Suspected or active pulmonary tuberculosis
55 Do you have STD or suspect that you have STD?	Yes/No	Always Show							
56 Do you have other medical risk conditions?	free text	Always Show							
57 Have you had or are you vaccinated for Rubella?	Is vaccinated/Is not vaccinated or immunized	Always Show							
58 Rubella Counselling	Yes/No	Show IF "Rubella"="Is not vaccinated or immunized". Hide IF "Rubella"= Either "Is vaccinated" OR "Has had rubella"				IF Is not vaccinated OR immunized			
Physical examination									
60 Height (cm)	nnn cm	Show once, when it is filled out, it can be hidden		IF "Height" is <145 cm: Refer to UHC, MCWC OR Chandpur district hospital	IF referred				Low height (<145 cm)
61 Weight (kg)	nnn kg	Always Show							
62 BMI	nn	IF once calculated it can be hidden for further visits. Should be remaining until it is calculated		1) IF BMI <17 refer to Upazilla Health Complex, MCWC or Chandpur district hospital	IF referred		1) IF BMI <18,5 Management: Counsel the woman		Underweight 2) Obese
63 Systolic blood pressure (mmHg)	nnn mmHg	Always Show							
64 Diastolic blood pressure (mmHg)	nnn mmHg	Always Show							
65 Systolic blood pressure (mmHg)	nnn mmHg	Show IF systolic >=140 OR >=90 diastolic; Hide IF systolic >=140 OR >=90 diastolic; AND/OR systolic >140: refer to UHC, MCWC OR Chandpur district hospital			IF referred		IF >=20 AND systolic blood pressure >140 AND 1) IF GA <20 week IF >=20		
66 Diastolic blood pressure (mmHg)	nnn mmHg	Show IF systolic >=140 OR >=90 diastolic; Hide IF systolic >=140 OR >=90 diastolic; AND/OR systolic >140: refer to UHC, MCWC OR Chandpur district hospital			IF referred		IF >=20 AND systolic blood pressure >140 AND 1) IF GA <20 week IF >=20		
67 Temperature (F)	nnn.n	Always Show		IF >102 F; Refer to Upazilla Health Complex, MCWC or Chandpur district hospital	IF referred				Fever
68 What kind of anemia screening did you do?	Hemoglobin/Colorscale/Pallor index	Always Show							
69 Pallor (symptom of anemia)	No pallor/Mild pallor(+)/Moderate pallor(++)/Severe pallor(+++)	Show IF "What kind of anemia screening did you do?"= "Severe pallor"; Refer to UHC, MCWC OR Chandpur district hospital			IF referred		IF "Moderate pallor" OR "Mild pallor"; "2 1) Severe anemia 2) Moderate anemia 3) Mild anemia 4) No anemia"		
70 Jaundice	Yes/No	Always Show		IF "yes" refer to Upazilla Health Complex, MCWC or Chandpur district hospital	IF referred				"Jaundice"
71 Convulsions	Yes/No	Show IF GA >=20		IF "yes" refer to Upazilla Health Complex, MCWC or Chandpur district hospital	IF referred				"Eclampsia"
72 Edema	Yes/No	Show IF >=20 weeks of gestation. Hide IF <20 weeks of gestation							
73 Edema of the feet	Mild/Moderate/Severe	Show IF "Edema" = "yes". Hide IF "Edema" is "no"		IF "Severe". Refer to Upazilla Health Complex, MCWC or Chandpur in appropriate time	IF referred				Severe edema, face
74 Edema of the hands	Mild/Moderate/Severe	Show IF "Edema" = "yes". Hide IF "Edema" is "no"		IF "Severe". Refer to Upazilla Health Complex, MCWC or Chandpur in appropriate time	IF referred				Severe edema, feet
75 Edema of the face	Mild/Moderate/Severe	Show IF "Edema" = "yes". Hide IF "Edema" is "no"		IF "Severe". Refer to Upazilla Health Complex, MCWC or Chandpur in appropriate time	IF referred				Severe edema, hands
76 Any other symptoms to be recorded?	free text	Always Show							
Obstetric/Abdominal examination									
77 How many fetuses palpable?	No fetus palpable/One fetus/Two fetuses/Three or more fetuses	Show from week 12, Hide before week 12		IF "More than one fetus in womb" Refer to UHC, MCWC OR Chandpur district hospital	IF referred				"Twins"/"Triplets"/"Quadruplets"
78 Fetal heart sound (FHS)	Present/Not heard/Not measured	Show from >=20 weeks. Hide before week 20.		IF >=28 weeks of gestation AND = fetal sound "Absent"	IF referred				Either "Negative" OR "Positive"
79 Fetal heart rate (beats/minute)	nnn	Show IF >=28 weeks of gestation AND "Fetal heart sound"= "Present" 1) <110 OR 2) >160 AND gestational age is >=28 weeks. Refer to UHC, MCWC OR Chandpur district hospital			IF referred				1) Fetal bradycardia 2) Fetal tachycardia
80 Fundal height measurement (cm)	nn	Show IF "One fetus" AND Gestational age is >= 16 weeks (international guidelines). IF >24 weeks of gestation AND a discrepancy of +/- 3=three IF referred			IF referred				1) Minus 3 cm discrepancy 2) Plus 3 cm discrepancy
81 Position of baby in womb	Head/Breech/Transverse/Ukno	Show >= weeks 32, Hide <W32		IF "Breech"/"Transverse"/"OR IF Condition is flagged as "This woman should give birth in hospital"					Condition should be taken into account

Menu

Ane Lunde - Age 21

* High risk pregnancy

EDD 2017-10-08

* Unmanaged condition

Gest. age: 9+3

G/P/Ab: 1/0/0



Clinical examination (الفحص الكلينيكي)

Previous values

Report date	Gest.Age at visit	Systolic blood pressure (mmHg)	Diastolic blood pressure (mmHg)	Edema	Cerebral or visual symptoms of hypertension	Body weight (kg)	Fetal heart sound (FHS)	Fundal height measurement (cm)	Presentation
2017-01-04	0	120	80	No		58			

Data element

Value

Systolic blood pressure (mmHg)

140

Diastolic blood pressure (mmHg)

80

Edema

☐ Yes ☒ No

Body weight (kg)

62

Have there been any other medical or surgical conditions identified since the previous visit?

