The Impact of Health Systems Research in Supporting In-Patient Paediatric Services in Kenya's Primary Referral Hospitals.

Fredrick N Were

MBCHB, MMED, FPNM, MD, EBS

Professor of Perinatal and Neonatal Medicine,

University of Nairobi

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Taifa Hall

DEDICATION

My Late Son Kizito Wafula

Passed in 2003 [tender age of 20 years]

My Late Brother Paul Albert

Passed in 2000 [young age of 54]

**And of course my late parents
The most humble and most family committed Domasus and
The Master of Behaviour Correction Teresia**

Scope of the thesis presentation

- Introduction
- Rationale and methods for the research and publications
- Rationale and conceptualization of the thesis
- Findings, Interpretations and Discussions
- Contribution of the research and thesis to society

Introduction
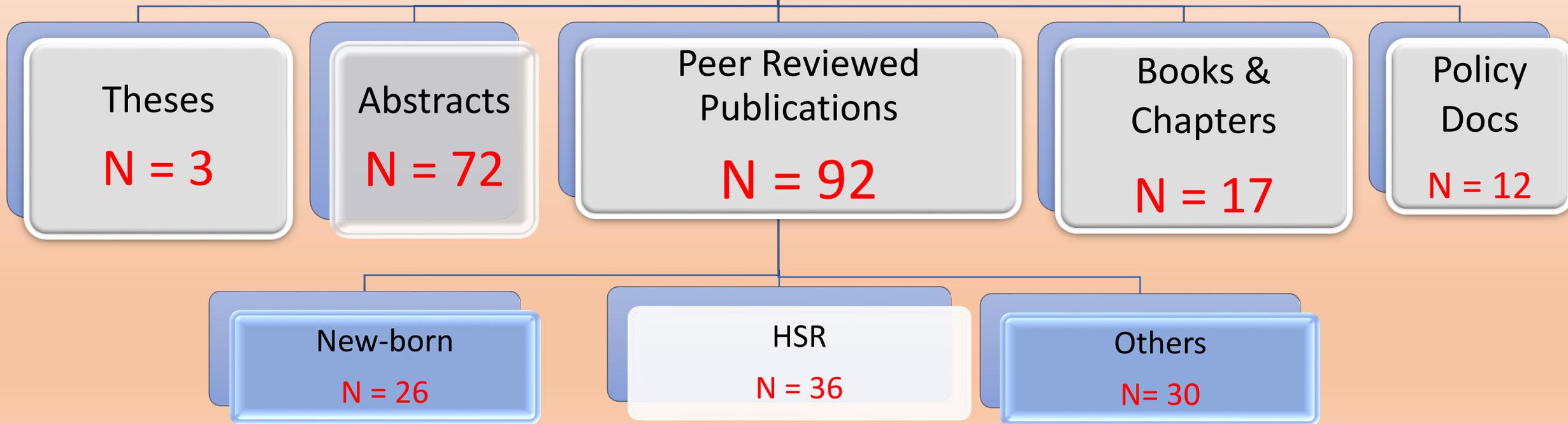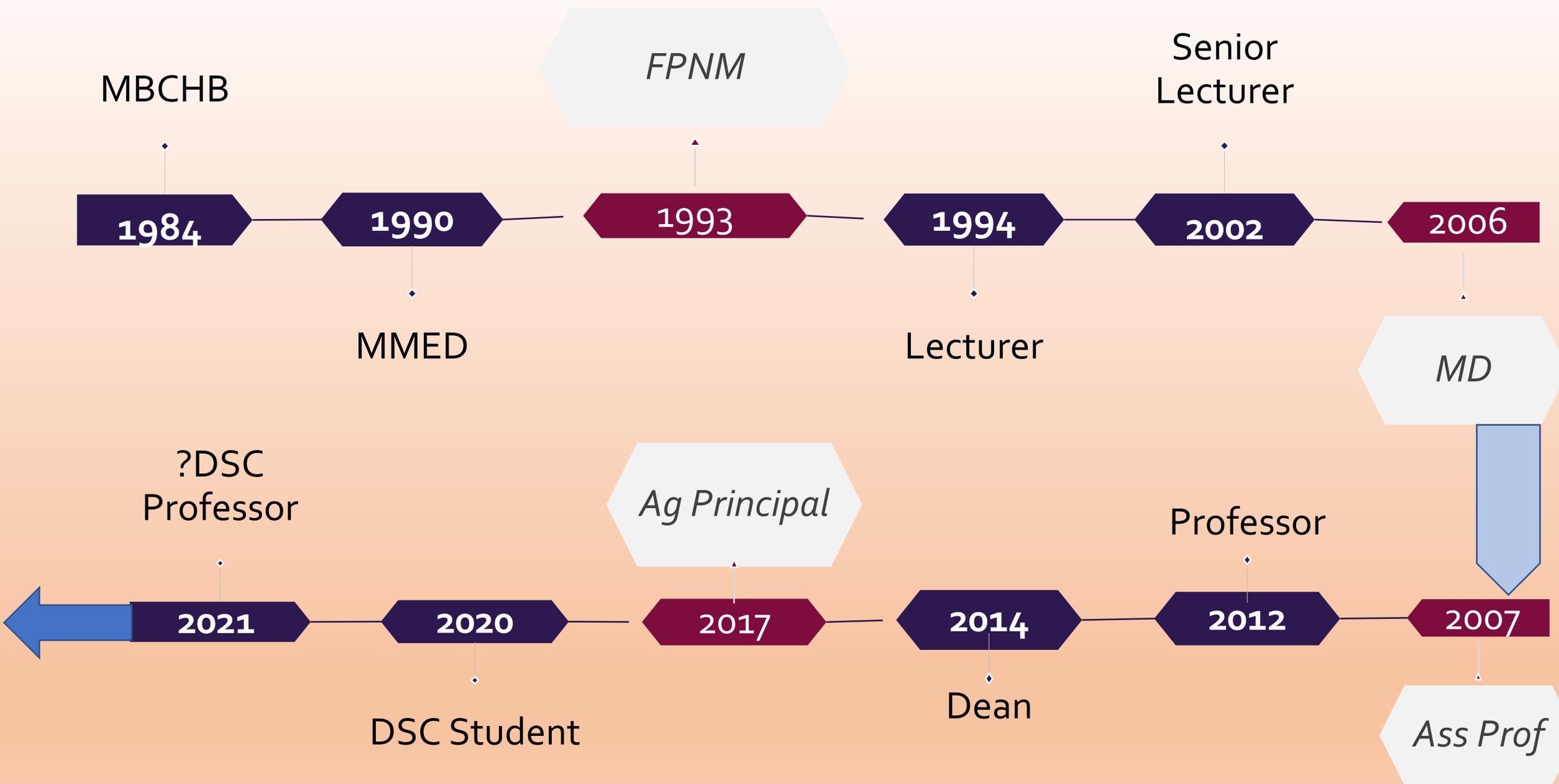
Child survival trends from 1990 -2005

http://www.un.org/en/development/desa/population/publications/mortality/child-mortality-report-2018.shtml,

Source: Welfare monitoring Survey II1994, Situation Analysis of Women & Children 1989 , KDHS 1998, 2003, 2008
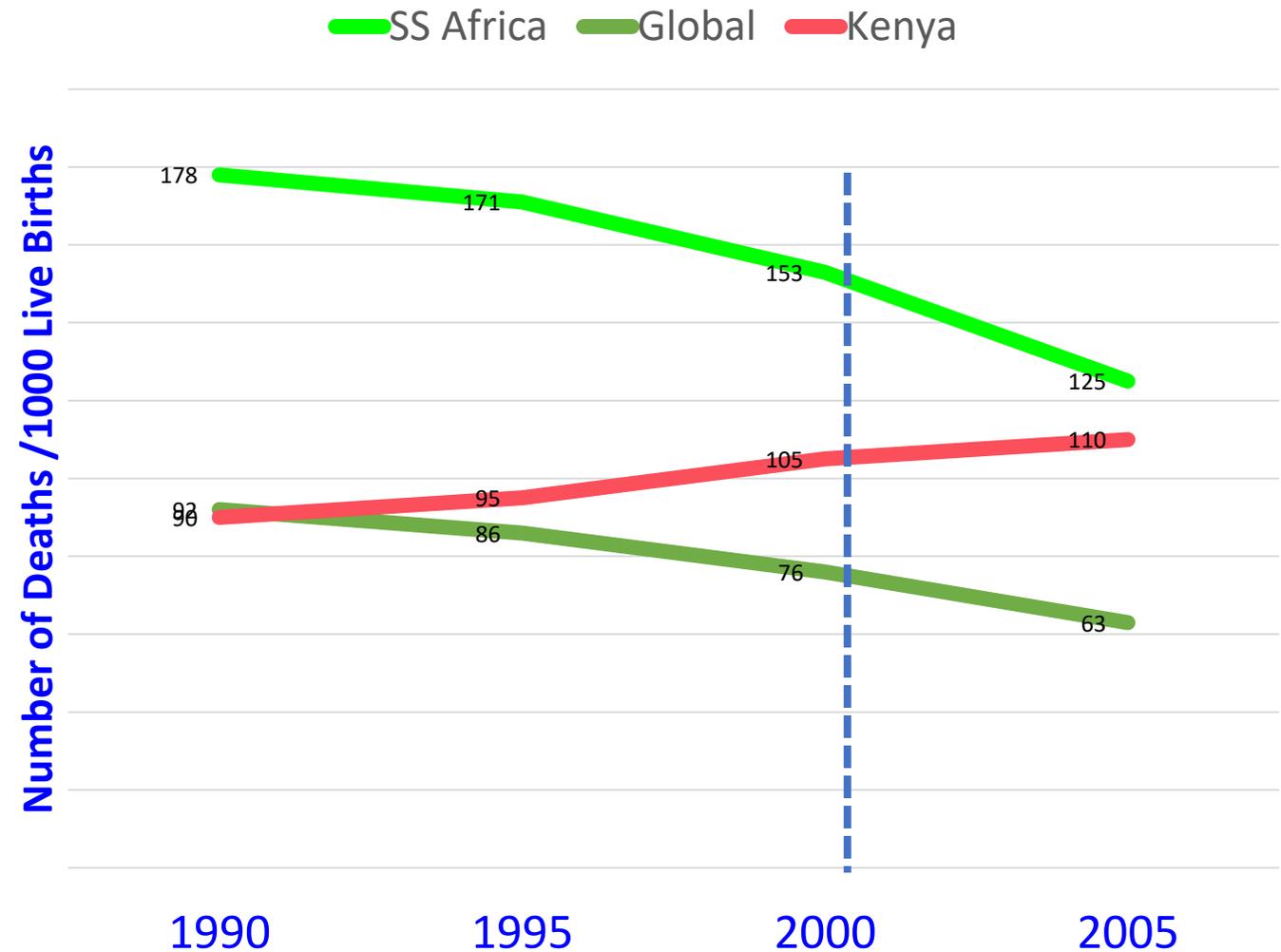
The Millennium Development Goals

Global Motivation to accelerate reduction of child mortality using research driven interventions
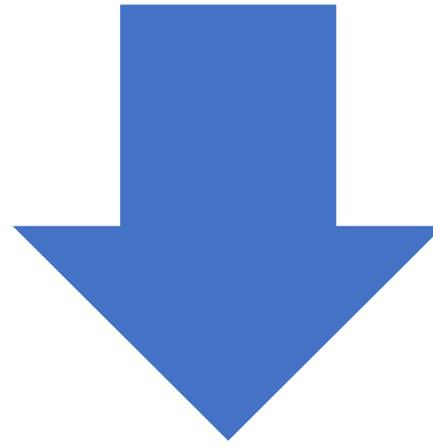
Preventive

Well Supported
Programs
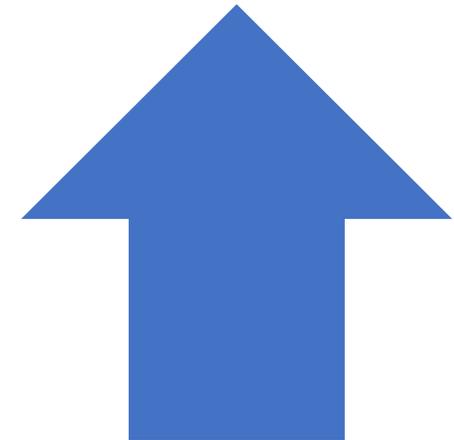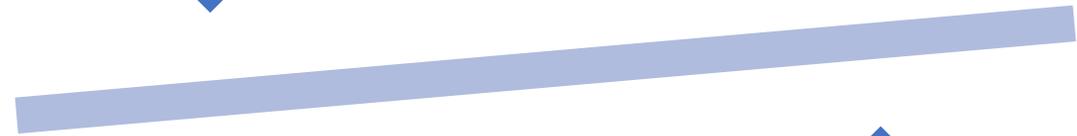
Curative

Weak Health
Systems

The balance of
global/local interest

Health Systems Building Blocks

Health Systems (HS) refers to all organizations, people and actions whose primary intent is to promote, restore or maintain health

https://en.wikipedia.org/wiki/Health_system

Health System Building Blocks	B Block	Indicator (s)
	Governance & Leadership	Set and/or updated national health strategies as well as overall oversite
	Health Information	Established patient, service and outcome data inventory
	Service Delivery	Infrastructure and quality of care measures
	Human Resources	Staff/population ratios and distribution as well as skill capacities
	Medicines & Technologies	Supply chain management for medicines and medical technologies
	Health Financing	Procurement and effective budgeting of funds

https://www.who.int/healthsystems/EN_HSSkeycomponents.pdf

Linking HS with HSR

HS Performance indicators are situation audits

They inform us of structural and process gaps in services provided

Appropriate and adequate response to them requires HSR

Health Systems Research

HSR is *"a multidisciplinary field of health research which studies governance, financial and delivery arrangements for health care and public health services"*.

HSR *includes implementation considerations for reforming or strengthening these arrangements*, and broader economic, legal, political and social contexts in which these arrangements are negotiated and operate.

The purpose of health systems research is to improve the *understanding and performance* of health systems.

Evolution of HSR

The 1950s
- Avedis Donabedian and the
- Quality of Care

The 1960s
- Concept of Ecology of
- Medical Care appears

Late 1970s
- Growth of several institutes
- addressing HSR, JHU-USA

The 1980s
- HSR recognised as
- a profession

Sub-theme Definitions

DELIVERY SCIENCE
Bringing best practices of care to every patient every time

IMPLEMENTATION SCIENCE
Study of methods for converting evidence to practice

IMPROVEMENT SCIENCE
Determination of effective improvement strategies

MANAGEMENT SCIENCE
Development and implementation of health policy

Health Systems Research

OPERATIONAL RESEARCH
Developing solutions to operational problems in health care delivery

http://www.who.int/alliance-hpsr/alliancehpsr_backgroundpaperhsrstrat1.pdf

Dr Margaret Chan, Director-General of the WHO, Beijing, China, October 29, 2007

"Something is wrong. For the first time, public health has commitment, resources, and powerful interventions.

What is missing is this: the power of these interventions is not matched by the power of health systems to deliver them to those in greatest need, on an adequate scale, in time.

In part, this lack of capacity arises from the failure of governments all around the world to invest adequately in basic health systems. It also arises, in part, from the fact that research on health systems has been so badly neglected and underfunded. The two go together. So long as investments in health systems are given low priority, research in this area will also be neglected.

In the absence of sound evidence, we will have no good way to compel efficient investments in health systems."

Objectives and Methods for the Primary Research(es)
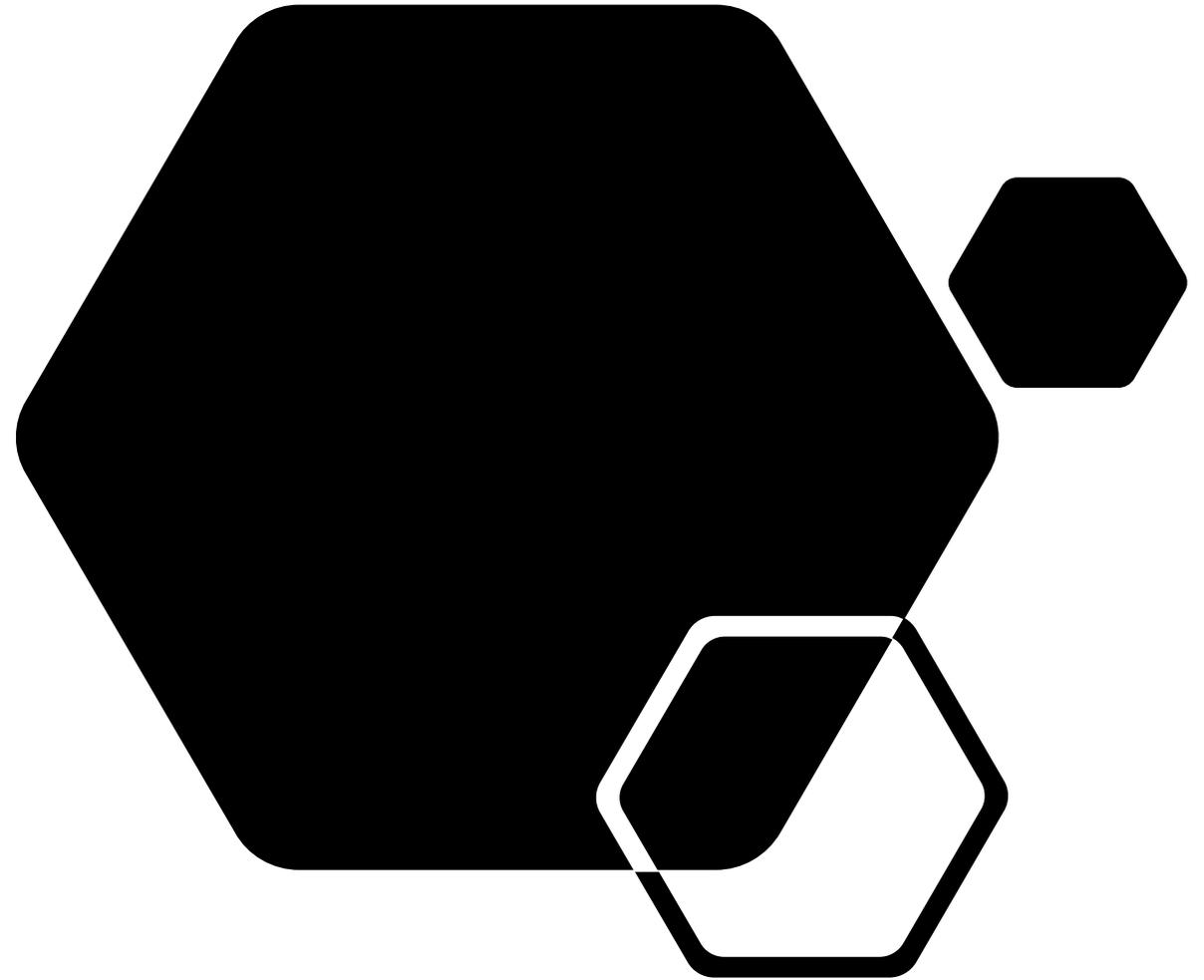
Global objectives of the research

The **overall aim** of these research programs was to initiate a culture of Health Systems Research as a tool for enhancement of better child health and survival.