☐ Yes ☒ No

Medications (العلاج)

Previous values

Report date	Gest.Age at visit	Medication(s) prescribed during this visit	Other medications the woman is currently taking
2017-01-04	0	FeFO	

Profile | Edit



Risks related to current pregnancy



Risk date	Risk	Gestational age	Status
2017-03-08	Chronic hypertension	9	<input checked="" type="checkbox"/>

Notes



Add new note here

Save note

No notes exist

Menu

Ane Lunde - Age 21

EDD 2017-10-08

Gest. age: 9+3

G/P/Ab: 1/0/0



Data element

Value

Medication(s) prescribed during this visit

FeFO

Other medications the woman is currently taking

Complete

Delete

Generate PDF

Antenatal care management



Management date	Gestational age	Condition	Management	Performed	Status
2017-03-08	9	400 µg folic acid	FolicSupplements	✓ Yes	
2017-03-08	9	First routine ultrasound	RefUltra	✓ Yes	
2017-03-08	9	Measure hemoglobin ABO & RH	RefLab	✓ Yes	
2017-03-08	9	Screening for glucose in urine	RefLab	✓ Yes	
2017-03-08	9	Screening for protein in urine in booking visit	RefLab	✓ Yes	
2017-03-08	9	Urine analysis for UTI	RefLab	✓ Yes	

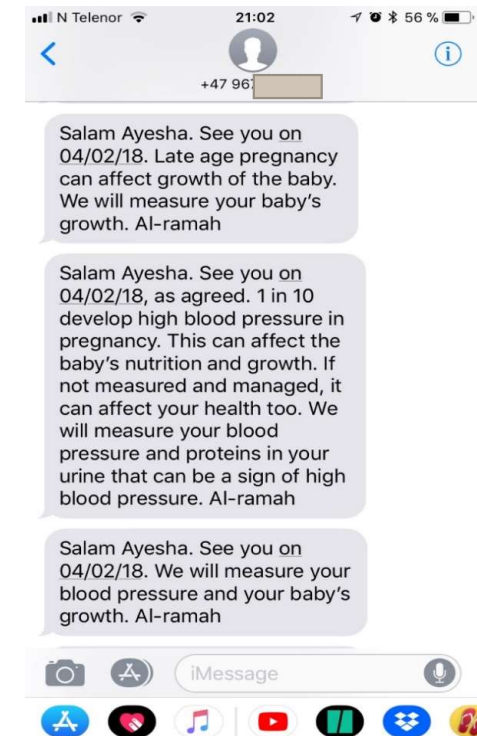
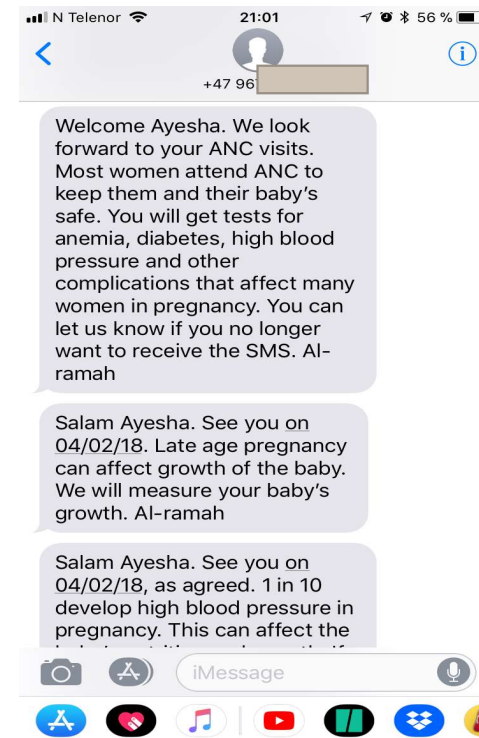
Managements and Risks Widgets

- “CREATEEVENT”

ProgramRuleAction -> Widget displays all management and risks events within ANC stages

Targeted client communication by SMS

- HBM (formative research)
 - Perceived susceptibility
 - Perceived severity
 - Perceived benefit
- Model of actionable feedback:
 - Customizable/actionable
 - Non-punitive
 - Individualized
 - Timely
- Nudge style used:
 - Enhanced active choice & gain framed
 - Featuring statistics
 - Calling by name
 - Identifying the trusted source
 - Social nudging



SMS Triggers within MCH Program

Message category	When ?	To whom?
Welcoming/introductory SMS	Within 24-hours after booking	All pregnant women who agreed to receive SMS
Persuasive SMS	One week before scheduled appointment for the <i>'five sentinel visits'</i>	<ul style="list-style-type: none"> • Women scheduled within the GA for the <i>'five sentinel visits'</i> • NOT diagnosed with specific HR condition (Anemia, GDM, HDP, FGR) targeted at that specific GA
Risk-factor SMS	Three days before scheduled appointment	Women with risk-factor/s for specific high-risk condition BUT NOT diagnosed with it
Reminder with purpose	24-hours before scheduled appointment for the <i>'five sentinel visits'</i>	Women who are scheduled within the 'window period'
Reminder (simple)	24-hours before ANY scheduled appointment	All appointments scheduled outside of the for the <i>'five sentinel visits' which is 'window period'</i>
Reminder: missed appointment	24-hours after MISSED scheduled appointment	All women who missed scheduled appointment
Continuity of care focused SMS	24-hours around term (last) visit and NOT scheduled for any ANC	All pregnant women who reached term (attended the last scheduled visit for ANC) and not scheduled for any ANC
PNC/NBC SMS	24-hours after the first PNC/NBC visit	All postpartum women who attended first PNC/NBC services, or whose birth outcome is registered in the MCH eRegistry
PNC	24-hours before reminder for 2 nd Postpartum care visit	Postpartum women who attended first PNC and scheduled next visits



Guidelines

Iron and folic acid supplementation during pregnancy (1,2,3)

Level of care: Community/Primary/Referral
All health workers

First antenatal care visit

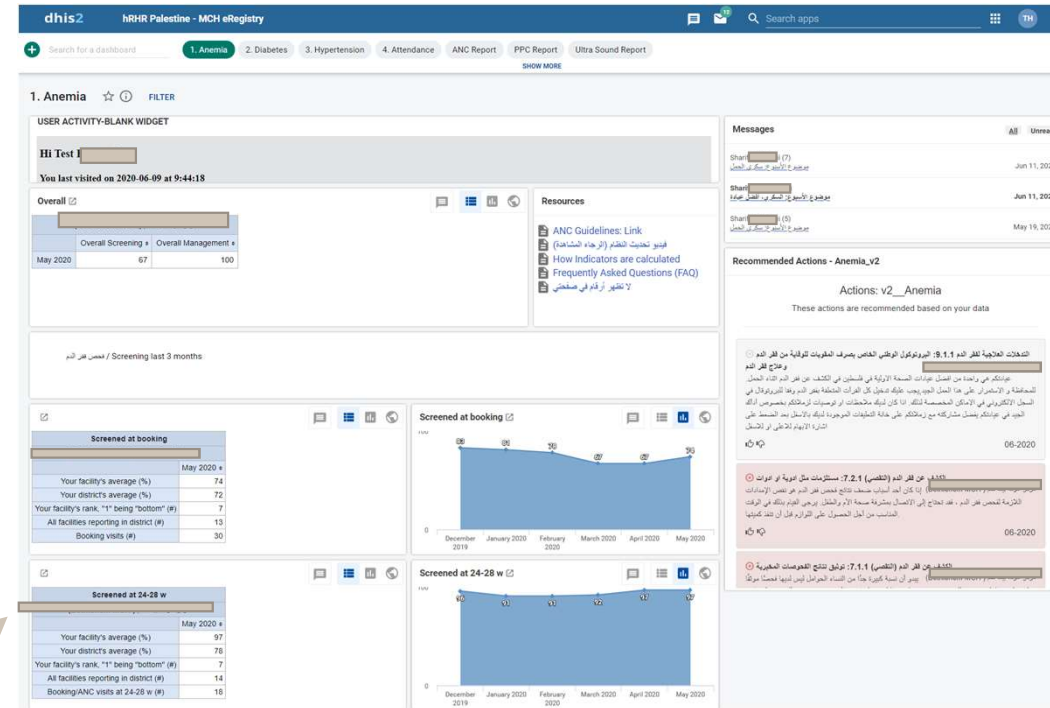
Test:	Hemoglobin	Hematocrit	Clinical signs
Value:	> 11 g/dL	11-7 g/dL	< 7 g/dL
Result:	No anemia Hb >11 g/dL or Hematocrit >33%	Moderate anemia Hb 7-11 g/dL or Hematocrit 20-33%	Severe anemia Hb < 7 g/dL or Hematocrit < 20% or Extreme pallor
Action:	If prevalence of anemia <40%: • 60 mg iron + 400 µg folic acid for 6 months If prevalence of anemia >40%: • 60 mg iron + 400 µg folic acid for 6 months • + 3 months post partum	120 mg iron + 400 µg folic acid for 3 months • Counsel on compliance with treatment • Give appropriate oral antimalarial if not given in the past month • Continue with supplementation	120 mg iron + 400 µg folic acid for 3 months • Revise birth plan so as to deliver in a facility with blood transfusion services • Counsel on compliance with treatment • Give appropriate oral antimalarial • Following the therapeutic regimen, the preventive supplementation regimen should be initiated • Follow up in two weeks