Objective 1

Describe the performance indicators of health systems supporting in-patient care in 1^0 ref. hospitals

Objective 2

Undertake interventional studies within the auspices of HSR to correct gaps found

Objective 3

Use the findings of the research for enhancement of practice and policy

Study designs

	Type	Section
1	Cross-sectional	HS performance indicator surveys in 2002 and 2015.
		Additional studies measuring uptake of various interventions within the delivery science research
2	Systematic reviews and commentaries	Employed for the commentaries from which health management science portfolio was build
3	Randomized Controlled Trials	Used in all the implementation and improvement sciences works

Selection of Interventions Study Hospitals

Hospital	Malaria transmission setting	Antenatal HIV prevalence	Infant Mortality per 1000	Catchment population poverty∞	Annual paediatric admissions
Intervention	Highland	High*	70	50 - 70	5,000
Control	Highland	High	>100	50 - 70	4,500
Intervention	Intense	High	>100	50 - 70	3,500
Control	Intense	High	>100	50 - 70	2,500
Intervention	Low	Mod**	40	35	3,300
Control	Low	Mod	40	35	1,800
Intervention	Arid	Mod	70	50 - 70	1,700
Control	Arid	Mod	70	50 - 70	1,100
>10%*, 5-10%**, Income <$2/day %∞					

Intervention Methods
Multifaceted Intervention For Implementing CPG

Interventions	
1	6 monthly performance surveys
2	Verbal feedback after each survey
3	Written feedback of survey findings
4	**Training (based on WHO ETAT)**
5	Dissemination of CPGs
6	Dissemination of job aids
7	3 Monthly supervisory visits
8	On-site problem solving capacity
9	Introductory seminar on the CPGs

Sequence of deployment

Timing	Intervention group	Control group
Baseline	1 – 8	1, 2, 5, 6, 8
6 months	1 - 3, 7 & 8	1, 3
12 months	1 - 3, 7 & 8	1, 3
18 months	1 - 3, 7 & 8	1, 3

Training Methods

STRATEGY	METHODOLOGY
Behavioural change model	Didactic sessions in followed by repeated interactive learning sessions.
Adult learning theories	Active participatory learning in small group interactive sessions
Social influence theory	Involvement of local experts in development of the tools and training facilitation by credible individuals thereby building trainee trust.
Diffusion of innovation theory	Extensive training to create a critical mass of people supporting the new practices.
Health education model [3 strategies]	Predisposing (best practice lectures, Enabling (practise of skills and Reinforcement (feedback on personal performance).
Reflection	Problem-based audit, local evidence supported feedback, small group learning through role-play ending with post course evaluation.

Policy engagement process for new-born care

Phase 1

- Defining expected standards of care
- Reviewing existing policies
- Initial stakeholder identification

Phase 2

- Determine access gap [burden and access to facilities]
- Determine effective coverage gap [access & quality]
- Explore impact of missed care on effective coverage

Phase 3

- Presentation and discussion of findings
- Develop policy options for better care
- Policy for creating health care assistant position
- Development of a strategy research testing effects of HCA
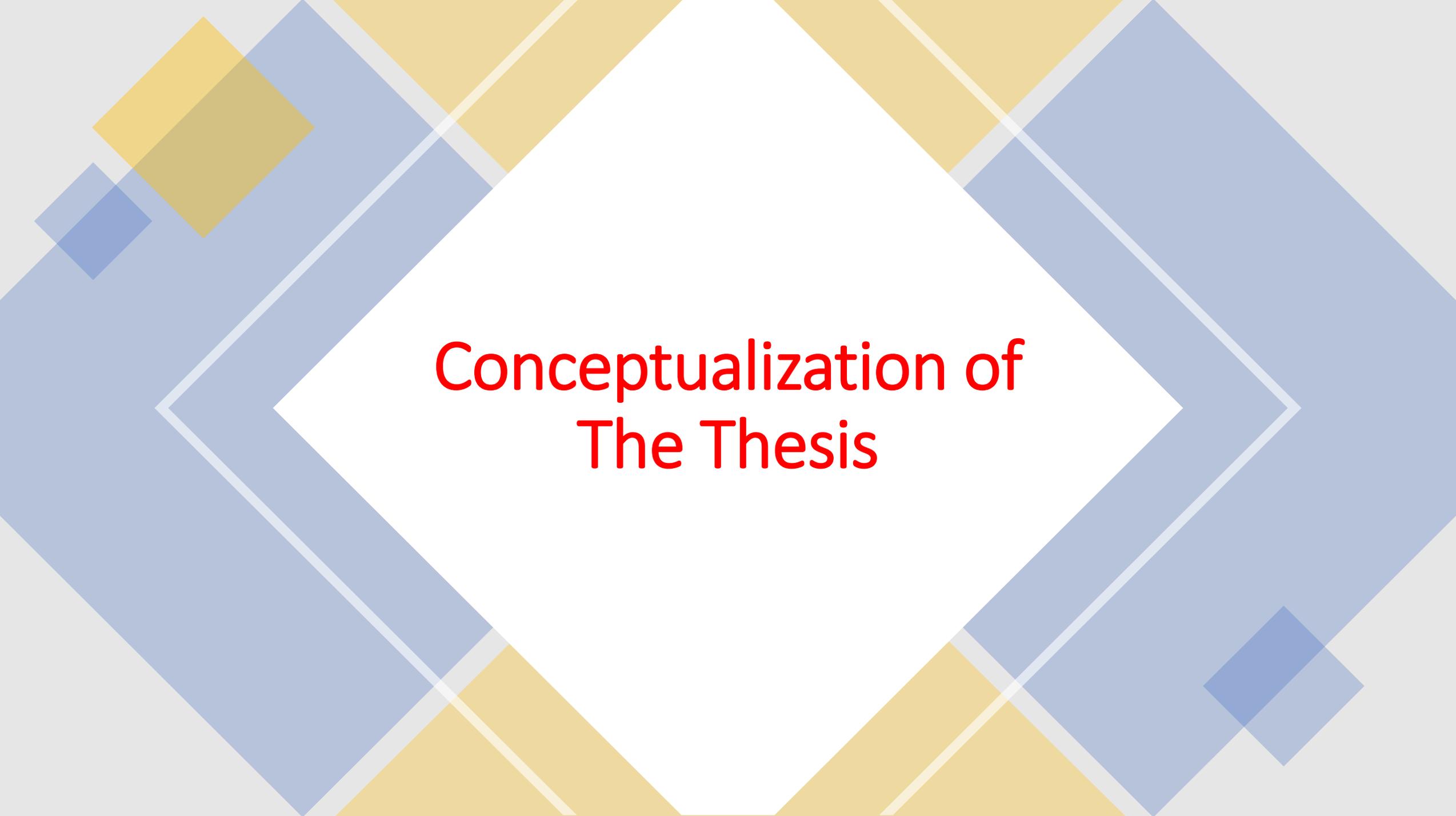
Conceptualization of The Thesis

Rationalization

1

Provide a thematic narrative of >18 yrs work in HSR supporting child health

2

Analyse and Report the impact of HSR based interventions in improving care of children admitted in Kenya

3

Share Kenya's HSR experiences and outputs as tools usable by others in L&LMICs

PUBLICATIONS COMPRISING THE THESIS

THEME	→	HS performance evaluation		Health Systems Research Papers			

SUB-THEME			→	Management	Implementation	Delivery	Improvement

No of ARTICLES	→	2 Pre 4 Post		8	5	7	4

DESIGNS	→	Cross-section		Syst. Reviews	RCTs	Cross-section	RCT and nRCTs
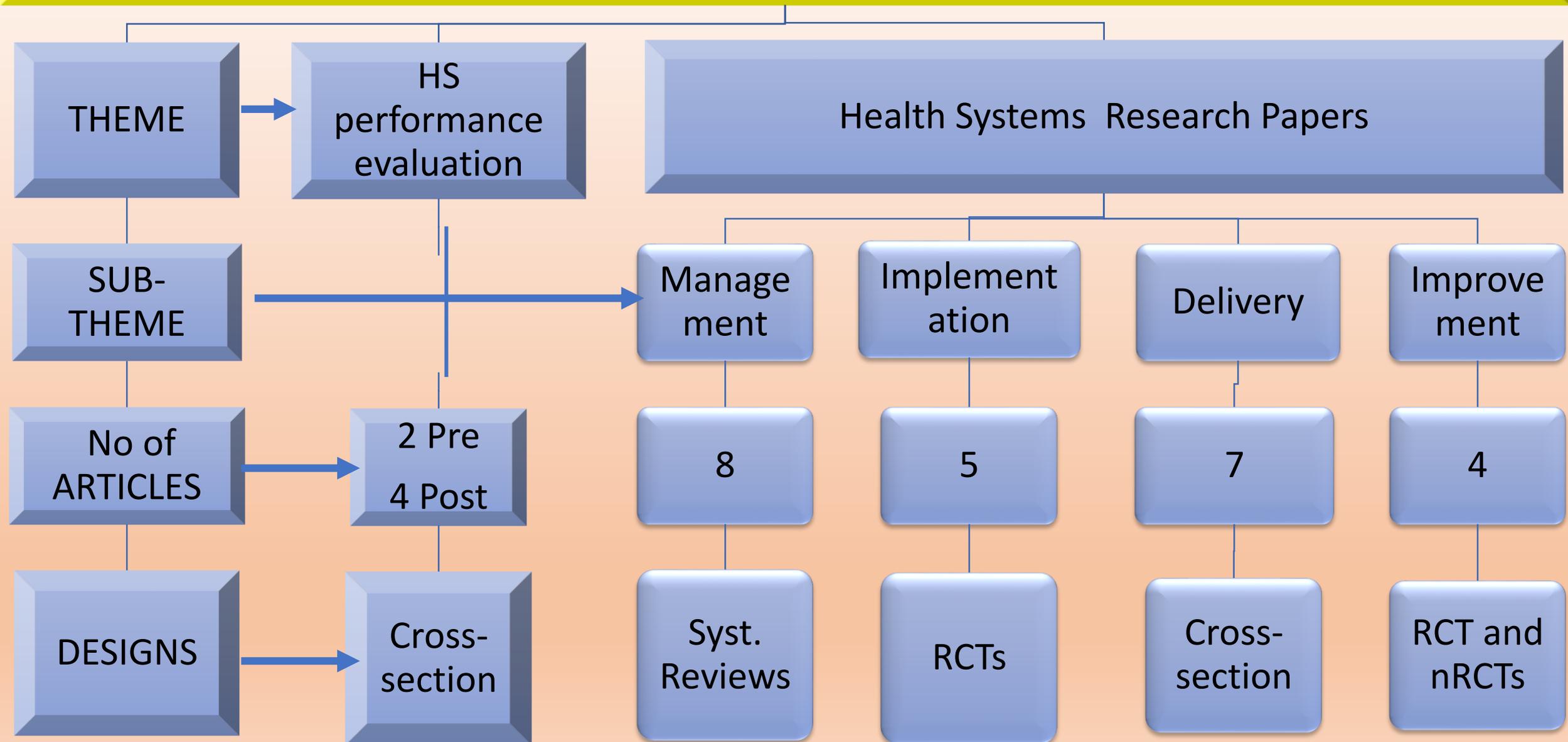
Basis of classification of the research categories

Classification	Design	Justification for classification
HS Performance	Cross-sectional	Descriptive studies simply quantifying the presence of relevant the indicators
Management	Commentaries and non-comparative interventional	Review of existing norms in policy development. Reporting development of policies and guidelines and development processes
Implementation	Cluster/parallel/simple randomised trials	Papers reporting proof of acceptability and impact of locally developed tools
Delivery	Prospective cross-sectional	Observing changes in guideline uptake and service delivery preparedness using real time data
Improvement	Controlled trials	Reporting prove of value of improvement brought about by delivery modifications.

DEVELOPING THE THESIS

Performance of Health Systems supporting in-patient care

2002 Survey
Governance
Service Delivery
Health Information

Corrective Interventional research in

Management science

Implementation science

Delivery science

Improvement science

Improved governance

Enhanced service delivery

Established HIS infrastructure

Proof of concept by a survey in 2014-2015

Thesis

Showcasing innovative research approach for LMICs

Summarizing contributions to literature

Suggesting Contribution towards improved childhood mortality

Findings, observations, interpretations and discussion

State of HS supporting in-patient care in 2002

Data from 14 district hospitals spread across Kenya describing

Performance indicators based on WHO building blocks

I Governance and Leadership

II Service Delivery Quality

III Health Information Systems

IV Human Resources for Health

V Medical products & Technologies
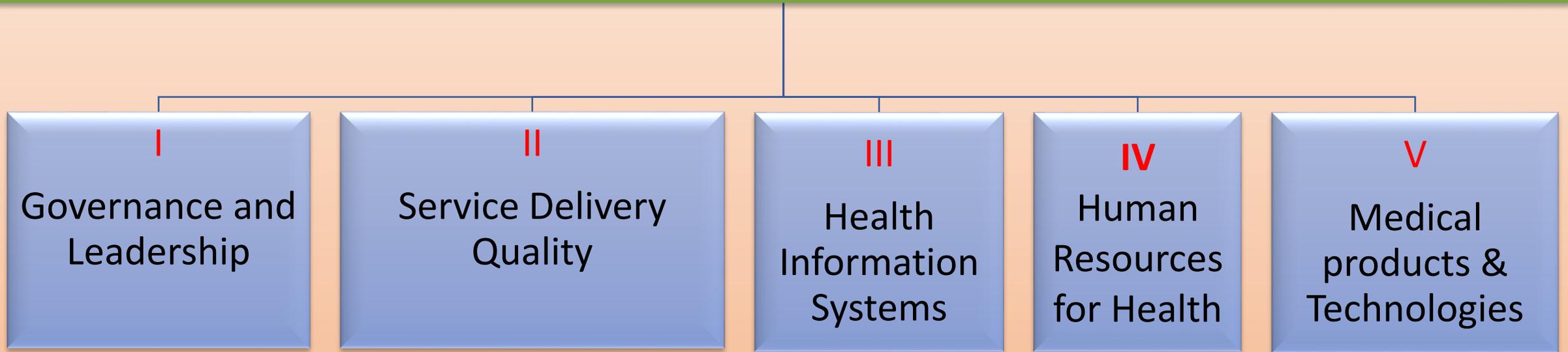
1. *Assessment of inpatient paediatric care in first referral level hospitals in 13 districts in Kenya.* Lancet. 2004; 363:1948-1953.

2. *Delivery of paediatric care at the first-referral level in Kenya.* Lancet. 2004; 364:1623-1629.

Service Delivery Quality

Proportions of babies/children deemed to have received clinical care according to existing protocols

Basic Care (weight) 35%

Standard Observations (HR, RR, Skin Colour) 51%

Critical Signs (reduced consciousness, laboured breathing and circulatory failure) 37-76%

Service Delivery Quality

Proportions receiving Lab Tests and treatment according to guidelines

X-Rays
[Pneumonia]
0%

Blood Sugar
[Danger Signs]
0%

Spinal Fluid
[Meningitis]
0%

Malaria Parasite Slide
88%

Haemoglobin
Interpretation
27%

Antibiotic dosing
56-70%

Malaria treatment
5%

Blood Transfusion
10%

Care of SAM
0-32%

Health Information Systems

Responsible for capturing and reproducing all data including clinical info to assist in efficient care

Most of The Patient Files Had Very Little Clinical Information

Non-Standard Abbreviations Were Common Making Accurate Inference Difficult.
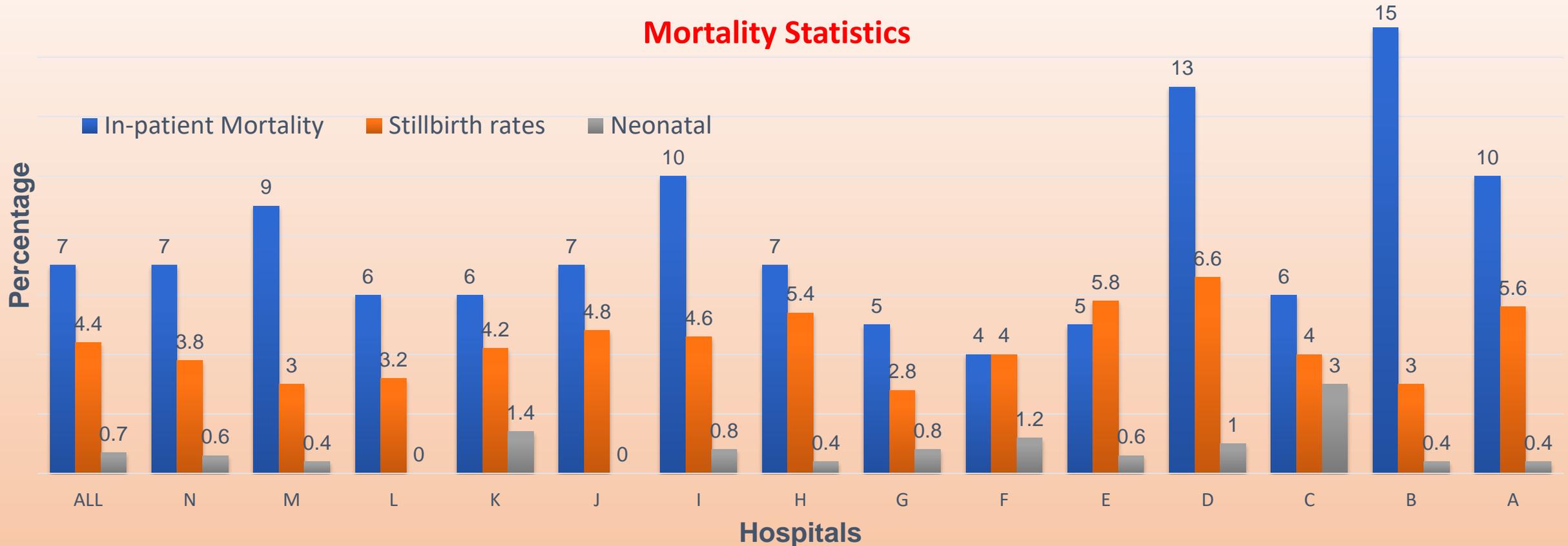
Human Resources for Health

Distribution of Human Resources

Availability of Clinicians Providing Care in the 14 Hospitals

■ No with Staff Carder   ■ No Without Staff Carder

	Paediatricians	Medical Officers	Clinical Officers	Nursing Staff
No Without Staff Carder	10	8	2	0
No with Staff Carder	4	6	12	14
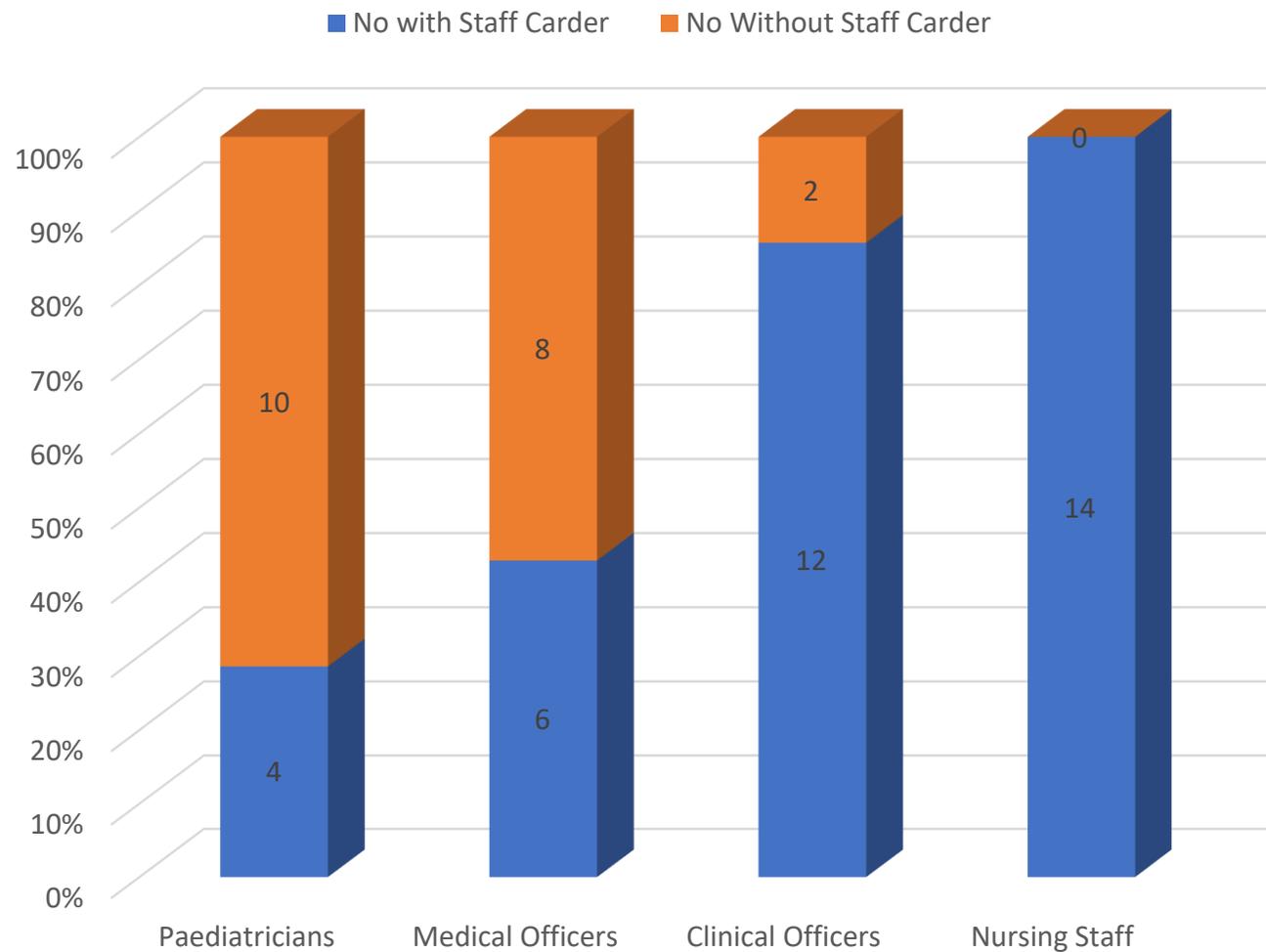
Availability of Medicines and Medical Products

Stock-out Rates

% Items rarely or never available

- Laboratory Sevices[n=7]
- Primary Medications[n=13]
- Supportive Medications[n=12]
- Medical Eqyipment[n=16]

Number of Hospitals

Number of Hospitals	<3	6 - 8	>8
Laboratory Sevices	86	0	14
Primary Medications	54	38	18
Supportive Medications	43	14	43
Medical Eqyipment	44	31	25
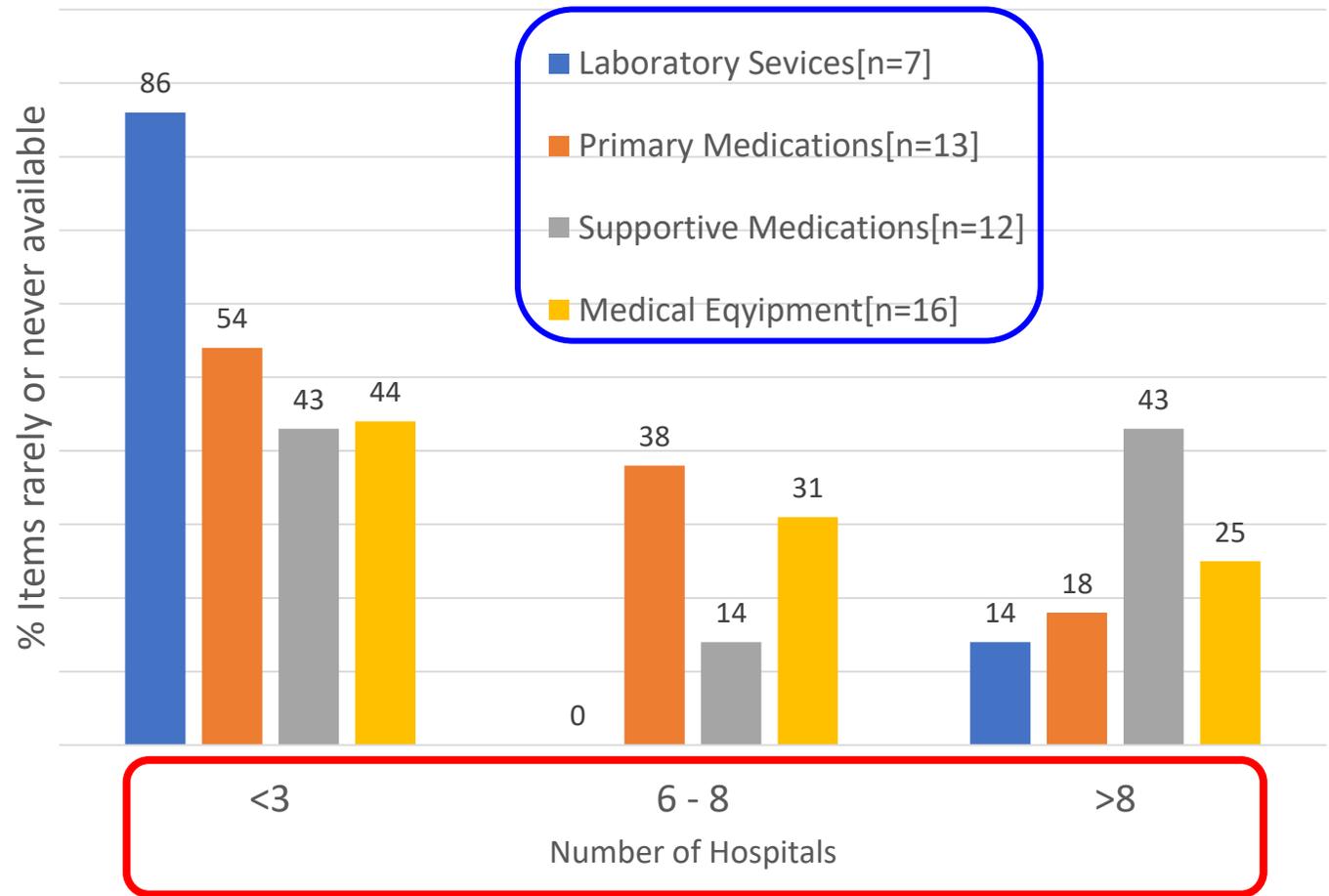
Reflections on the state of HS in 2002

Leadership and Governance

- Clinical care governance was poor as determined by absence of policy and practice
- guideline documents in all the 14 hospitals

Service Delivery & Quality

- Satisfactory Infrastructural preparedness but poor Clinical Practice Guideline(s) utilization

Health Information Systems

- Consistently poor clinical records' quality making retrospective analysis very unreliable.

Human Resources for Health

- Inadequate numbers and distribution

Medicines and medical technologies

- Major stockouts in some hospitals

Transition from evaluation to intervention

The 2002 survey confirmed that the health systems in place were not adequately supporting paediatric in-patient care in primary referral hospitals

With focus on Governance and Leadership, Health Delivery and Health Information Systems a Series of HSR studies were undertaken in response

The studies were in the sub-themes of Management, Implementation, Delivery and Improvement Sciences

Management Science Research

Defined as the Development and implementation of health policy through evidence based research [Speaks to the Leadership and Governance Building Block]

The findings report;

I
Established Quality Data Infrastructure

II
Developed Clinical Practice Guidelines

III
Initiating Policy development

1. ADC; 2008; 93:540-544., 2. BMJ Glob Health 2016;1:e000028., 3. Res Policy Syst. 2017; 15(1):4, 4. ADC. 2008; 93:799-804, 5. Arch Dis Child 2017;102:846–851., 6. Plos Med, 2016 13(4): e1001991, 7 BMJ Global Health 2020;5:e001937

Reliable data enhancing research for Policy and practice

Clinical Information Network

Evolving into a Learning Health Systems

Northern Neonatal Network [England]

Vermont Oxford Network [USA]

LHS

Child-H Problem Identification [RSA]

Clinical Information Network Kenya
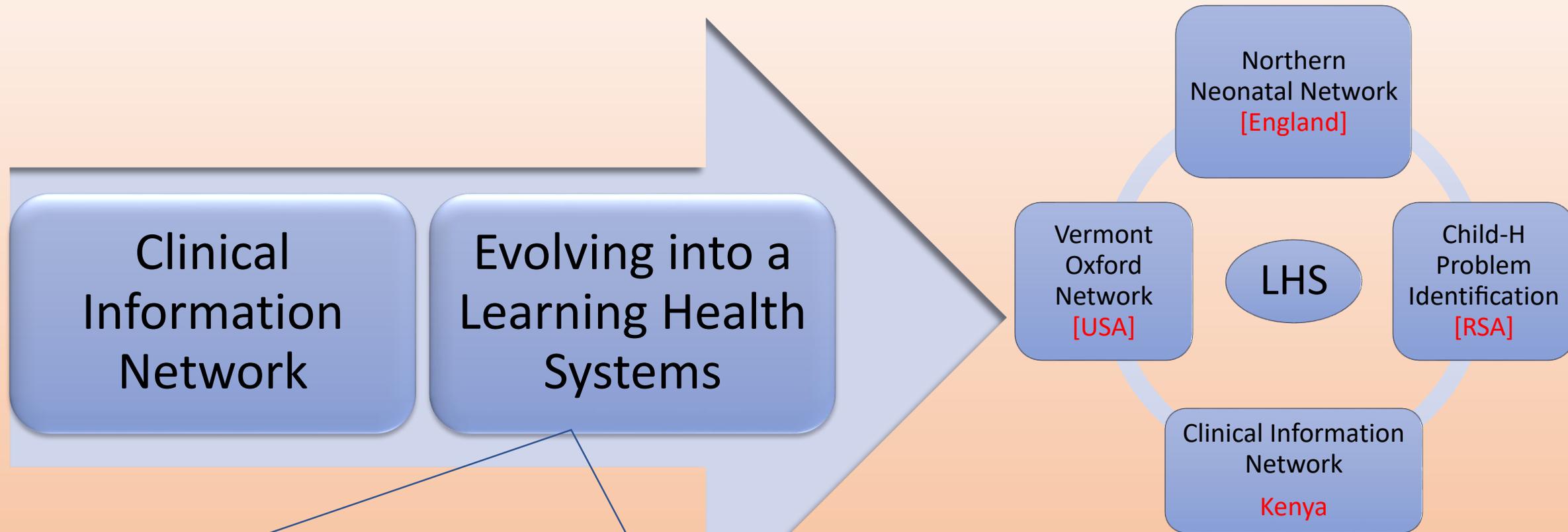
Learning health systems (LHS) are **healthcare systems** in which knowledge generation processes are embedded in daily practice to produce continual improvement in **care**. Quality improvement at the point of **care** for each patient using new knowledge generated by research; research done in routine **healthcare** settings. [https://en.wikipedia.org/wiki/Learning_health_systems]

Clinical Practice Guidelines

Primary conditions

1. Malaria Quinine; Artesunate
2. Pneumonia; 1st line therapy, Amoxycillin
3. Meningitis; 1st line, steroids
4. Diarrhoea; Zinc
5. Neonatal Sepsis; Gentamycin Once Daily
6. Sickle Cell Disease; Hydroxyurea

Supportive care

1. Feeding the malnourished
2. Feeding the preterm; Initiation timing , Breastmilk fortification and feed increments.
3. Respiratory care for pre-terms; Caffein and Continuous Positive Airway Distention

Treatment of emergencies

1. Anticonvulsants for children
2. Anticonvulsants for New-borns
3. Glucose for hypoglycaemia
4. Fluid bolus for the severely ill
5. Neonatal resuscitation initial and revised

Disease Prevention

1. Alcohol hand rubs for infection control
2. Chlorhexidine cleaning for the umbilical cord
3. Antibiotic prophylaxis to prevent infection in high-risk new-borns

Developing policy for nursing care

Nurses are the primary clinicians for new-borns in many hospitals

Given their small numbers; There is need to confine them to clinical duties

Policy Proposal
Task shift more manual duties to less skilled workers

Estimates of access to quality of care in Nairobi for the estimated 21,966 sick new-borns likely to need in-patient care in the year 2018

Coverage Achievable [fractional]