All subsequent antenatal care visits

Hemoglobin or hematocrit measures if moderate or severe anemia has been identified at previous ANC, or if screening has not been performed at previous ANC. Follow decision flow-chart as for ANC1.

- (1) Guidelines for the Use of Iron Supplements to Prevent and Treat Iron Deficiency Anemia. Washington: International Anaemia Consultative Group (INACG); 1998
- (2) Guidelines for Essential Interventions, WHO; Pregnancy, Childbirth, Postpartum and Newborn Care: a guide to essential practice
- (3) Definition of severe anaemia and recommended treatment regimens from Stoltzfus & Dreyfuss. Guidelines for the Use of Iron Supplements to Prevent and Treat Iron Deficiency Anemia. Washington: International Nutritional Anaemia Consultative Group (INACG); 1998. p.19 and 23

Feedback and Reporting



eRegistry





Shared client record to promote continuity and quality of care

Implementation Challenges

Context is King

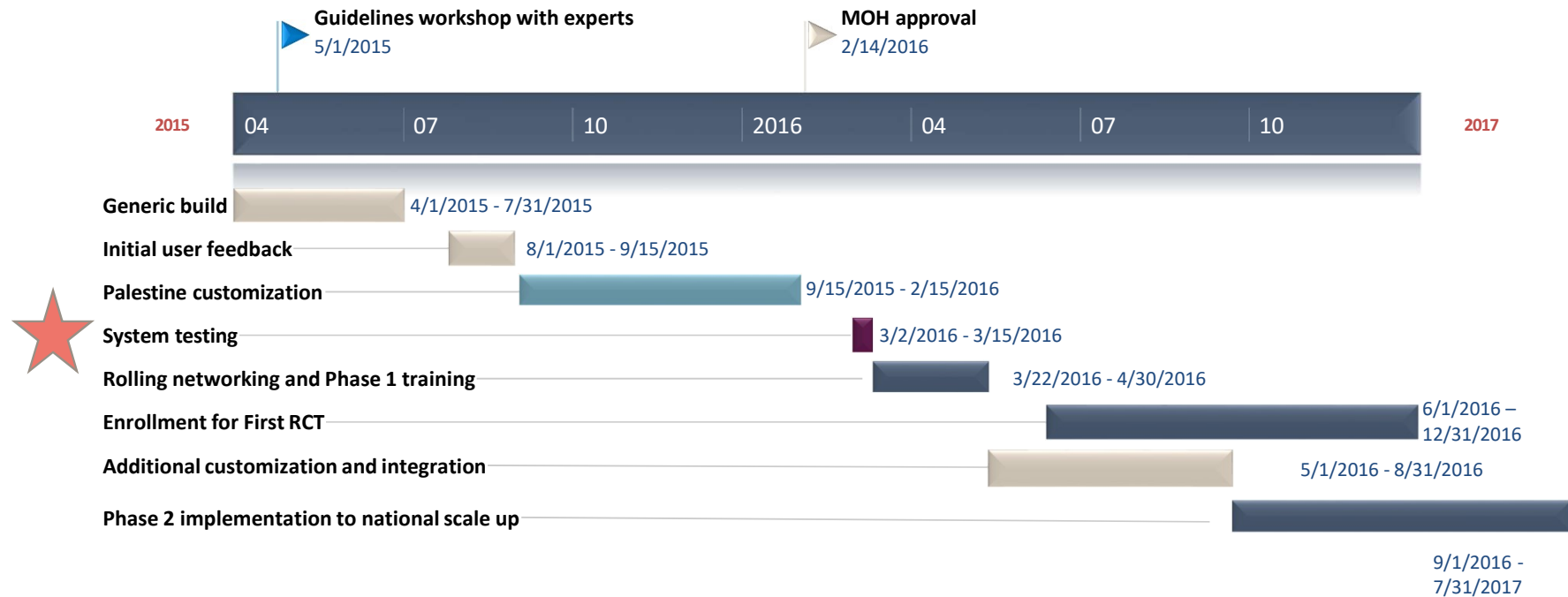
- What we prepared for from the start...
 - Identification
 - Safety and privacy
 - Networks and coverage
 - Technological literacy
 - Governance and coordination
 - Legacy structures and behavior
 - Community of learning & practice
 - Standards and evidence
 - Advocacy and support
- ...*And our biggest roadblocks*
 - Tracker Technology Readiness
 - Performance and reliability at scale → unexpected crashes
 - No realistic test environment at scale → tested on production
 - Records shared by Android and browser users
 - Multi-stage analytics
 - “Look-back” Automated SMS Trigger
 - Autogenerated Client ID based on Org Unit
 - System ownership & access rights
 - Maintenance of DHIS 2.29 Branch + custom eReg app + custom Android
 - Multiple MoH branches & coordination
 - Integration with legacy systems (Palestine)
 - Duplicated data entry on paper (Bangladesh)

Dashboard Requirements and DHIS2 Development

Technical Requirement (c. 2016)	Generic DHIS2 as of 2016	New DHIS2 Core (2018)	DHIS2 custom features	DHIS2 2.31 core?? (2019)	Outside DHIS2 (Python3)
Dashboard shared only with clinician	X				
Percentage indicators of program data	X				
Pivot tables and charts	X				
Custom period boundary & “rolling avg”		X			
Count most recent value in enrollment	X				
Count any value in enrollment (d2:countIfValue)		X			
Validation instructions		X			
Validation Rules on DASHBOARD			X 		
Scheduled validation analysis		X			
Analyze patients by visit clinic	X				
Analyze patients by enrolling clinic	X				
Analyze patients by “ ownership ” clinic				X	
Show facilities “ district rank ” via dashboard					X 

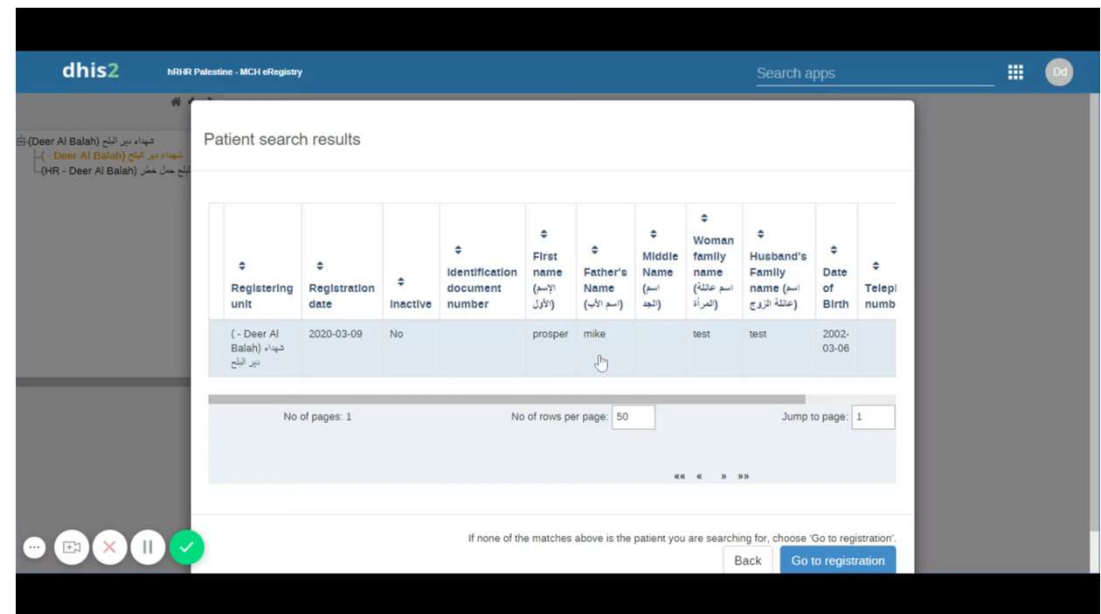
Timeline Overview: 2015 - 2017

Context is King



eRegistries features possible through HISP Collaboration

- Search for records nationally
- Audit log before opening if record from outside OU
- Share stages by user groups
- Enter raw data -> Validate & generate risks, managements, and referrals
- Scheduling next visit
- Automated SMS to pregnant woman
- Exporting longitudinal registry data, linked to SMS sent
- Quality feedback dashboard shows validation results



Key Implementation Lessons

Context is King

Palestine

- Network connection and server reliability
- Built strong competence with hardware / software
- Connecting to existing systems
- Two MOHs + Research team requires communication
- RCT + implementations = mutually reinforcing rigor

Matlab

- Usability of shared record at community level
- Android compatibility/ performance with program rules
- User group sharing
- Retraining is key – need a large team to support!
- Testing point-of-care system takes time and commitment

Research

Mahima Venkateswaran

Kjersti Mørkrid

Types

eRegistries research

- Cluster randomized controlled trials
 - Using an eRegistry for fidelity and data collection of other health interventions
 - Health systems research and epidemiology
 - Qualitative research for design of DHIs
 - Implementation research
-
- Overall methodology: longitudinal data collection that supports DHIs

eRegQual

Type: cluster randomized controlled trial

- Objective: assess effectiveness of eRegistry's clinical decision support compared to paper-based records on the quality of antenatal care
- 60 clusters with eRegistry vs. 60 clusters using paper records
- 6367 pregnant women in the trial

eRegQual

Type: cluster randomized controlled trial



Antenatal care (ANC)

Process outcomes: screening
and management

Anemia

Diabetes

Hypertension

Fetal growth
monitoring

Malpresentation

ANC
attendance

Labor and delivery

Adverse pregnancy outcomes

Moderate/severe anemia

Large for gestational age baby

Severe hypertension

Small for gestational age
baby undetected during ANC

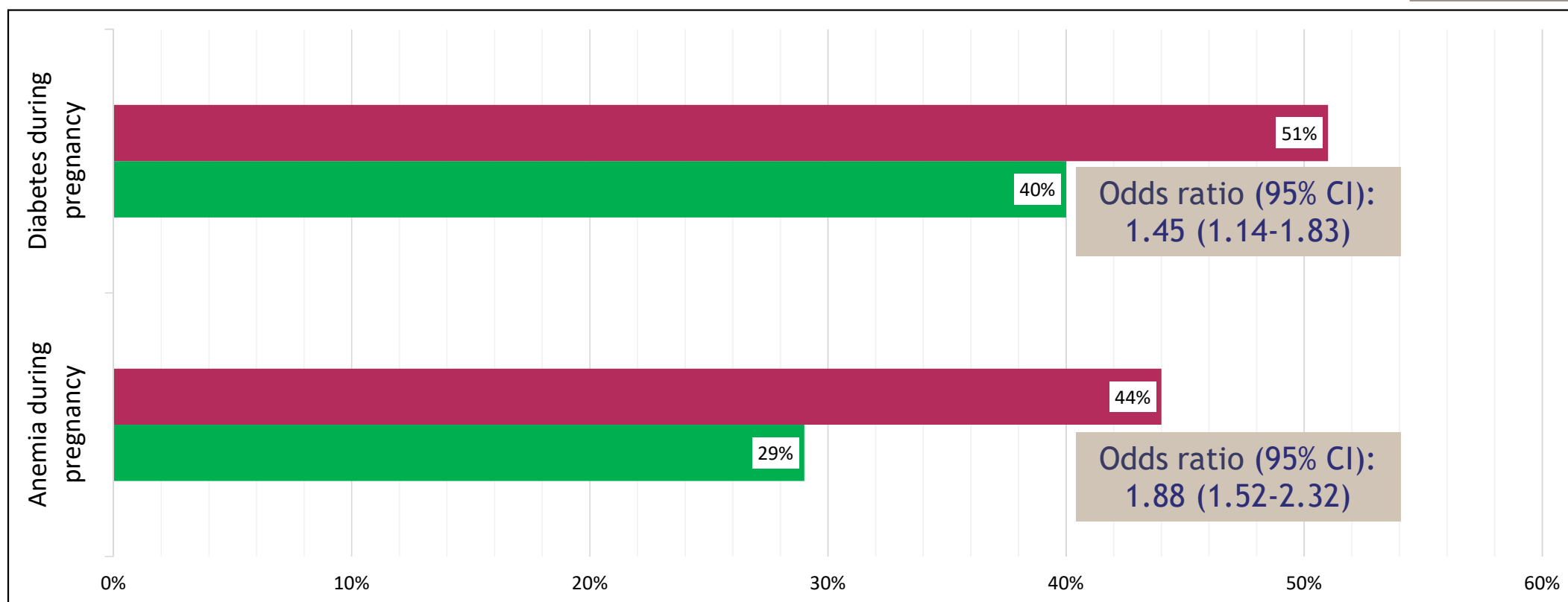
Malpresentation at labor
undetected during ANC