Target Population	Service Contact	Service Readiness	Basic quality adjusted coverage	Public sector nursing adjusted coverage
1	0.56	0.46	0.25	0
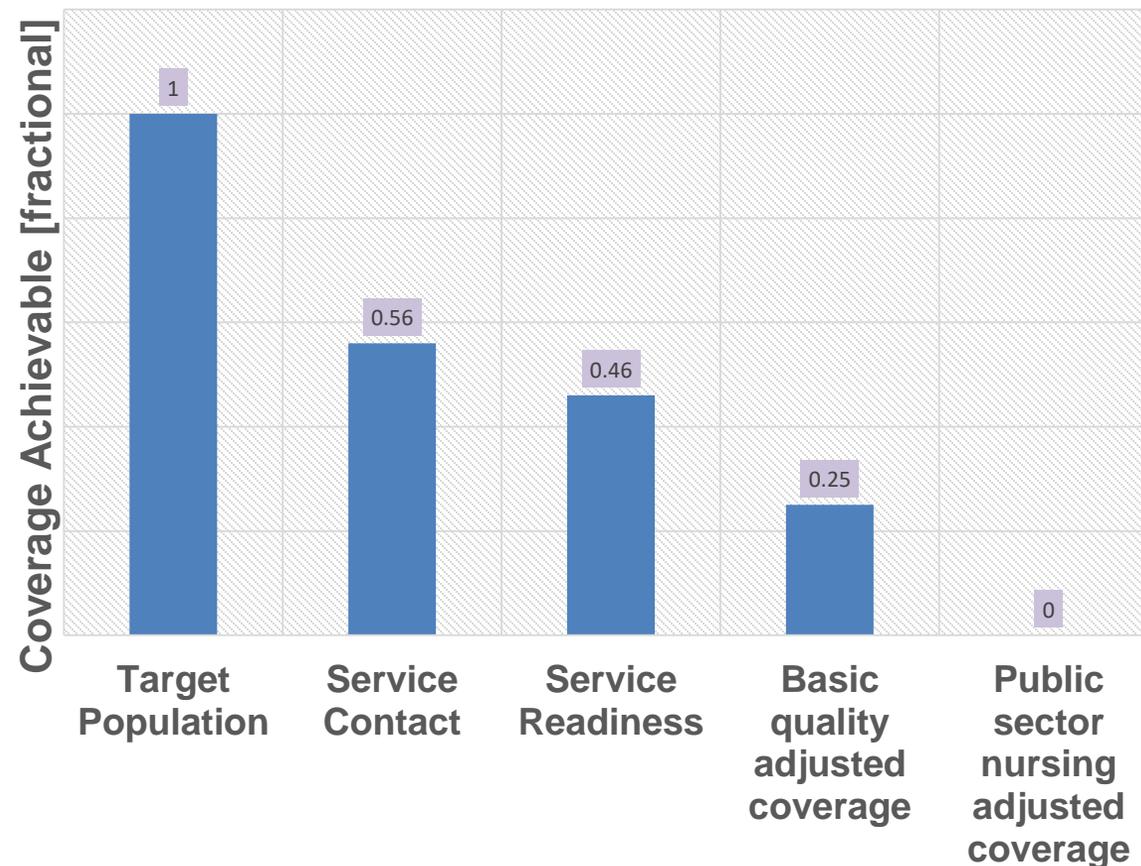
Reflections on management science work
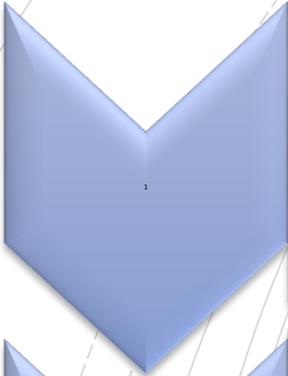
1. An opportunity exists for clinical uses of the CIN platform beyond in-patient paediatric care. The work has potential to expand in specialty as well as geographic coverage.
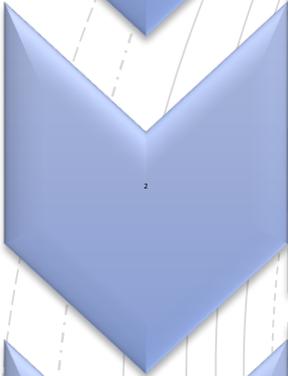
2. CPGs should locally developed or extensively domiciled and introduced through stakeholder engagement using appropriate training methodologies.
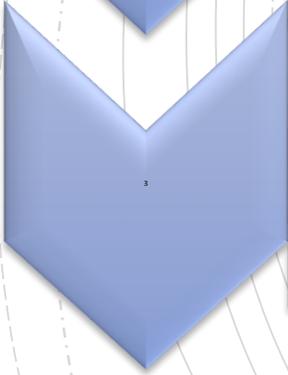
3. There is also an opportunity to build on the policy development example given here for other interventions.

Implementation Science Research

Study of methods for converting evidence to practice

The Products

1. BMC International Health and Human Rights 2006, 6:9

2. PLoS Medicine | www.plosmedicine.org 1 April 2011 | Volume 8 | Issue 4 | e1001018

3. Implementation Sci. 2019; https://www.ncbi.nlm.nih.

The outputs;

Establishing utility of a new tool; PAR

Introducing CPGs using implementation science methodology

Establish and use an innovative approach to enhance utilization of CPGs

Introduction of Structured Paediatric Admission Record
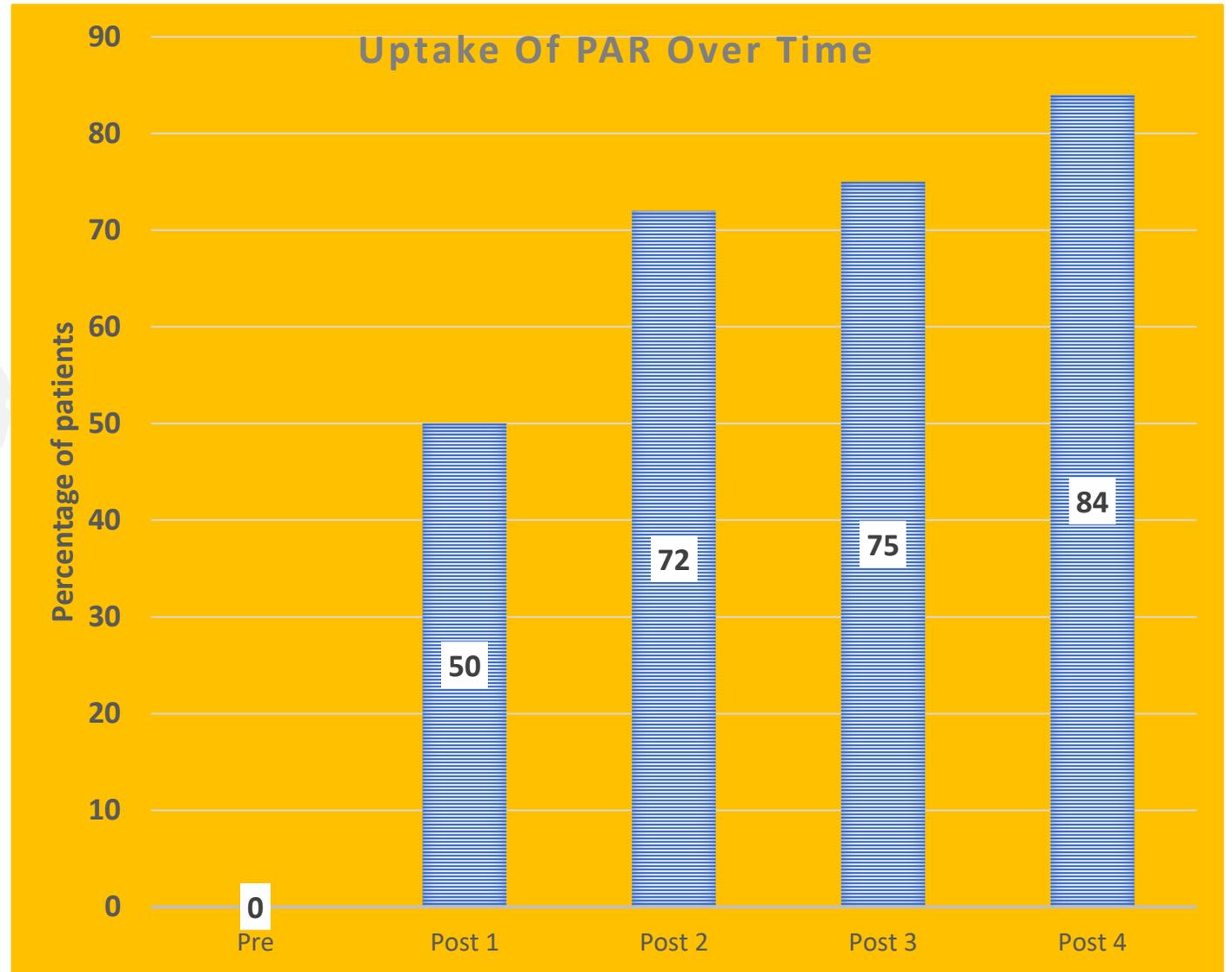
Impact of introduction of CPGs using Multi-Faceted Implementation Approach

Structural Indicators of Change After Intervention

Legend: Intervention (blue), Control (orange)

Indicator	Intervention	Control
Consumables/fluids	34	9
Essential Drugs	20	10
Equipment	40	10
HCWs Impacted	47.5	30
Hygiene & Safety	39	21
Nutritional Support	45	27.5
Staff & Systems organization	27.5	3
Overall	43	15

Y-axis: Percentage Change
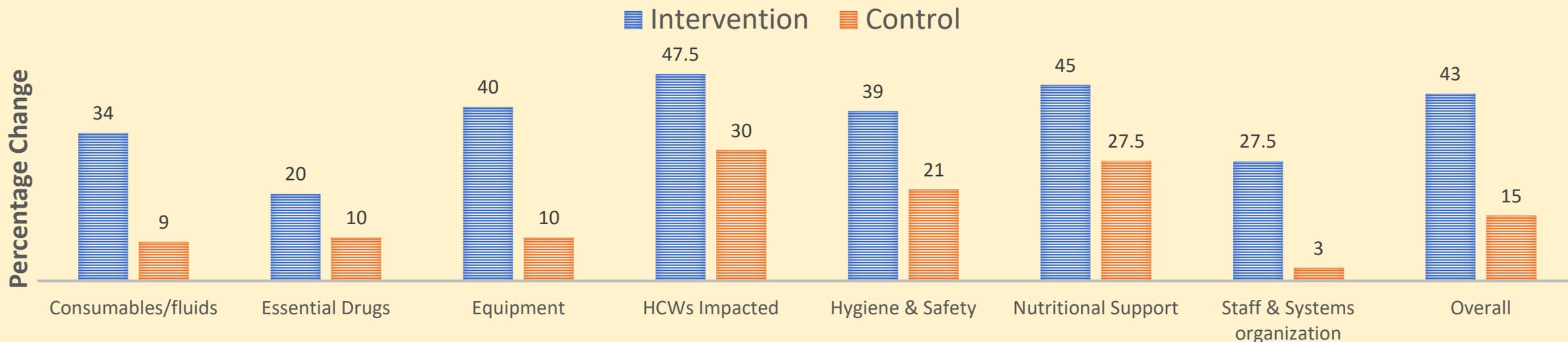
Process Indicators [Improvement in use of care guidelines]

Completion of admission assessment **up 54%**

Antibiotics Accurate dosing **up 15%**

Antimalarial Accurate dosing **up 24%**

Antibiotic Errors **down 4-fold**

Antimalaria Errors **down 7-fold**

Use of audit and feedback for pneumonia guideline uptake

There was no significant impact on correct classification [P= 0.855] and occurrence of treatment change [12.6 %versus 12.6%].
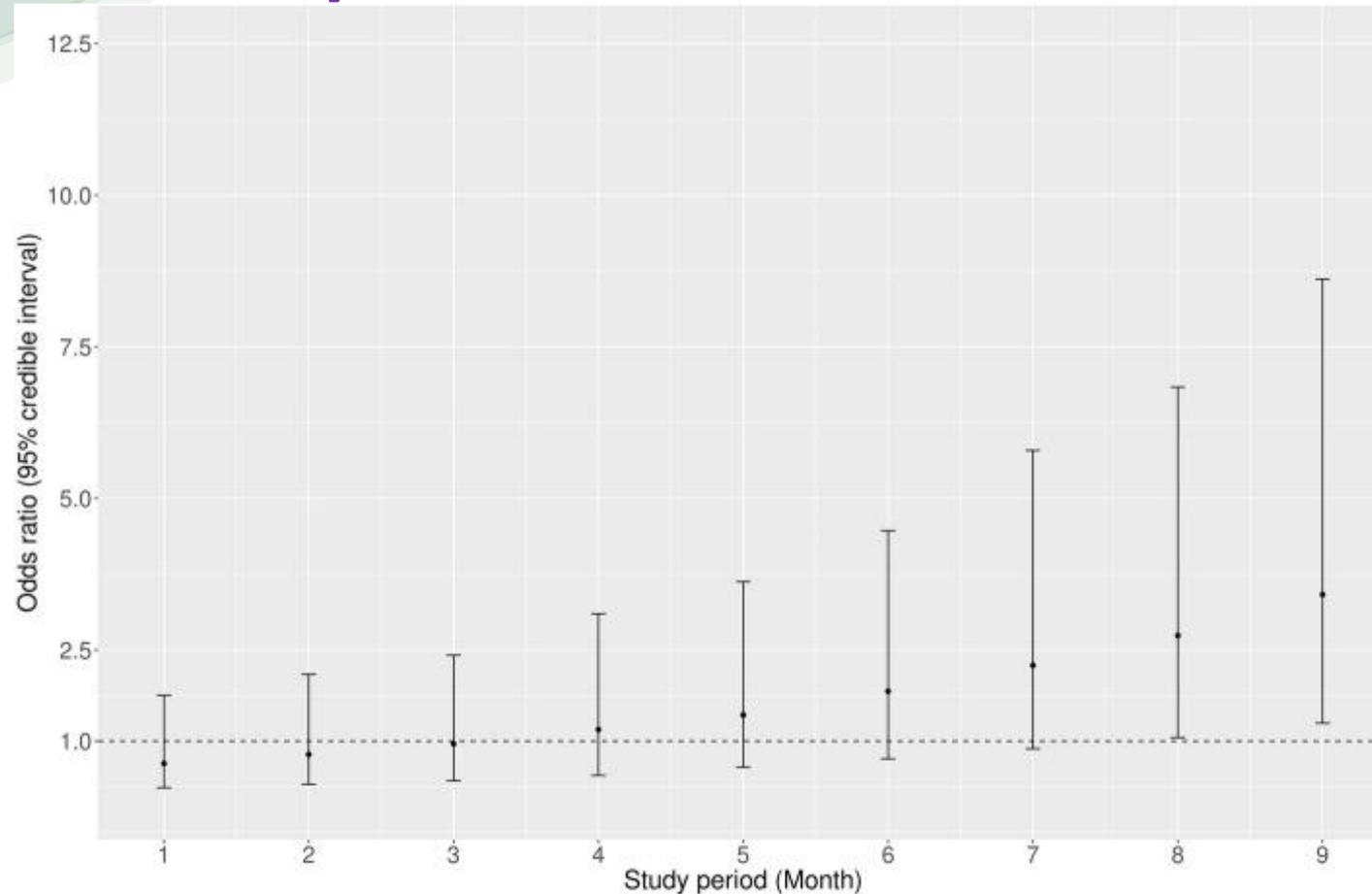
There was evidence of increasing impact over longer period 1.14 < 1.25 < 1.36, P<0.001]

Reflections from implementation research

01

The PAR proved to be an essential practice and implementation research tool

02

Value of Multifaceted approach for CPG introduction good though Impact is un-even

03

Audit feedback as an intervention may be effective but needs considerably longer time

Delivery Science Research
Bringing best practices of care to every patient every time

Findings

- Describing utilization of guidelines during the intervention period

- Determination of preparedness to deliver essential health services

- Estimates of Demographic and Geographic reach of services.
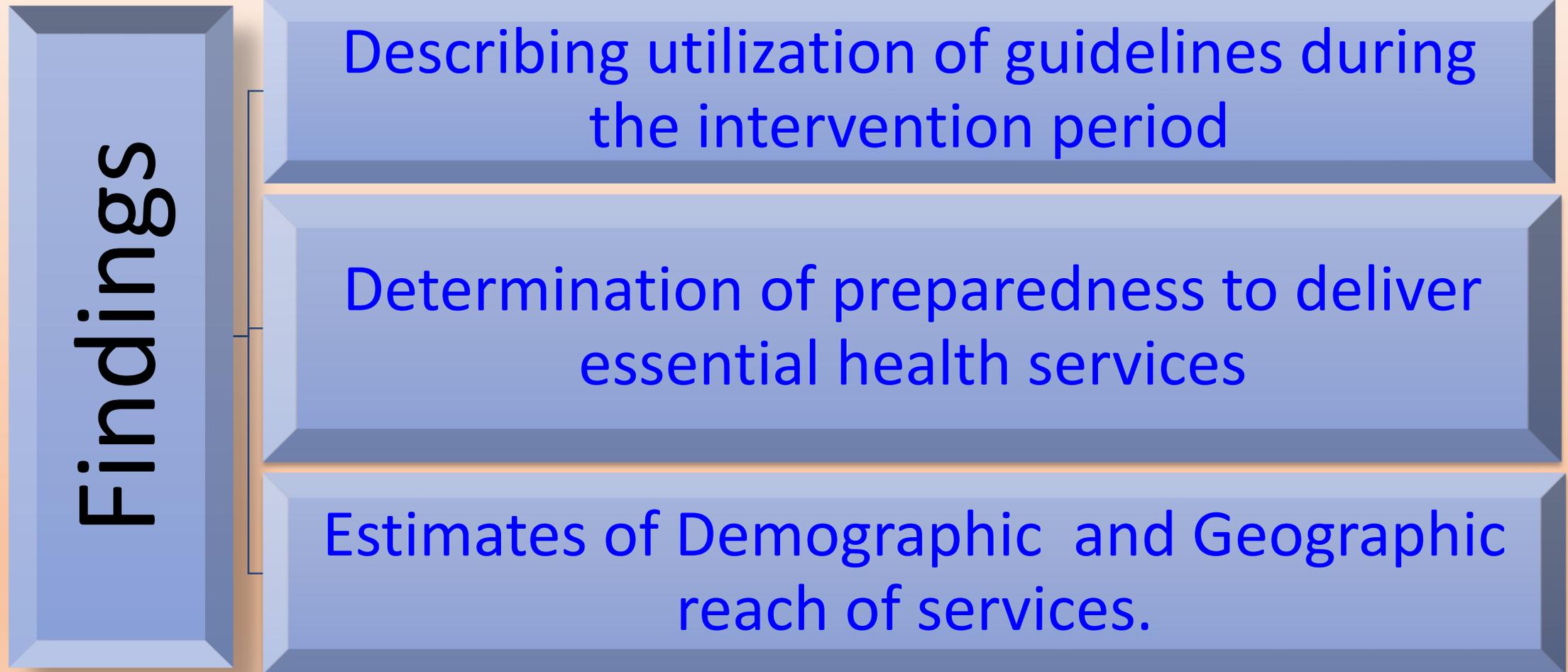
1. ADC. 2015; 100(1):42-7 , 2. PAMJ; 2014 www.panafrican-med-journal.com