eRegQual

Type: cluster randomized controlled trial

Non-eRegistry
clinics

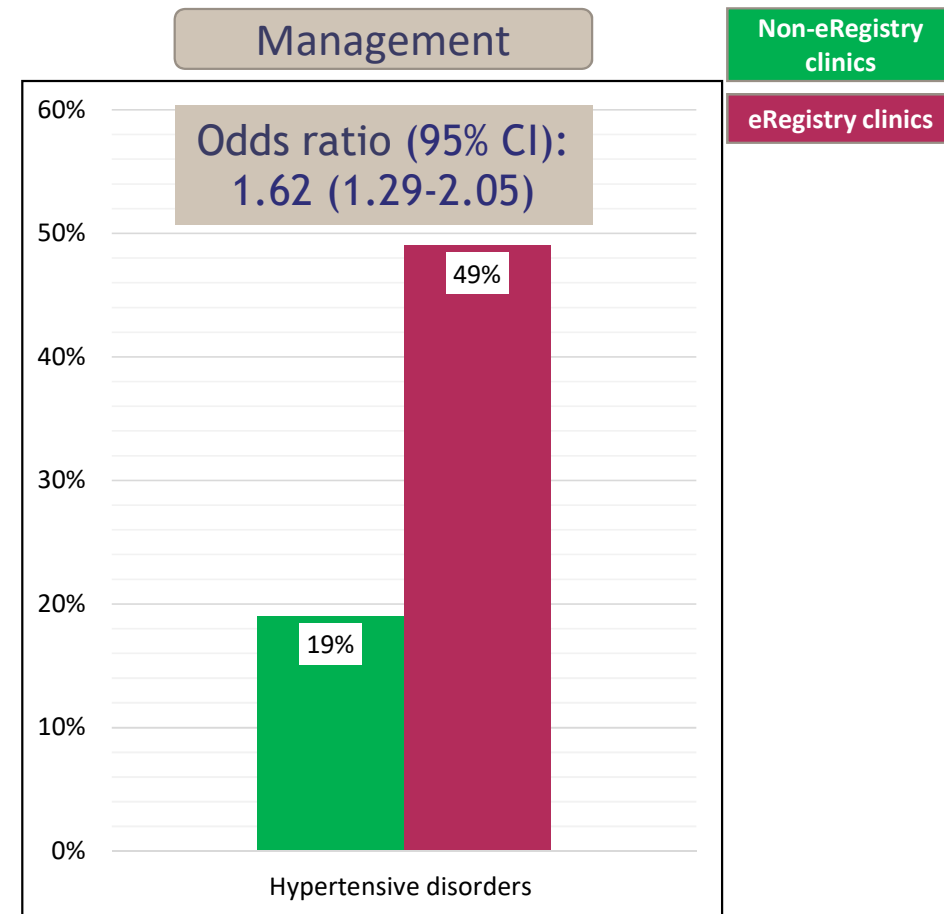
eRegistry clinics



eRegQual

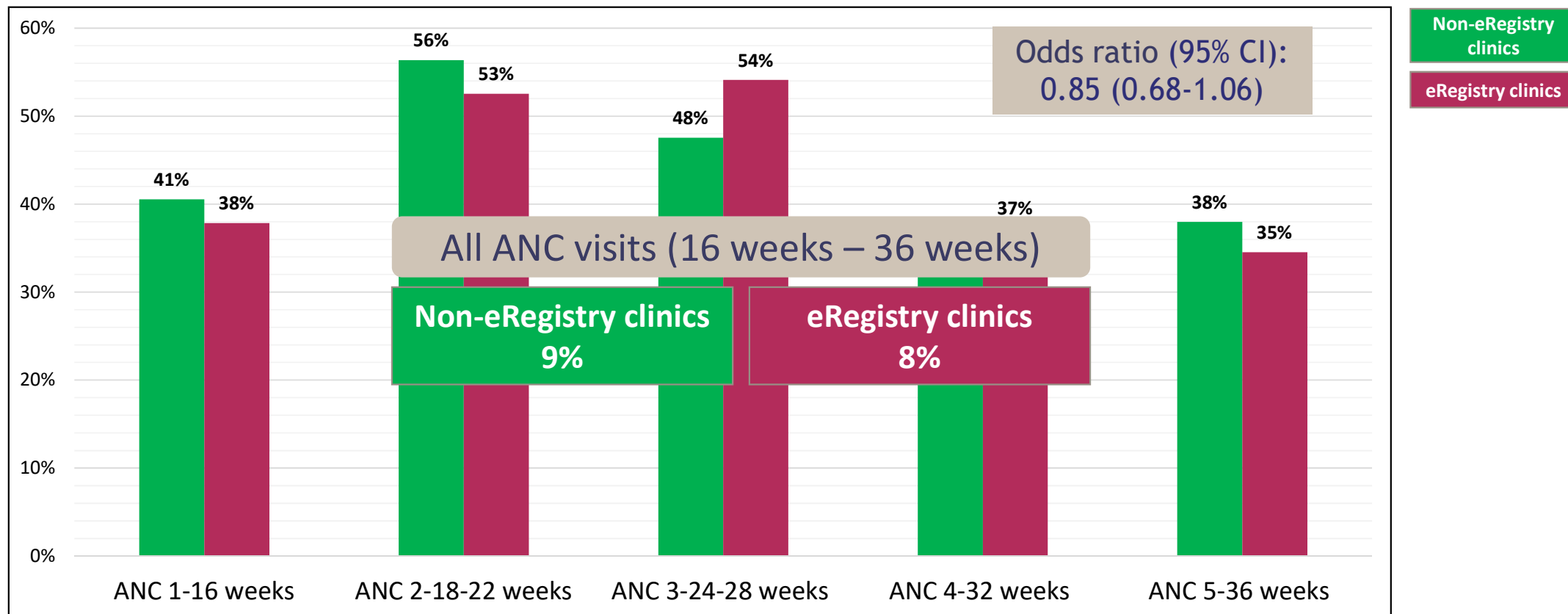
Type: cluster randomized controlled trial

- High baseline screening (blood pressure measurement)
 - Non-eRegistry clinics: 95%
 - eRegistry clinics: 96%



eRegQual

Type: cluster randomized controlled trial



eRegQual

Type: cluster randomized controlled trial

Moderate/severe anemia

Large for gestational age baby

Severe hypertension

Small for gestational age
baby undetected during ANC

Malpresentation at labor
undetected during ANC

Odds ratio (95% CI):
0.99 (0.87-1.12)