3. EAMJ; 2014; 91:13-20. , 4. PLoS One. 2015, 30;10(3): e0117048.

5. Trop Med Inter. Health, 2009; 14(10): 1165-1172 ,

6. PLOS ONE | https://doi.org/10.1371 , 7. BMC Medicine (2018) 16:72

Guideline utilization

Clinical Care, Feeds and Medication for New-born Care CPGs in 22 Internship Training Institutions
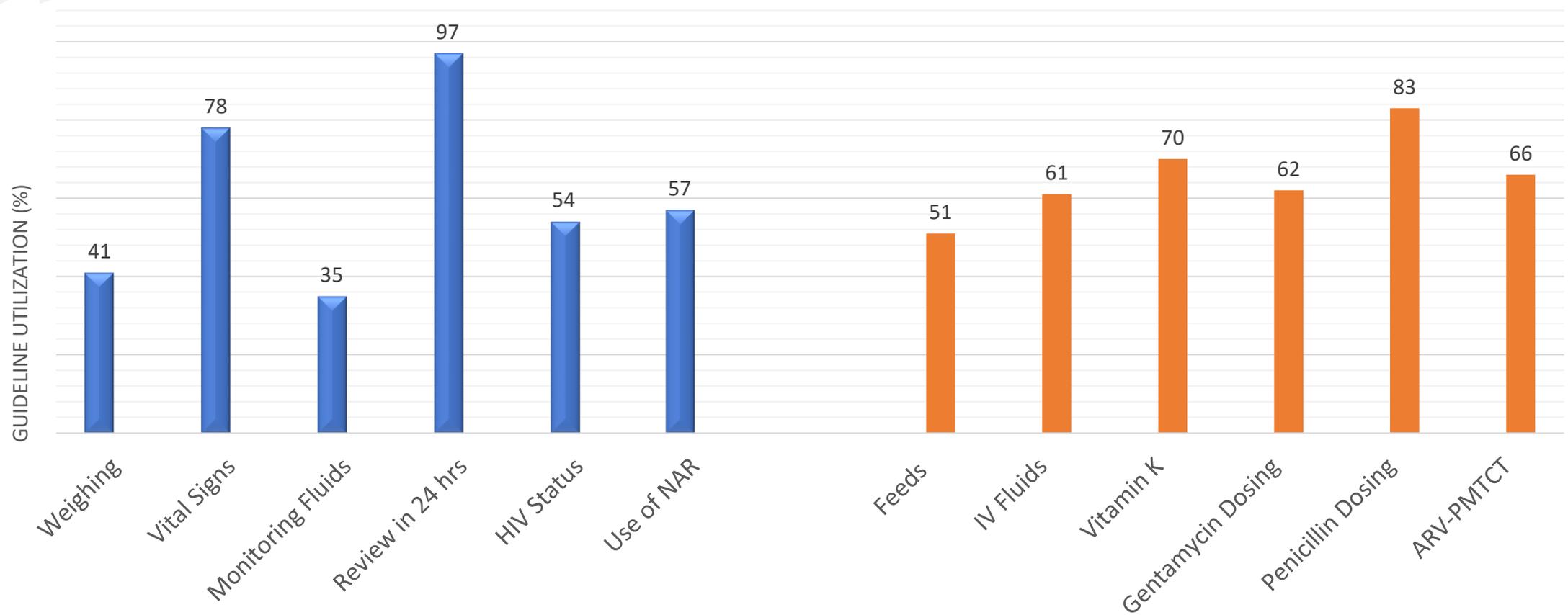
Structural-capacity to deliver care in primary referral facilities

Cumulative availability of 61 essential items in 22 hospitals

Legend:
- Vitamins, Minerals & Feeds (n=8)
- Guidelines & Wall Charts (n=9)
- IV Fluids & Drugs (n=12)
- Supportive care resources (n=11)
- Essential Equipment (n=11)
- Antibiotics (n=10)

Y-axis: % Items present per domain

X-axis: Hospitals (H1–H22)
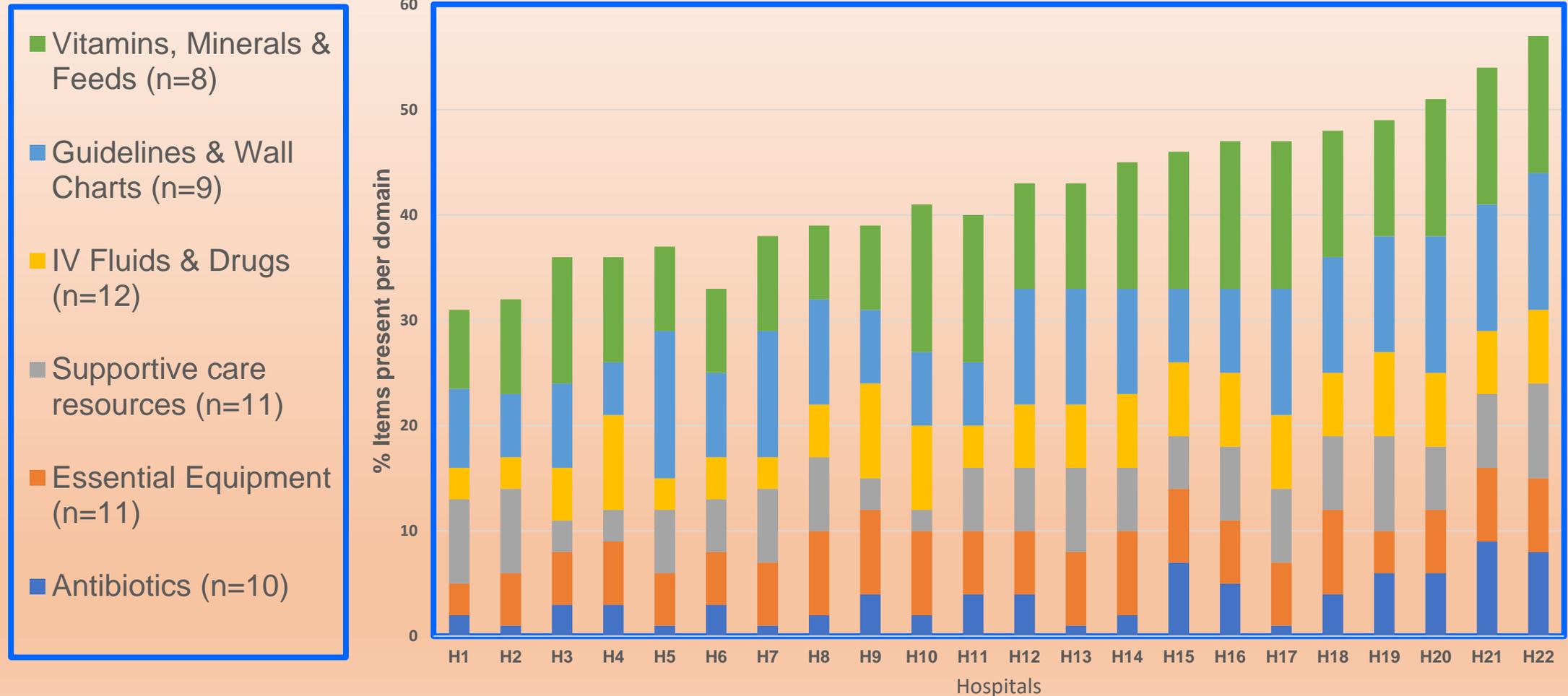
Process-capacity to deliver new-born services in Nairobi County

Radar plots for process domain scores by facility size (annual admissions)
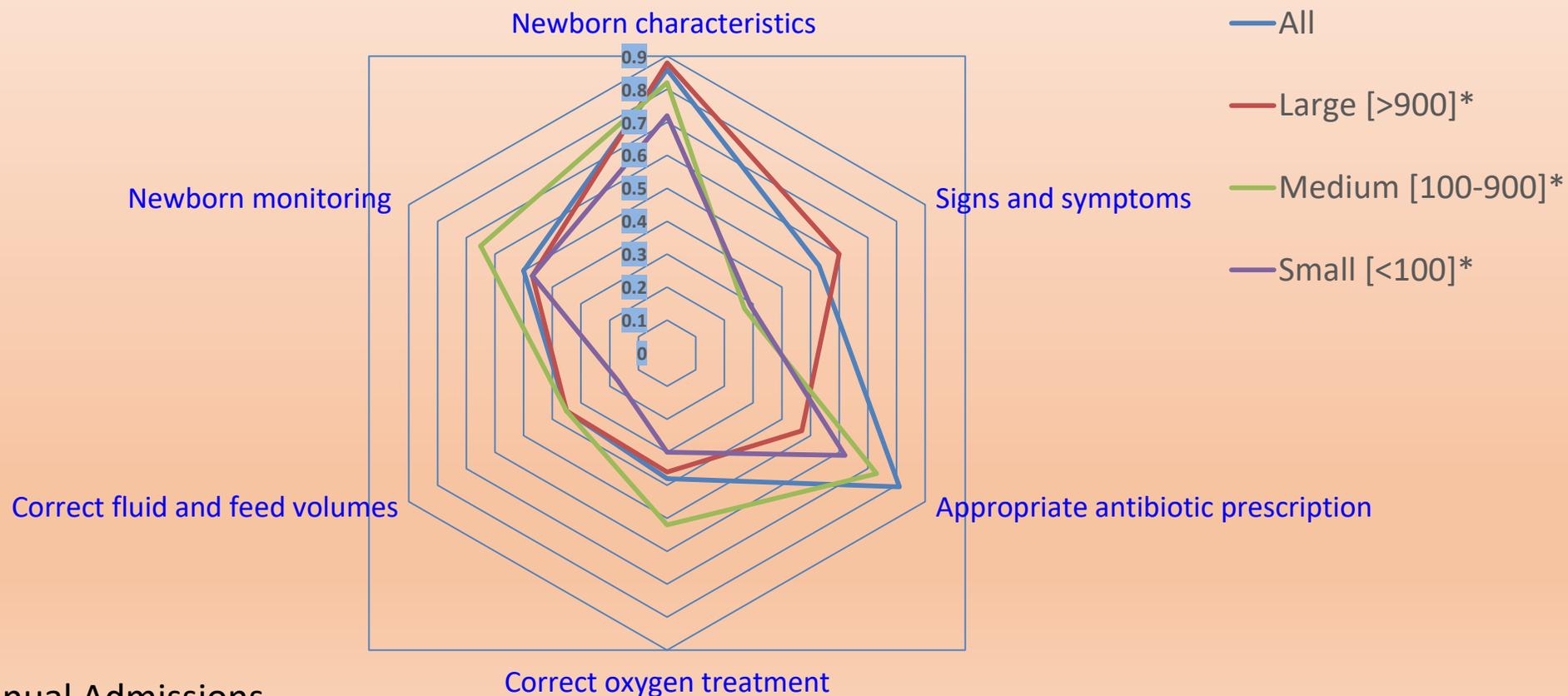
* Annual Admissions

Geographic and demographic coverage

Sick Newborns
- <200
- 200 -< 300
- 300 - 400
- >400

Hospital Admissions
- < 150
- 150 - 500
- >500 - 1000
- >1000

0   5   10   20 Km

N

The locations of INC facilities are represented by circles corresponding to the size of annual admissions of small and sick newborns on a density map of the number of newborns expecting to require inpatient services in 2015.
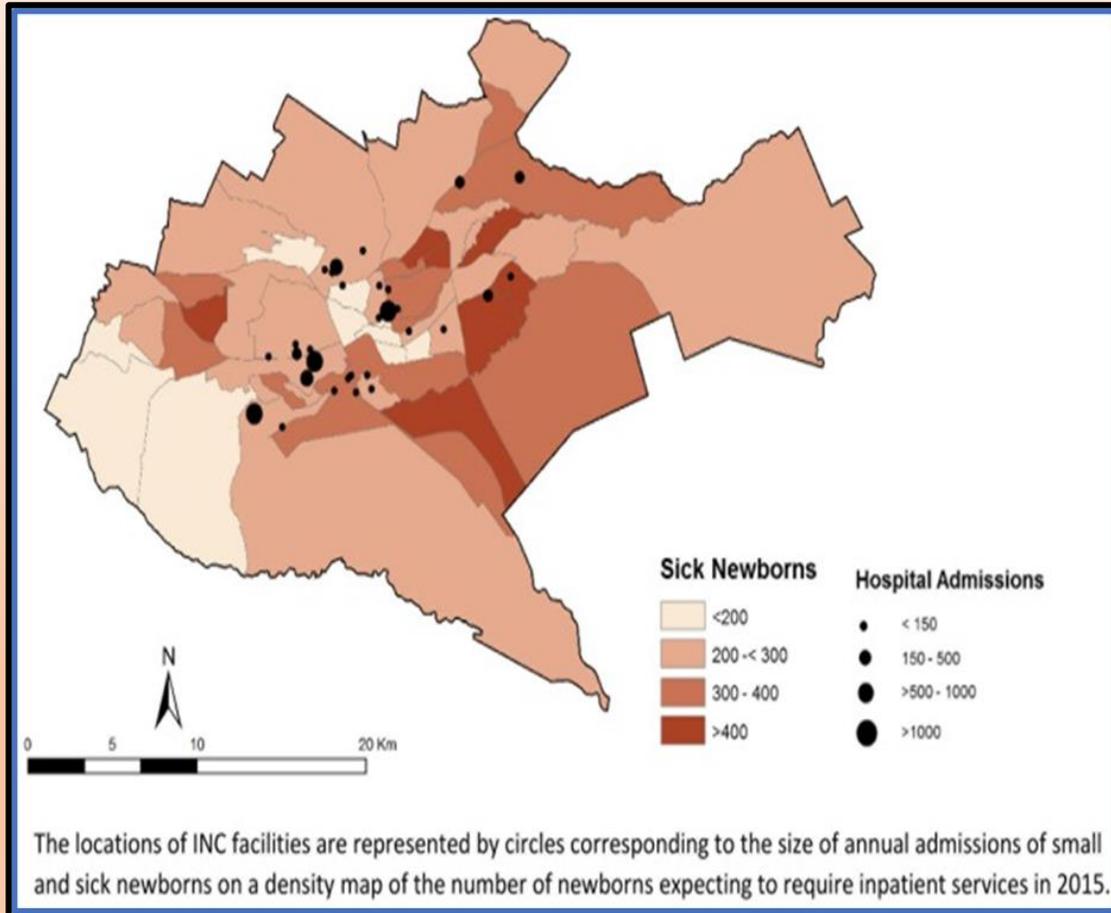
Coverage of neonatal in-patient services for new-borns who need in-patient care in Nairobi (modelling for 2014-15 year)

10.90%, 11%

19.50%, 19%

44.50%, 45%

24.90%, 25%

■ Not Covered   ■ High Quality
■ Medium Quality ■ Low Quality
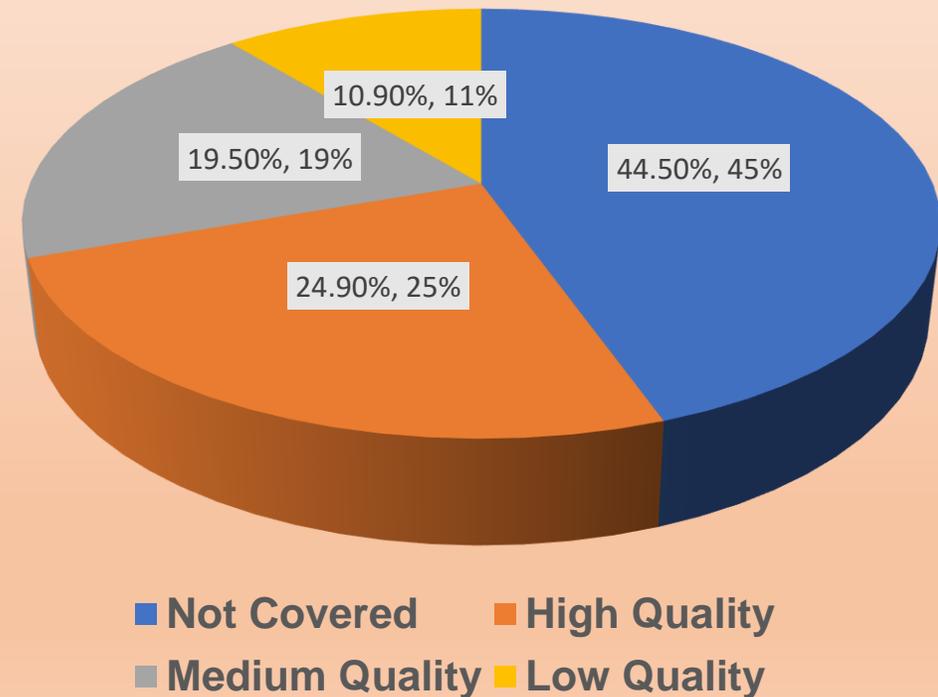
Reflection on Delivery Science

1. Measuring Quality of Care
- New-borns in the more rural and urban hospitals

2. Structural and Process preparedness
- Structural preparedness

3. Coverage of Services
- Variation of preparedness in rural hospitals
- In-equity in population and geographic reach of new-born services in Nairobi County.

Improvement science

Determination and enhancement of effective improvement strategies for health interventions through research

Demonstrating Improvement in the utilization of CPGs over a time period

Describing the Impact of **ONE** Day New-born Resuscitation Training

Testing the appropriateness of **new WHO guidelines** on Pneumonia Care

1. ADC Online First, 2014 as 10.1136/archdischild-2013-305561, 2. PloS ONE.2008; 3(2): e1599.doi; 10.1371/ journal, 3. Lancet Glob Health 2018; 6: e74–83.