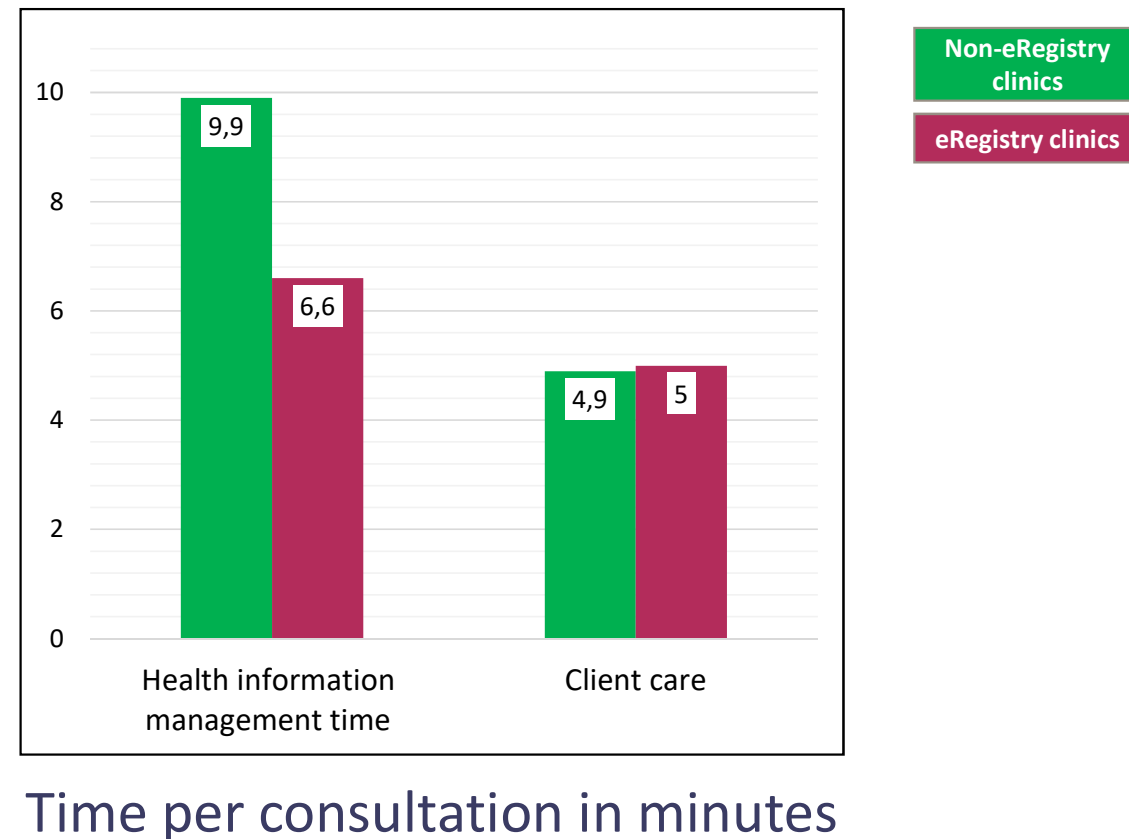
Non-eRegistry clinics
21.9%

eRegistry clinics
21.7%

eRegTime

Type: cluster randomized controlled trial

- Objective: time spent on information management in eRegistry vs. non-eRegistry clinics
 - Reading from files
 - Writing, reporting
 - Finding files
- 24 clinics, direct observations to record 'time-motion' data



eRegMat

Type: cluster randomized controlled trial

- Objective: assess effectiveness of an eRegistry with DHIs compared to an eRegistry without DHIs on the quality of antenatal care
- 29 clusters with an eRegistry vs. 30 clusters with an eRegistry PLUS
 - Clinical decision support
 - Feedback dashboard with action items
 - Targeted client communication via SMS
- Primary outcomes
 - Appropriate screening/management of hypertension → clinical decision support
 - Timely antenatal care attendance → SMS
- Secondary outcomes
 - Morbidity/mortality in the perinatal period → SMS, clinical decision support

7500 pregnant
women enrolled

eRegMat

Type: cluster randomized controlled trial

- Example of sub-study – assessment of Element biometrics
 - Successfully identified on the first attempt

Palm-based
biometric: 84%

Name-based
DHIS2: 61%

- Mean number of attempts needed to identify

Palm-based
biometric: 1.2

Name-based
DHIS2: 1.5

eRegistries for effective coverage of ANC

Type: eRegistry for fidelity/data collection of other health interventions

- Uganda
- Objective: Strengthening uptake, equity and quality of ANC by innovating the health information systems of the public health facilities using an eRegistry
 - Implementation research for DHIs by assessing and responding to factors for implementation at scale.
 - Cluster randomized trial: ANC4 schedule vs. the new ANC8

eRegCom

Qualitative research for design of DHIs - Quality Improvement Dashboard (QID)

- Designing a QID for healthcare providers through the understanding of the current supervision practice, preferences and needs, and the relationship to technology, data interpretation, and other factors
- Human Centered Design framework and the Model of actionable feedback: timely, individualized, customizable, non-punitive
- 18 in-depth interviews; 3 focus group discussions; observations, document & process review, and continued discussions and improvements

Quality improvement dashboard

Timely

- Finding: Irregular supervision, critical issues not timely addressed
- QID: Real time data – prompted weekly for a selected priority theme