Trends of CPG utilization over time period of 11 years
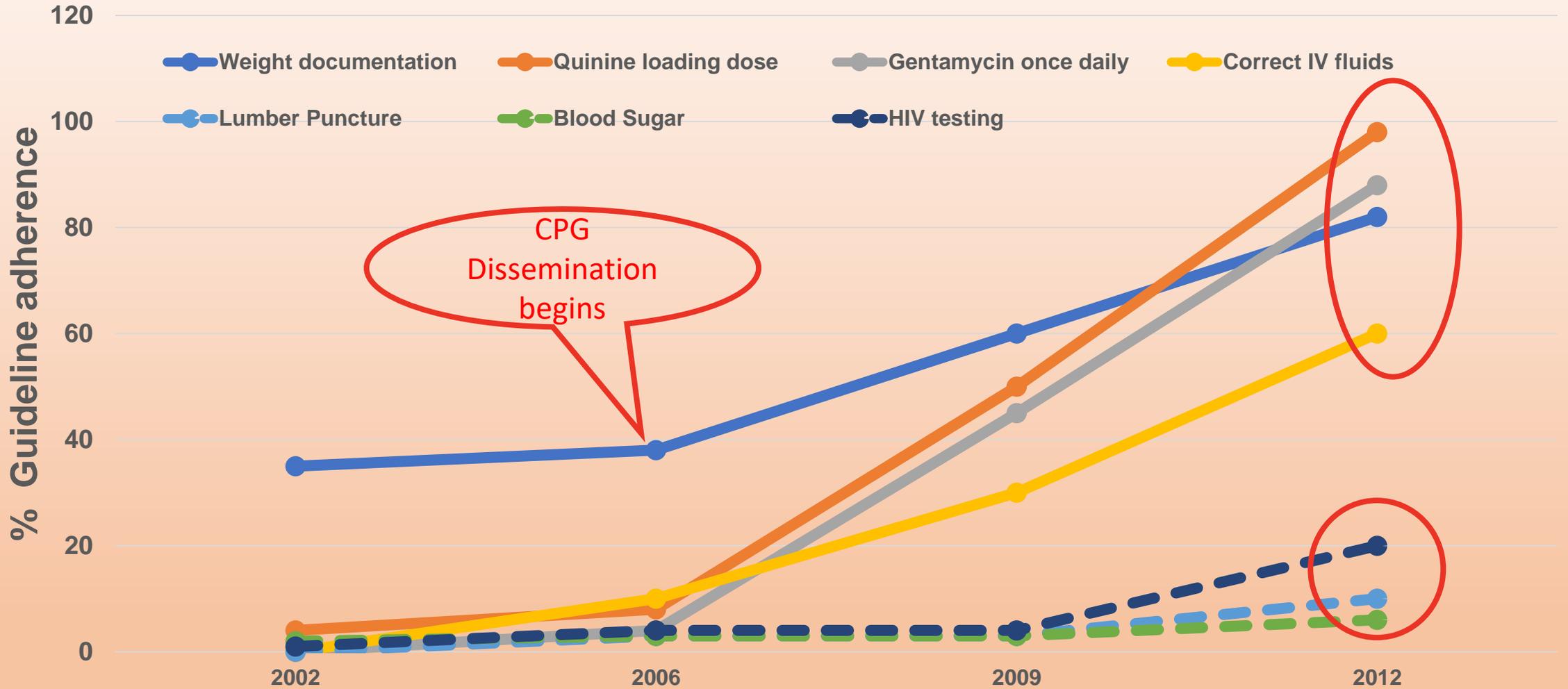
Impact of 1 Day New-born Resuscitation Training

Intervention group trained 3 weeks earlier than the controls

Comparing Resuscitation Scores; Scaled as Poor=1& Perfect=5

Comparison for unsafe/dangerous practices

Mean Score out of 5

95%CI 2.2-2.6
2.4

95%CI 1.6-2.0
1.8

Intervention [*N=129]   Control [*N=127]

Proportion Deemed Unsafe/Dangerous

95%CI 0.72-1.02

95%CI 0.20-0.61
0.45

0.87

Intervention [*N=132]   Controls [*N=130]
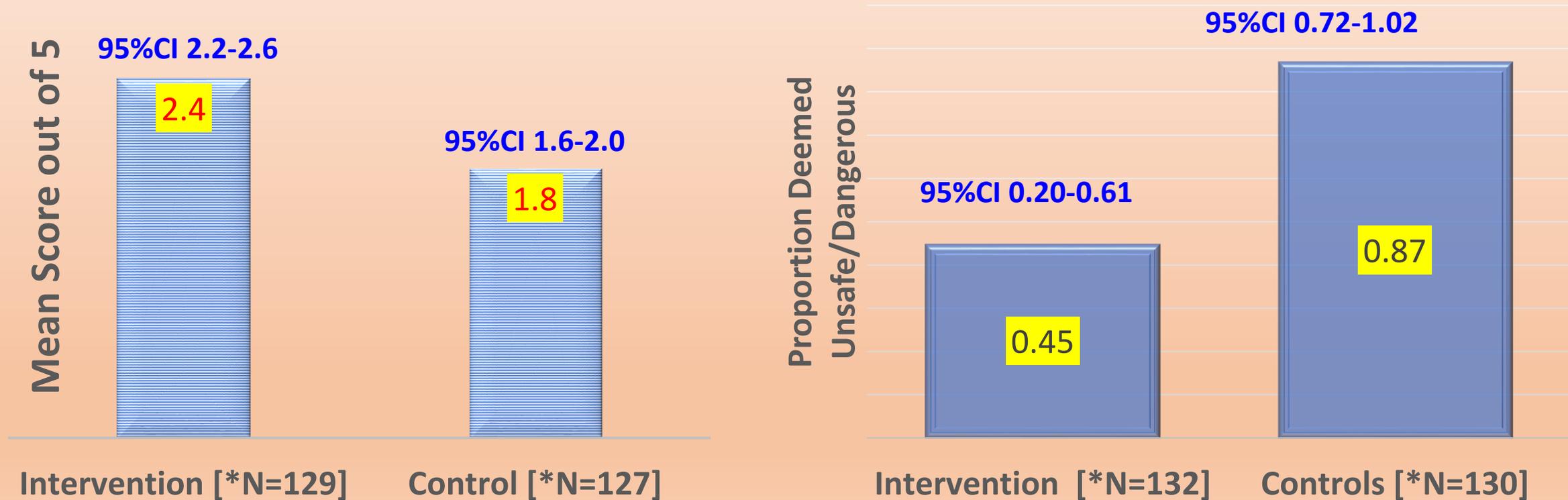
*Episodes of resuscitation

Testing appropriateness of new WHO guidelines on Pneumonia Care

The WHO introduced new guidelines for classification of pneumonia in 2013

These involved a major shift in diagnosis and treatment

We sort to determine appropriateness of the change

Risk factors for death based on new WHO pneumonia classification; based on a cohort of 6000 babies admitted before the guideline implementation

Children with Revised diagnosis of Non-Severe Pneumonia were to be treated at home

	Mortality (95% CI)
All pneumonia	5·2% (4·9–5·5)
All non-severe	2·7% (2·4–3·0)
Non-severe, no risk factors*	0·2% (0·0–0·9)
Age 12–59 months	1·5% (1·2–1·8)
Age 2–11 months	4·2% (3·7–4·8)
Male sex	2·2% (1·9–2·6)
Female sex	3·3% (2·8–3·8)
Low malaria prevalence	2·2% (1·9–2·5)
High malaria prevalence	3·8% (3·2–4·4)
Immunisation up to date	2·3% (1·9–2·7)
Immunisation not up to date	4·2% (2·0–7·6)
Respiratory rate <70 breaths per min	1·8% (1·6–2·2)
Respiratory rate ≥70 breaths per min	4·1% (3·5–4·7)
Chest indrawing absent	1·5% (1·1–1·9)
Chest indrawing present	3·2% (2·7–3·7)
Axillary temperature <39°C	2·0% (1·7–2·3)
Axillary temperature ≥39°C	3·8% (2·8–5·1)
WAZ ≥–2 SD	1·8% (1·5–2·1)
WAZ <–2 to –3 SD	4·4% (3·4–5·6)
WAZ <–3 SD	7·5% (4·9–11·8)
Pallor absent	1·8% (1·5–2·1)
Mild to moderate pallor	7·8% (5·1–11·4)
Severe pallor	11·2% (7·7–15·6)
Dehydration absent	2·5% (2·2–2·8)
Moderate dehydration	5·1% (3·6–6·9)

Mortality (95% CI)

# Reflections on Improvement Research

Progressive, though asymmetrical, improvement in uptake of key process guidelines demonstrated over 11 years

Process improvement (using 1 day new-born resuscitation) was attained with seemingly sustainable short term efficacy

Local data driven critical appraisal of new Pneumonia Treatment Guidelines introduced as an improvement

State of HS supporting in-patient care in 2015

Data from 13 district hospitals spread across Kenya describing

Performance indicators based on WHO building blocks

I	**II**	**III**	**IV**
Improved Governance and Leadership Functions	Enhancement of Service Delivery Quality	Better Health Information Systems	Better Human Resources distribution

1. Arch Dis Child 2015;0 :1-7,   2. J Trop Pediatr. 2015; 61(4): 255–259. 3. BMC Paediatrics, (2017) 17:99 DOI 10.1186/s12887-017-0850-8
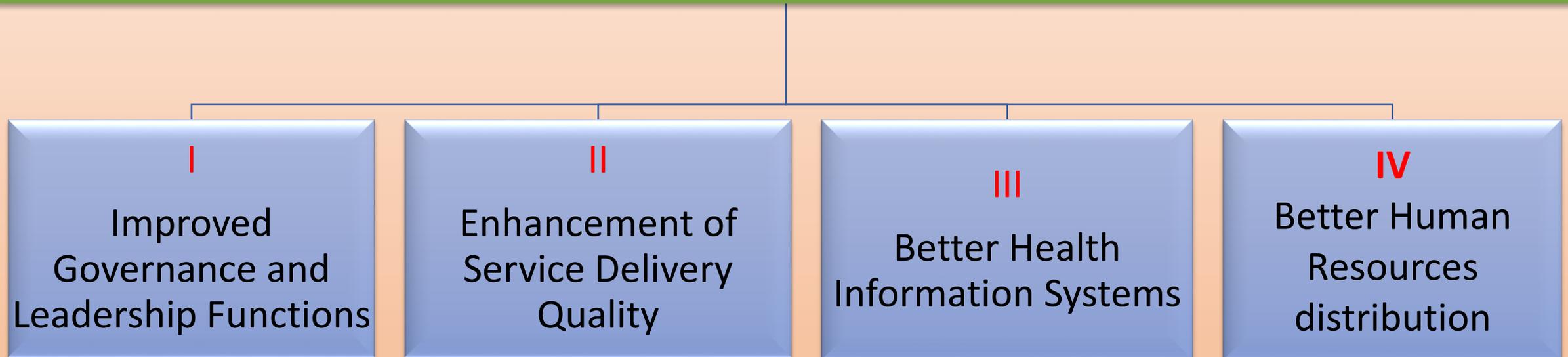
Improved Governance and Leadership Functions Nationally

- Universally deployed Clinical Practice Guidelines in health facilities including faith based and those classified above primary referral level.

- Move towards acceptance and adoption of policies developed locally.

Service Delivery Quality

Rates of guideline driven laboratory and prescription services

Danger signs 67% [52-85]	**Blood Sugar** 18%	**Chest X-Rays** 9%	**Antibiotic dosing** 35-96%	**Severe malaria treatment** 27%
Malaria slide 65-80%	**Lumber Puncture** 66%	**Routine HIV Test** 34%	**Diarrhoea therapy** 71%	**Care of SAM** 59%
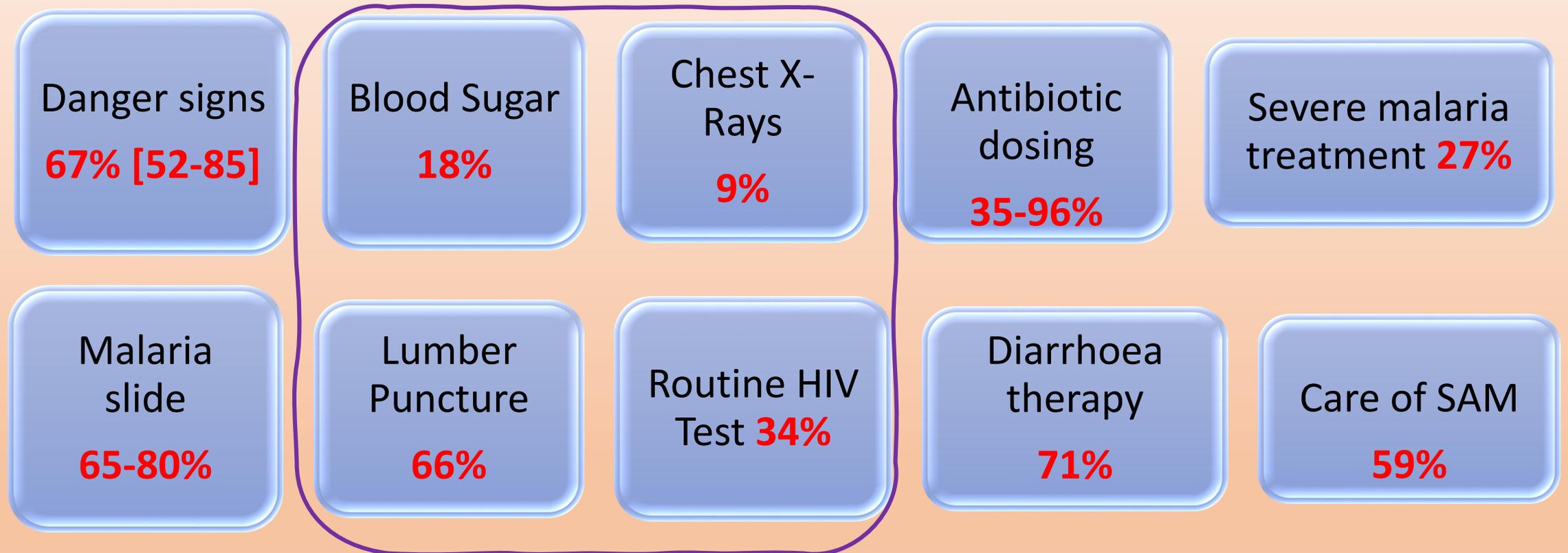
Health Information Systems

Predictors of all course mortality	Risk factor	Impact
	Abnormal Neurological Signs	30 – 300% increase
	Cardio-Respiratory	40 – 260% increase
	Malnutrition	200-300% increase
	Co-Morbidities	3-20% increase
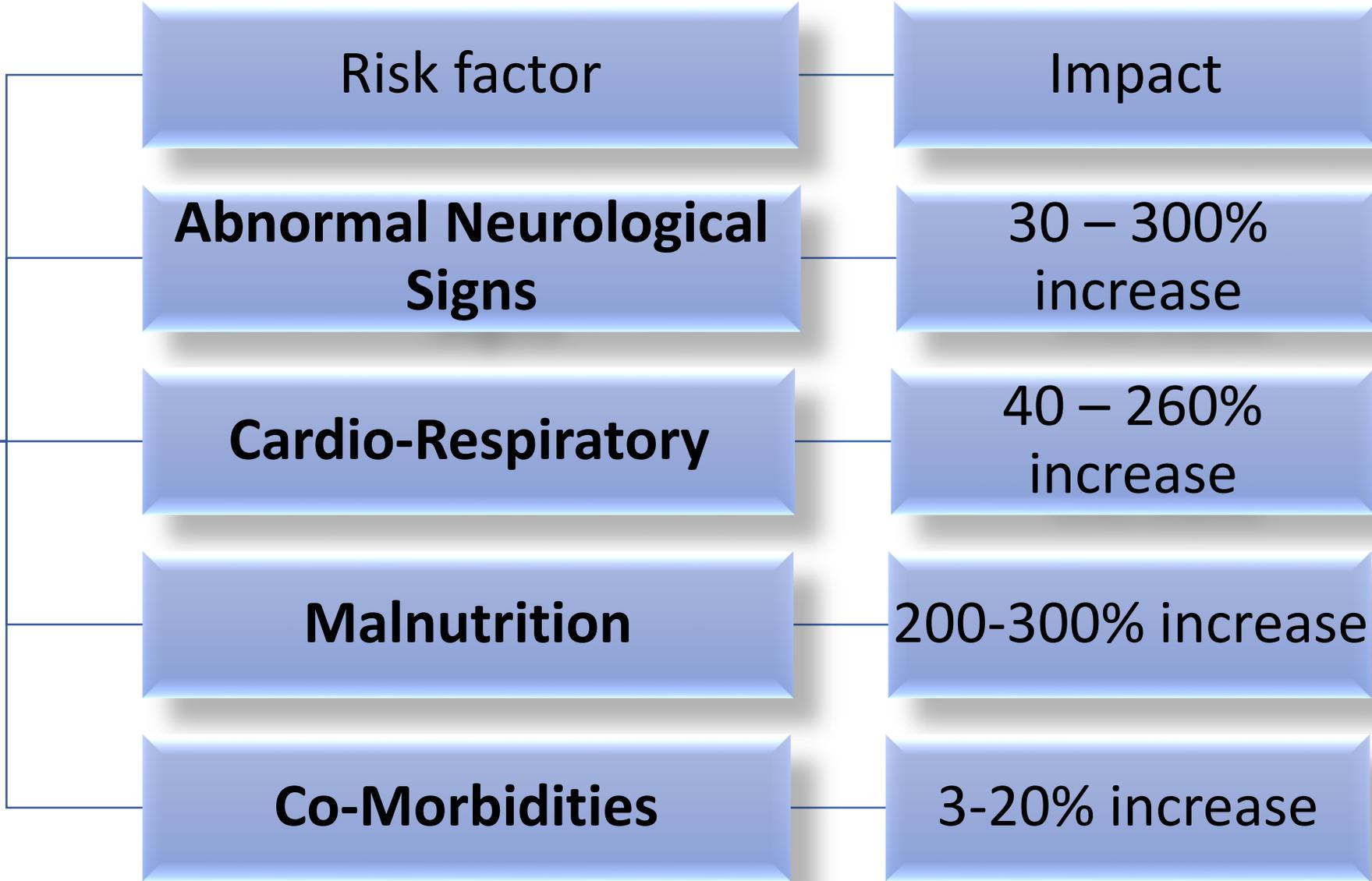
High Quality Mortality Data Now Available
## Capturing causes of mortality granulated for multiple cause with Venn diagrams

High malaria prevalence

Pneumonia   Dehydration

Malaria   81 (8.6%)   69 (7.3%)   Anaemia

60 (6.3%)

77 (8.1%)   19 (2%)

129 (13.6%)   46 (4.9%)

65 (6.9%)   9 (1%)

20 (2.1%)

67 (7.1%)   15 (1.6%)

35 (3.7%)   33 (3.5%)

109 (11.5%)

Not in top 4*
112 (11.8%)

Low malaria prevalence

Dehydration   Anaemia

Pneumonia   160 (18.6%)   13 (1.5%)   HIV

13 (1.5%)

202 (23.5%)   1 (0.1%)

240 (28%)   13 (1.5%)

17 (2%)   3 (0.3%)

4 (0.5%)

21 (2.4%)   11 (1.3%)

0 (0%)   13 (1.5%)

22 (2.6%)

Not in top 4*
125 (14.6%)
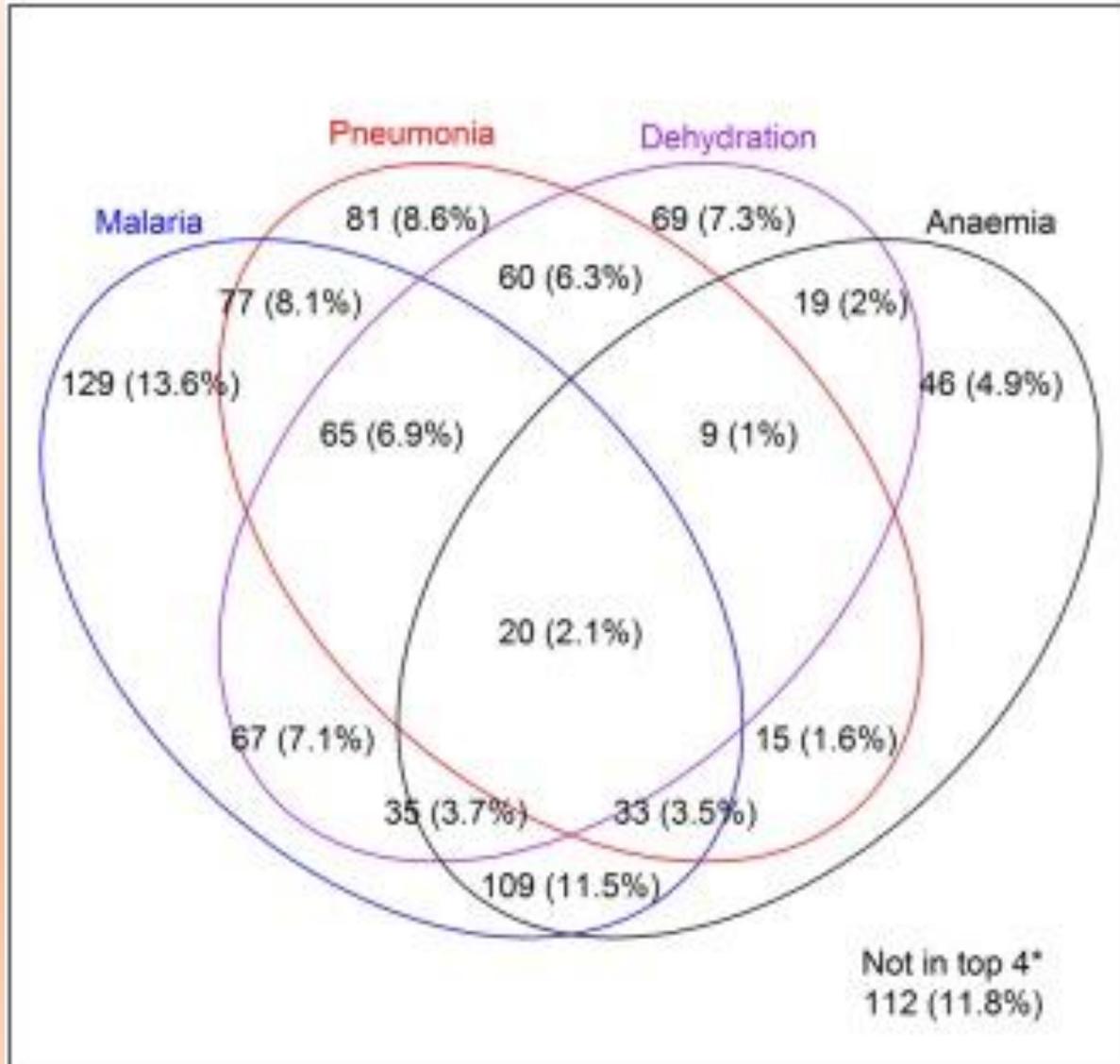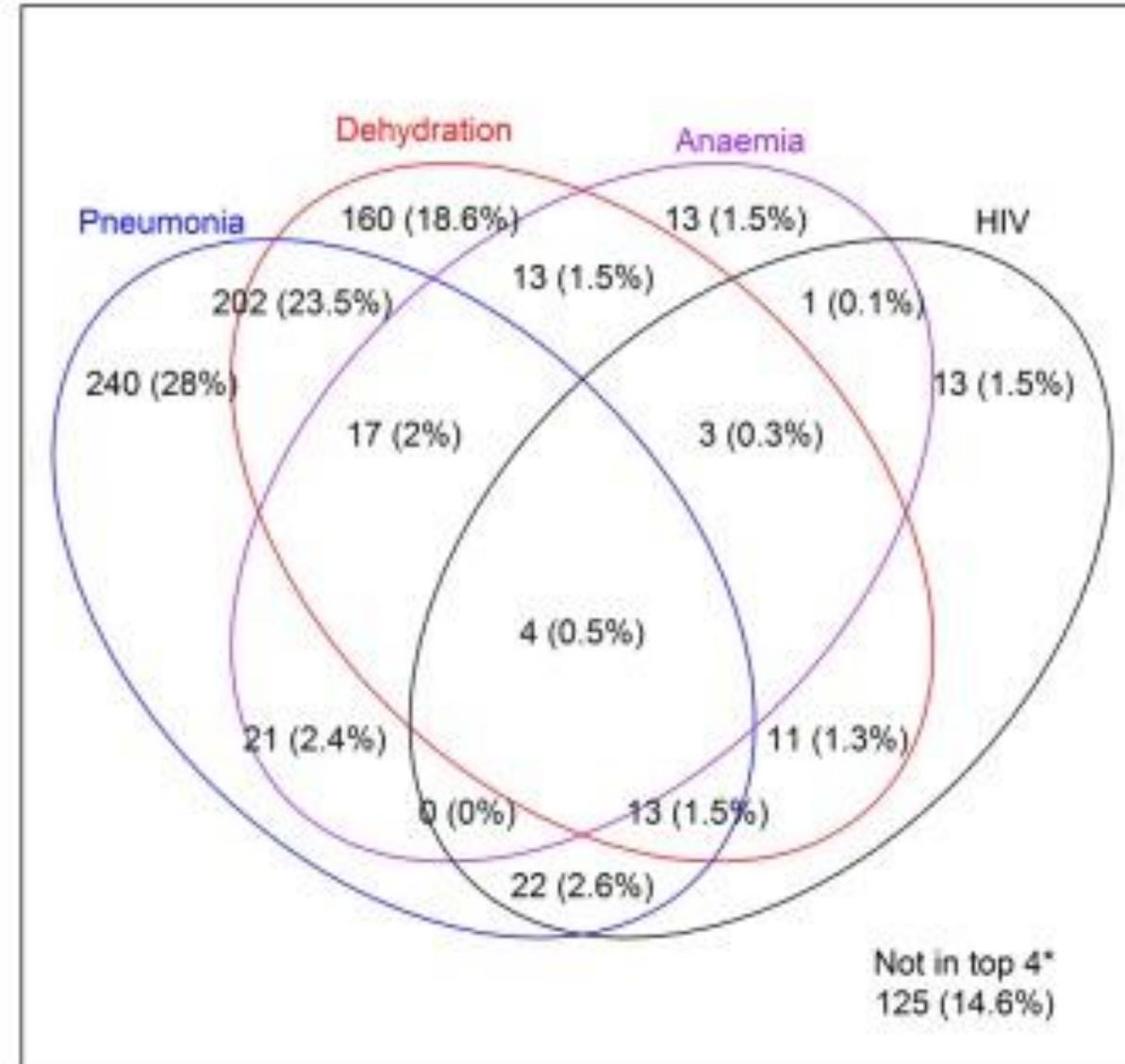
Improving Human Resource Distribution

Availability of paediatricians in primary referral hospitals (N (%)
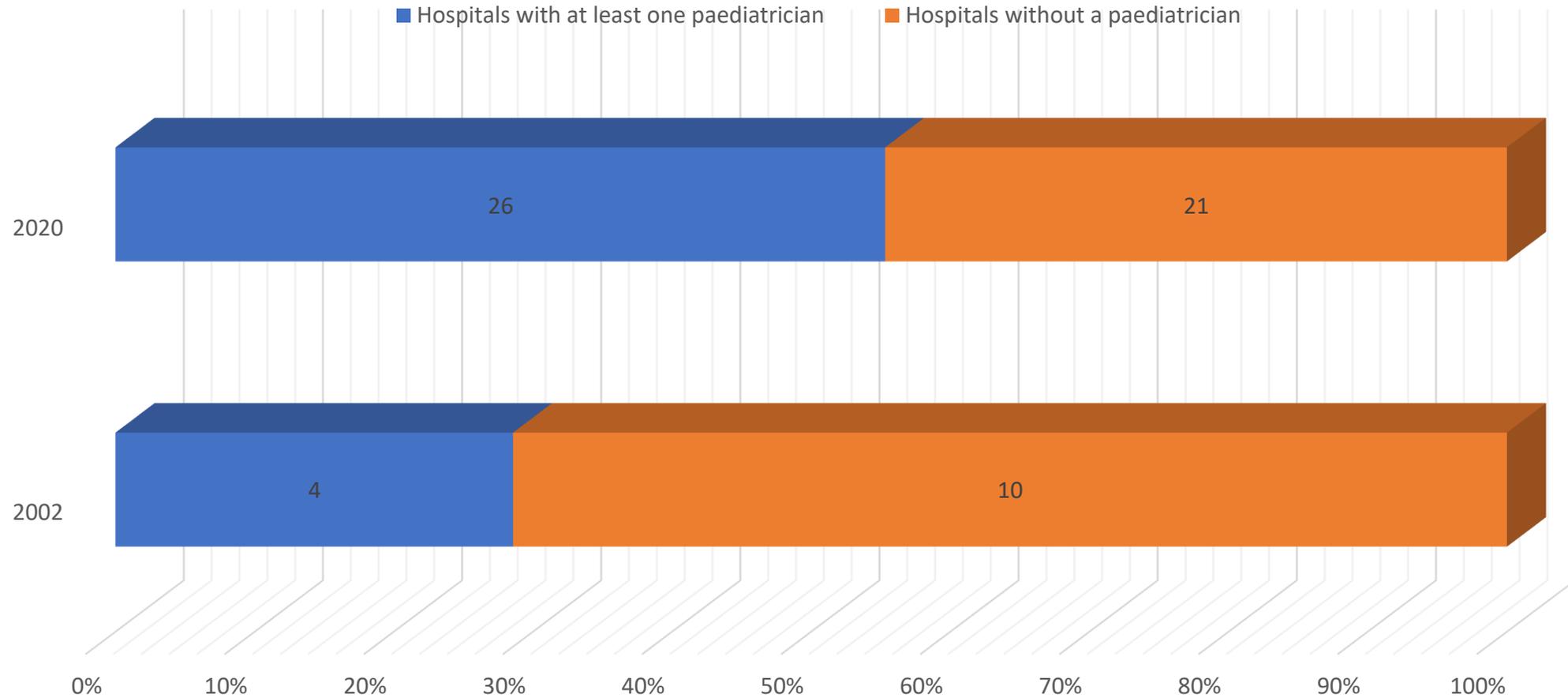
Reflections on State the Health Systems 2015

1
- Improved Governance and Leadership Functions Nationally
- Impacting on all key HS-BB

2
- Positive Strides in Service Delivery Quality

3
- Significantly enhanced Health Information Systems advising
- care

4
- Some visible improvement in Human Resource Distribution

Contribution of the research and thesis to science and society

ELUCIDATING THE VALUE OF SYNCHRONIZED HS-RESEARCH

Identify problem and determine research driven solution

High in-patient mortality contributed by poor Health Systems support for in-patient care

Establish contributory gaps in the care system(s)

Governance, Delivery and Health Information Systems

HRH, Infrastructure, Medicines & HF

First level of interventions

Management science principles to develop strategies and tools for appropriate responses

Escalate to governance systems

Second level of interventions

Implementation science methods for optimal delivery using the tools

Improvement science methods to test modified tools and/or strategies

Operational Science for testing underperforming tools/strategies

A second performance evaluation to test intervention impact

Creation of Data Collection Infrastructure

Anatomy and Physiology

of the

Clinical Information

Network

REDCap = Research Electronic Data Capture
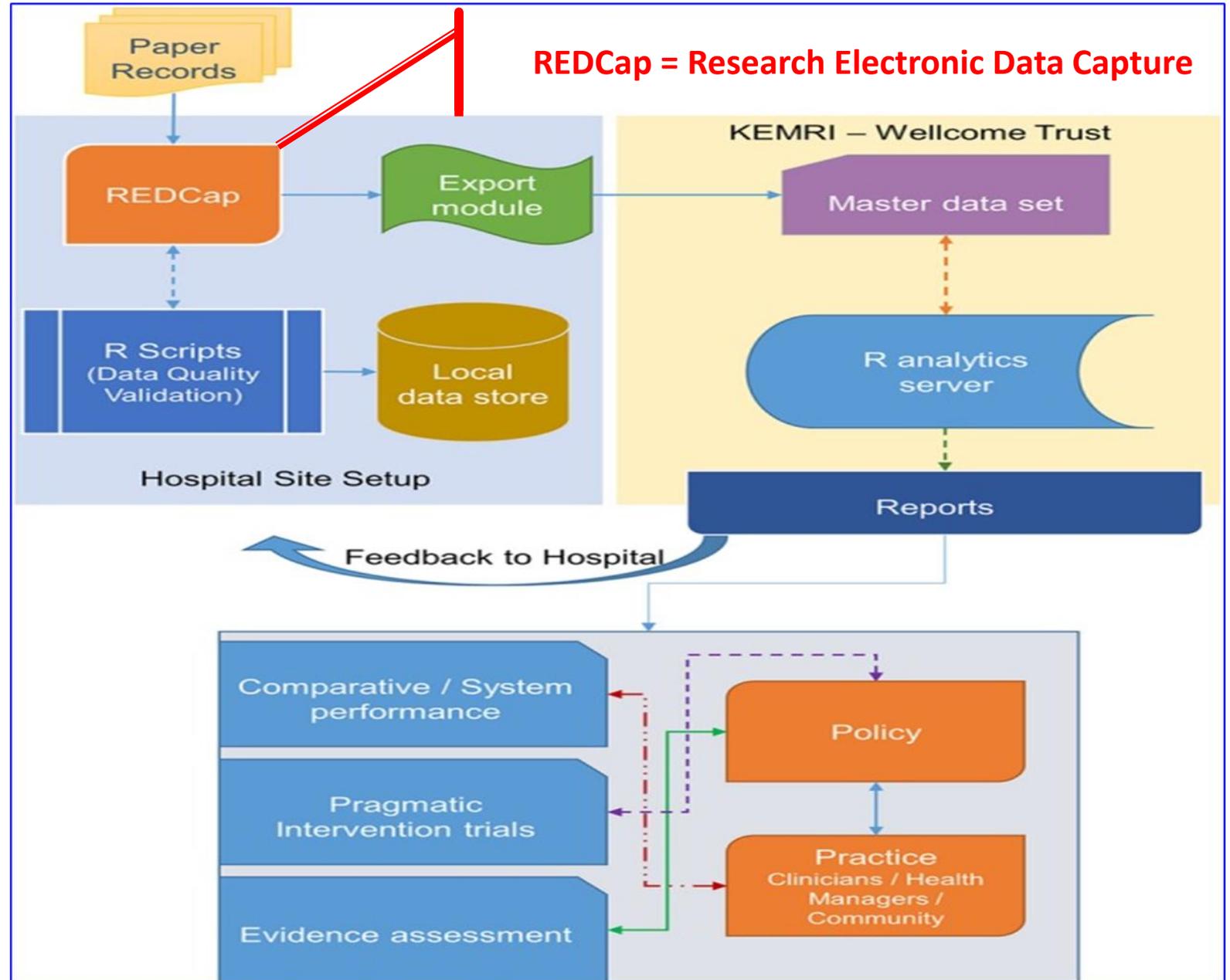
Building and Disseminating Knowledge