Individualized

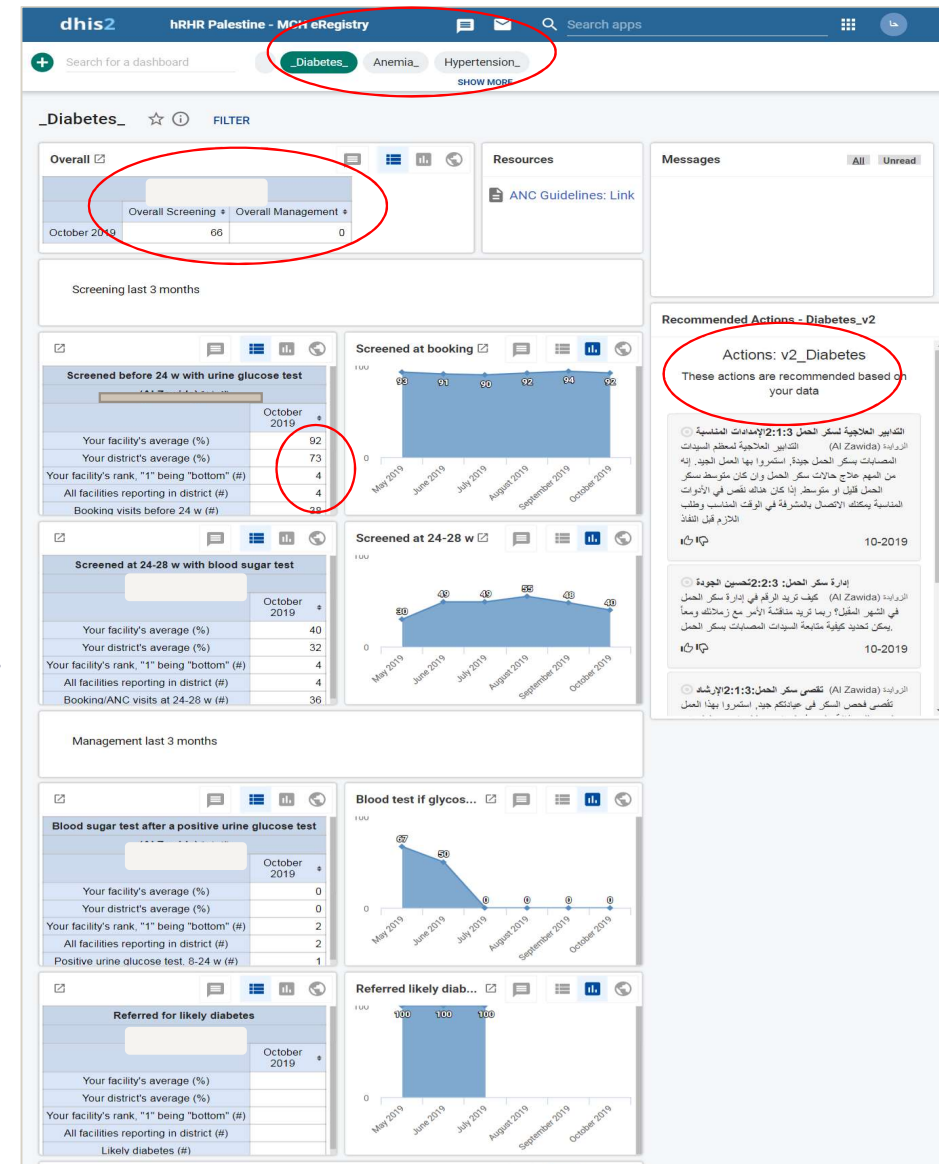
- Finding: Clinic level, completion of files, lack of skill for reading charts and graphs, indicators presented as fractions
- QID: Clinic level, room for improvement, no “mandatory” interaction with supervisors, understandable - color coding, FAQ

Non Punitive

- Finding: Concerned about being compared, feelings of being treated unfairly and punished
- QID: Compares with peer performance, training – quality improvement tool for them

Customizable

- Finding: Take clinical judgement, no existing culture of flexibility
- QID: Training - no expectation of 100%



eRegCom

Qualitative research for design of DHIs - Targeted client communication (TCC)

- Designing and evaluating a TTCC via SMS intervention to pregnant women through the identification of how pregnant women perceive their risks of getting anemia, hypertension and diabetes during pregnancy, in addition to benefits and barriers of attending ANC
- Co-design process with users, Health Belief Model , also nudging, MAF
- 8 in-depth interviews with women, and 8 with healthcare providers

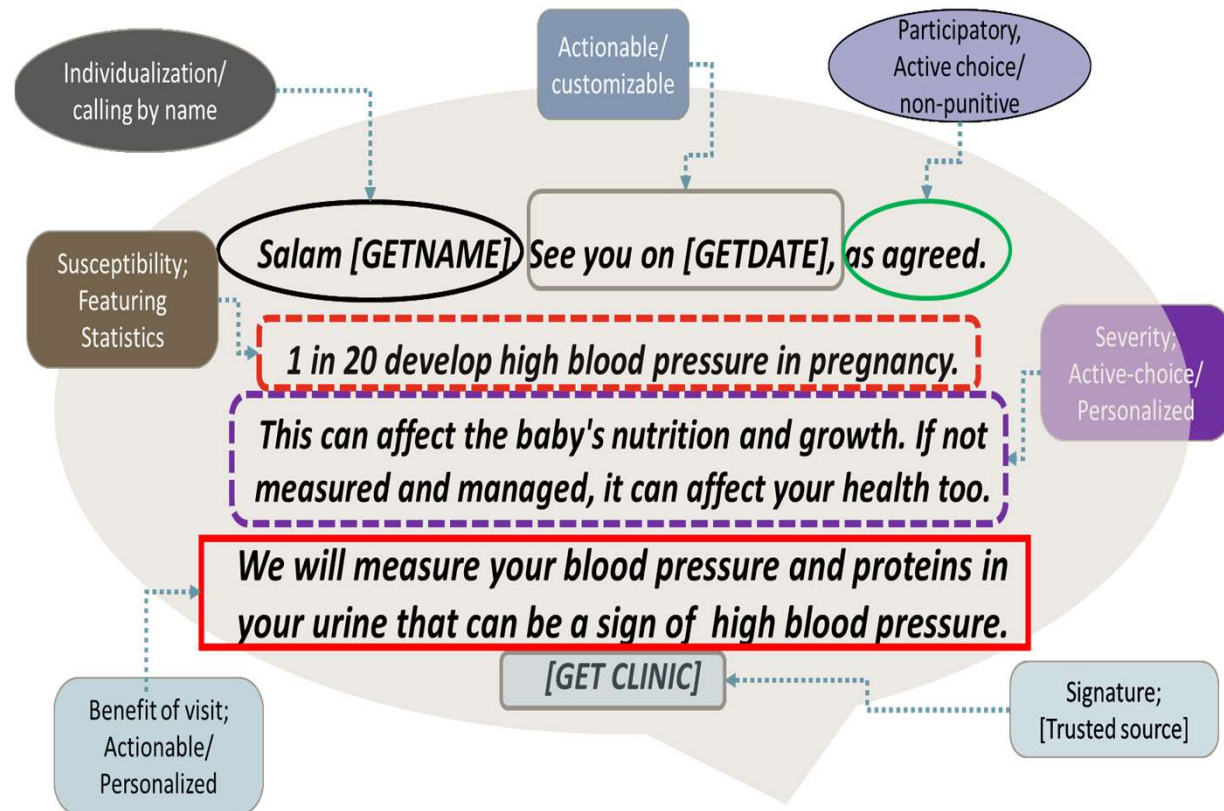
Targeted client communication via SMS

Text messages sent:

- At registration - welcome message
- One week prior to a timely scheduled visit
- Three days prior to a timely scheduled visit – only to women with risk factors for anemia, hypertension, diabetes
- 24 hours prior to a visit
- 24 hours after a missed timely scheduled visit

ANC visit and focus area:

- 16 weeks - fetal growth and wellbeing
- 18-22 weeks - hypertensive disorders
- 24-28 weeks - gestational diabetes and anemia
- 32 weeks - fetal growth
- 36 weeks - anemia

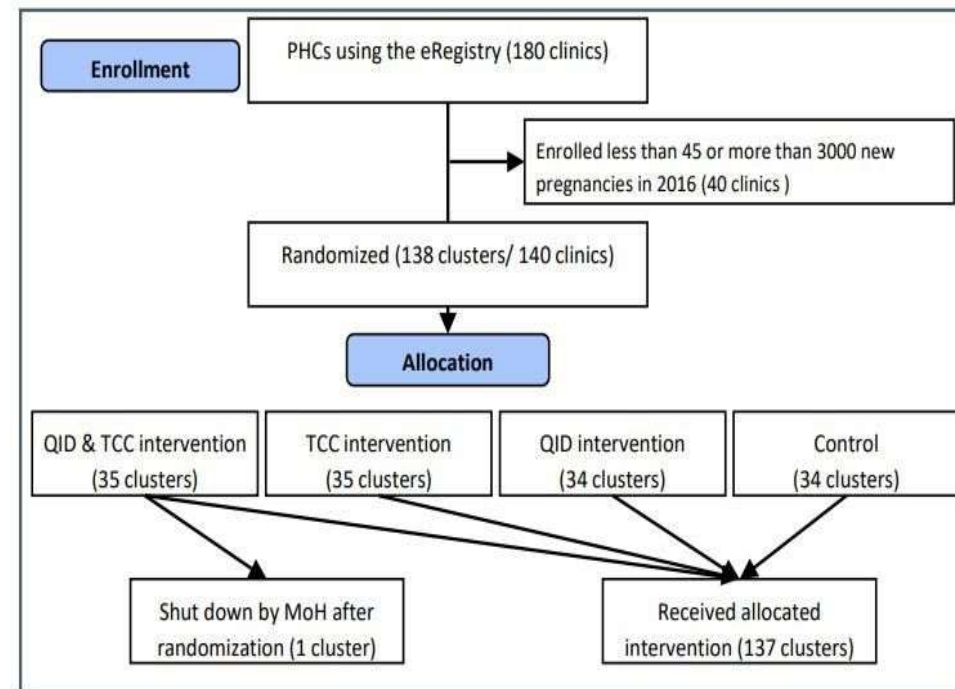


eRegCom

Cluster randomized controlled trial

- To estimate the effectiveness of the eRegistry's:
 - Quality Improvement Dashboard on improving appropriate screening and management for anemia, hypertension and diabetes during pregnancy by the healthcare provider
 - Targeted Client Communication on improving timely attendance to ANC by the woman
 - QiD and TCC interventions combined on the measures described above,

compared to the basic eRegistry



eRegCom

cRCT – preliminary results

QID on improving quality of care at 24-28 weeks

Anemia

- Screening: 59% (contr) vs. 63% (QID)
- Management: 18% (contr) vs. 9% (QID)

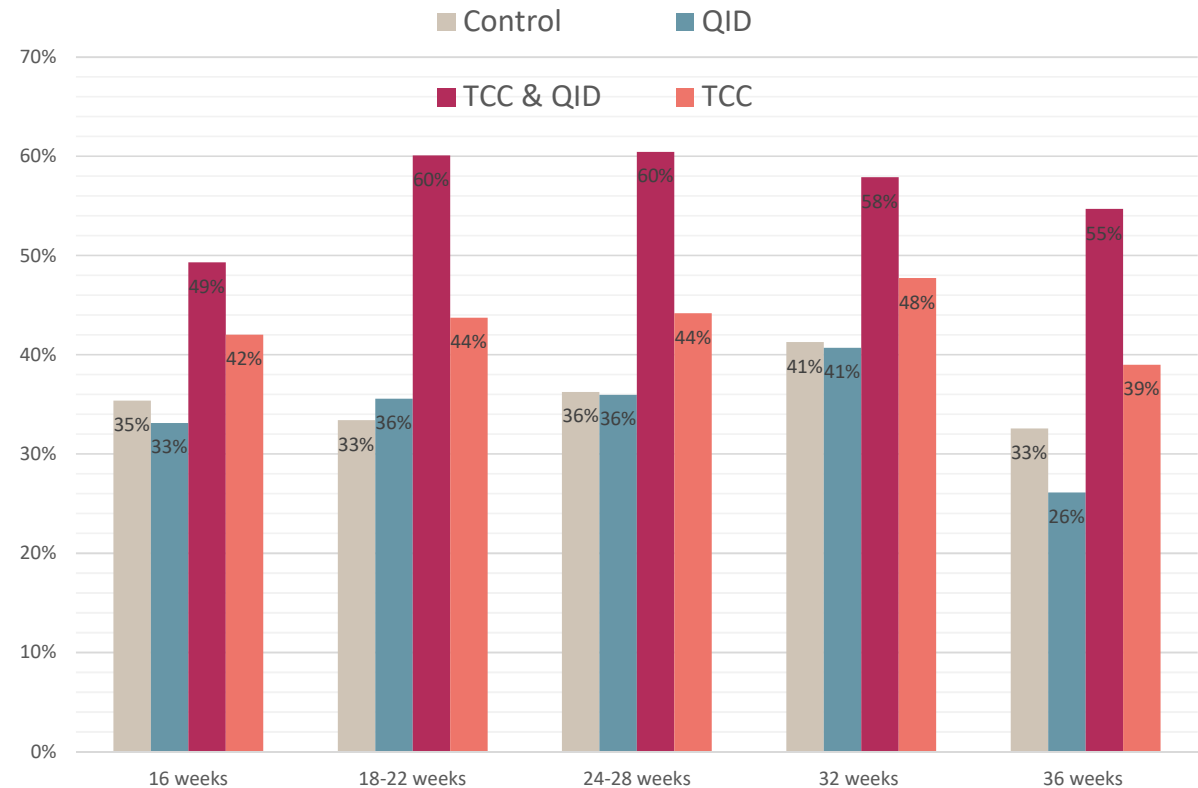
HT

- Screening 99% (contr) vs 99% (QID)
- Management 90% (contr) vs. 92% (QID)

Diabetes

- Screening 55% (contr) vs 57% (QID)
- Management 45% (contr) vs 45% (QID)

TCC on improving timely attendance to ANC



DHI to improve immunization and growth monitoring

Implementation research

Rwanda

- The Design and Implementation of a DHI to improve growth-monitoring for the Identification and Management of Malnutrition in Rwanda
 - Assessment of the national nutrition program for children under two years of age, and its growth monitoring service provision and utilization - HOT-FIT framework and Health Belief Model
- The Design and Implementation of a DHI to improve childhood immunization program in Rwanda
 - Assessment of the childhood immunization program for infants 0 -15 months of age in public health facilities, with regards to the data quality, effective coverage, and inequalities - HOT-FIT framework

Next steps

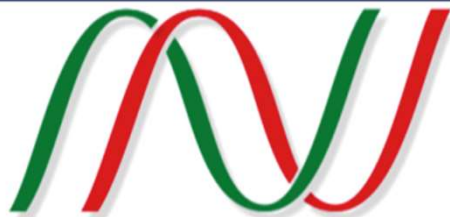
- Design a DHI based on the findings to “close the gap”
- A process evaluation of an implementation of a DHI



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المعهد الوطني الفلسطيني للصحة العامة
The Palestinian National Institute of Public Health



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Thank you



**eRegistries
Initiative**