Annual accretion of the HSR publications

Building and Disseminating Knowledge

Google scholar citations

Total Citations 1,556
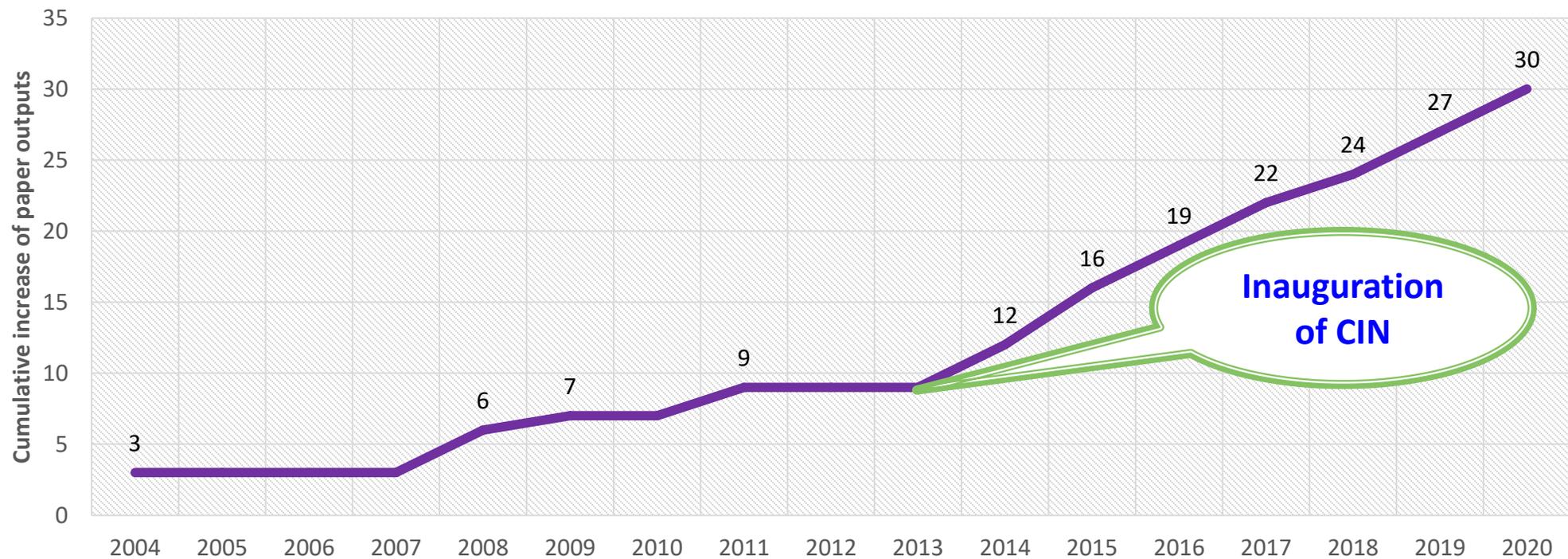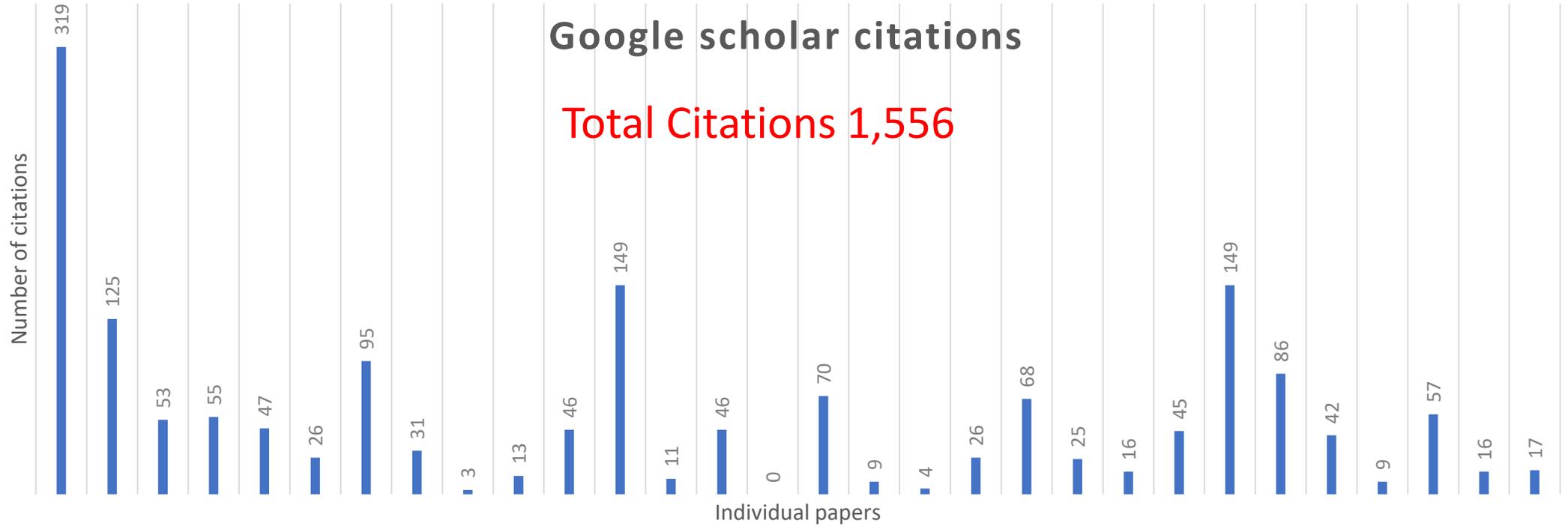
Improving practice
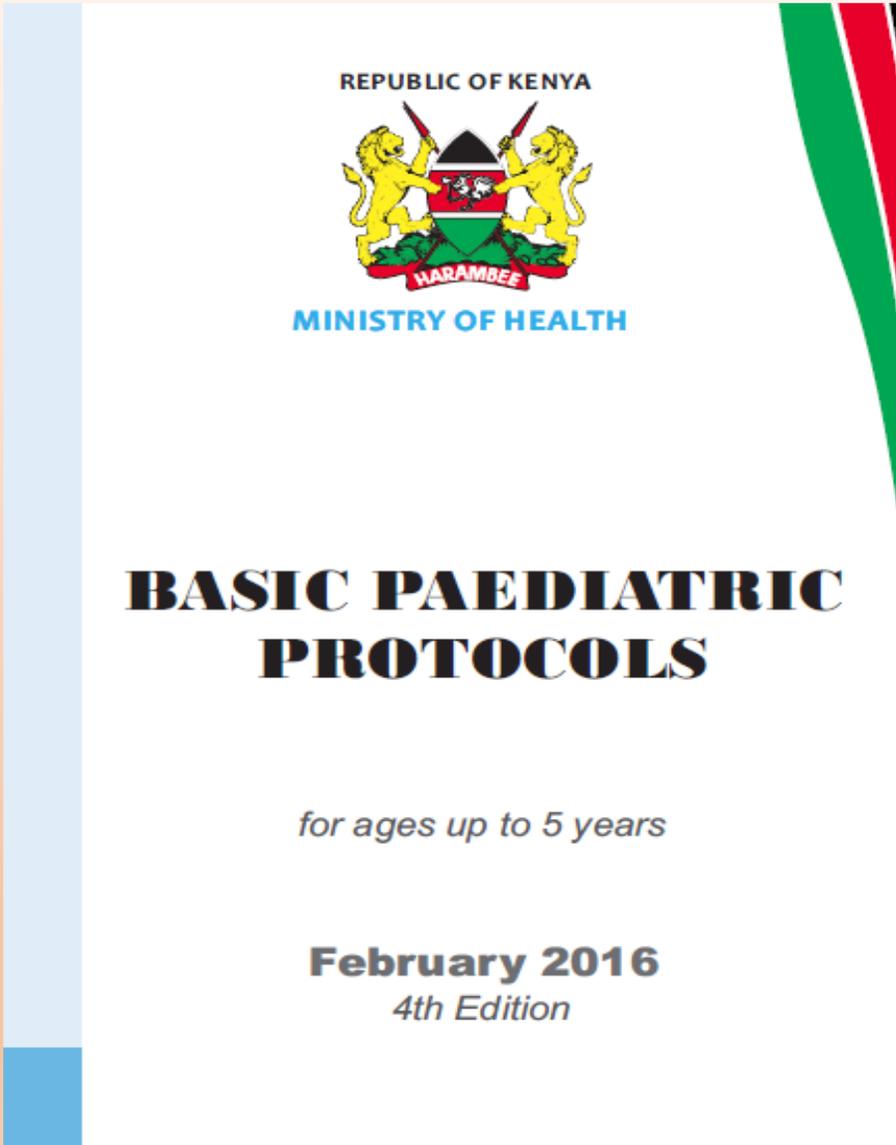
Adopted by all government facilities while many faith based as and private hospitals are presently upscaling use

Innovations in training to support buy in and uptake of CPGs

New Tool for Training Stakeholders

Domain	ERIC* strategies	Strategies adopted for Kenya
Change Infrastructure	Alter incentive infrastructure	Recognition of frontline staff by the network team and peers
Evaluative & Iterative Strategies	Change of record system	Introduction of the Paediatric Admission Record [PAR]
	Change of mandate	Increase presence of seniors
Interactive Assistance	Develop implementation and monitoring tools	Building a mechanism for capturing trustworthy data [CIN]
Stakeholder Inter-relationship	Building coalitions	Government, academic and research institutions and professional organizations
Training & educating stakeholders	Building coalitions	Government, professional association, senior peers and hospital team leaders
Support Clinicians	Creation of a learning collaborative	Creation and support for continuous professional development,

*Expert Recommendations for Implementing Change, 2015

Advising policy

The Basic Paediatric Protocol booklet is now supported by Ministry of Health policy while being included in undergraduate curricula since 2008

Advisory on pilot introduction of influenza vaccine due insufficient has created an environment of using evidence to advise important public health decisions

Task shifting of more manual duties to less skilled workers to allow nurses concentrate on skilled clinical inputs

Probable contribution towards the MDG 4 achievements

Number of Deaths /1000 Live Births

SS Africa — Global — Kenya

National adoption of CPGs

- 178 (1990, SS Africa)
- 171 (1995, SS Africa)
- 153 (2000, SS Africa)
- 125 (2005, SS Africa)
- 98 (2010, SS Africa)
- 76 (2015, SS Africa)
- 70 (2017, SS Africa)
- 92 / 90 (1990)
- 95 (1995, Kenya)
- 86 (1995, Global)
- 105 (2000, Kenya)
- 76 (2000, Global)
- 110 (2005, Kenya)
- 63 (2005, Global)
- 74 (2010, Kenya)
- 50 (2010, Global)
- 52 (2015, Kenya)
- 40 (2015, Global)
- 49 (2017, Kenya)
- 37 (2017, Global)

1990 1995 2000 2005 2010 2015 2017

http://www.un.org/en/development/desa/population/publications/mortality/child-mortality-report-2018.shtml,
Source: Welfare monitoring Survey II1994, Situation Analysis of Women & Children 1989 , KDHS 1998, 2003, 2008

THOSE WHO HAVE MADE PIVOTAL DIFFERENCE ON MY PATHWAY TO THIS END

Dr James Nyikal

Prof James Kaggia

Prof Francis Onyango

Prof RN Musoke

Prof Nimrod Bwibo
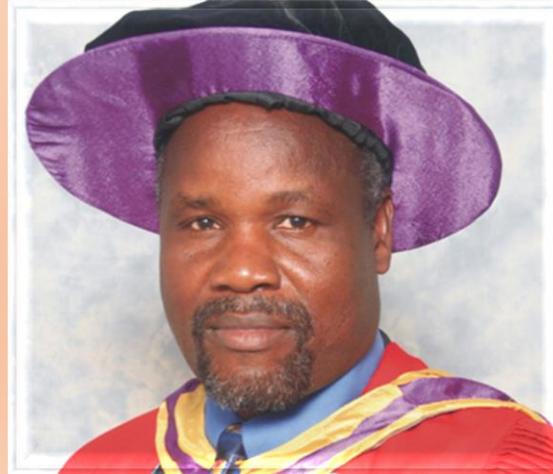
Prof Dominic Makawiti
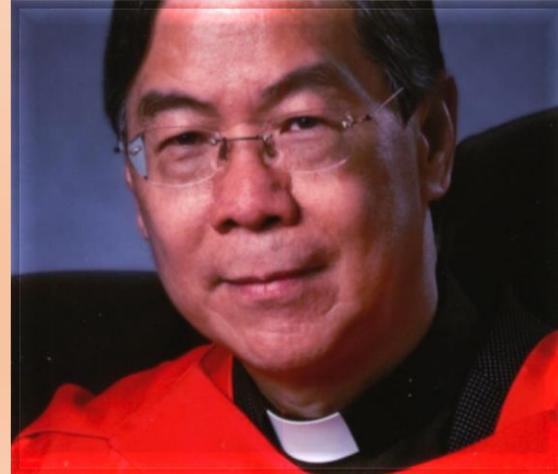
Prof Victor YU

Prof Mike English

And the Family; Providing support without measurable indicators

The Locations of the thesis theme publications

1	https://pubmed.ncbi.nlm.nih.gov/15194254/
2	https://pubmed.ncbi.nlm.nih.gov/15519635/
3	https://pubmed.ncbi.nlm.nih.gov/18495913/
4	https://pubmed.ncbi.nlm.nih.gov/27398232/
5	https://pubmed.ncbi.nlm.nih.gov/28153020/
6	https://pubmed.ncbi.nlm.nih.gov/28584069/
7	https://pubmed.ncbi.nlm.nih.gov/28584069/
8	https://pubmed.ncbi.nlm.nih.gov/16857044/
9	https://pubmed.ncbi.nlm.nih.gov/21483712/
10	https://pubmed.ncbi.nlm.nih.gov/30832678/
11	https://pubmed.ncbi.nlm.nih.gov/22078071/
12	https://pubmed.ncbi.nlm.nih.gov/26996797/
13	https://pubmed.ncbi.nlm.nih.gov/25138104/
14	https://pubmed.ncbi.nlm.nih.gov/25237411/
15	https://pubmed.ncbi.nlm.nih.gov/26862631/

16	https://pubmed.ncbi.nlm.nih.gov/25822492/
17	https://pubmed.ncbi.nlm.nih.gov/19695001/
18	https://pubmed.ncbi.nlm.nih.gov/29702700/
19	https://pubmed.ncbi.nlm.nih.gov/29783977/
20	https://pubmed.ncbi.nlm.nih.gov/24482351/
21	https://pubmed.ncbi.nlm.nih.gov/18270586/
22	https://pubmed.ncbi.nlm.nih.gov/29241618/
23	https://pubmed.ncbi.nlm.nih.gov/29179872/
24	https://pubmed.ncbi.nlm.nih.gov/27070913/
25	https://pubmed.ncbi.nlm.nih.gov/32133169/
26	https://pubmed.ncbi.nlm.nih.gov/30502070/
27	https://pubmed.ncbi.nlm.nih.gov/26662925/
28	https://pubmed.ncbi.nlm.nih.gov/25841436/
	https://pubmed.ncbi.nlm.nih.gov/32554508/

Asanteni
Thank you
Merci
Obrigado
Xièxiè nǐ
Gracias

Service delivery preparedness [Workload and Infrastructure]

ANNUAL WORKLOAD

Legend: ■ Admissions ■ Deliveries

Y-axis: No of Admissions/deliveries, 000

Hospital	Admissions	Deliveries
A	2.3	1.8
B	3.2	5.8
C	6.3	6
D	2.9	1.4
E	4.5	2.5
F	1.2	1.5
G	2.2	3.7
H	3.4	0.95
I	3.4	2.1
J	1.4	1.3
K	1.1	1.2
L	0.67	1.3
M	1.7	2.5
N	1.5	2.5

BEDS/COTS

Y-axis: No of beds/cots

Hospital	No of beds/cots
A	35
B	47
C	72
D	76
E	94
F	33
G	61
H	40
I	37
J	44
K	47
L	73
M	40
N	34
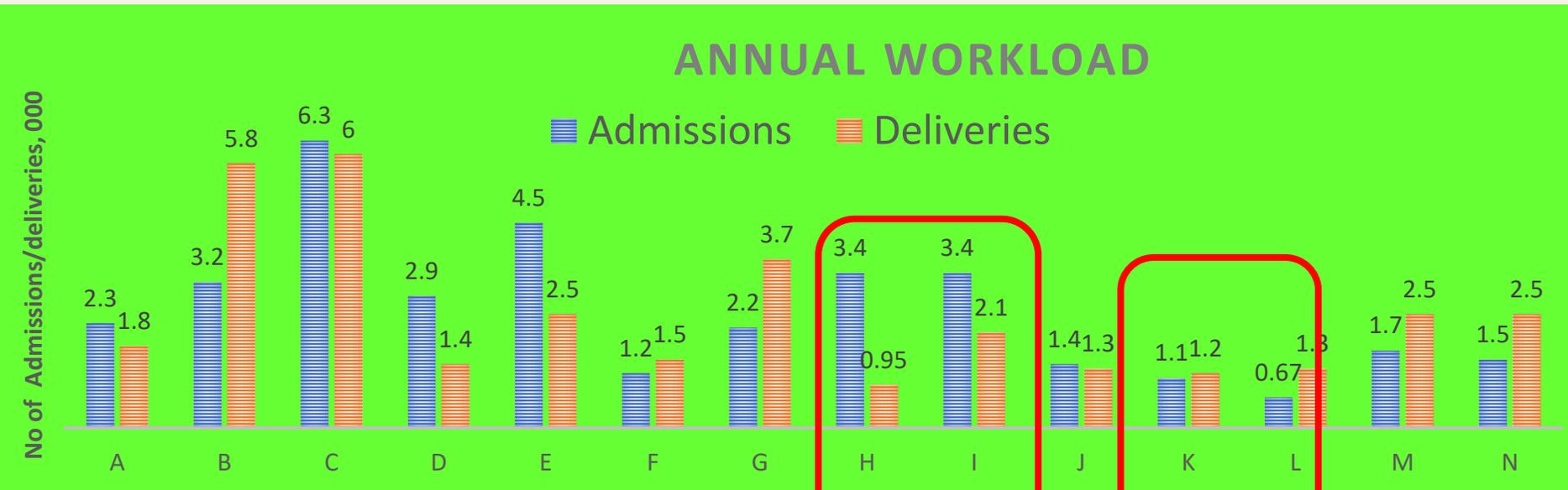
Hospitals with adequate support infrastructure out of 14

Electricity N=7

Water N=9

Ambulance N=9

Staff hand washing N=8

Carer hand washing N=4

Structural Capacity to deliver New-born in Nairobi City County

Structural Domain	No. of Items
Infrastructure	3
Lab Tests	9
Hygiene Equip	14
Equip & Drugs for Safe Delivery	37
Resuscitation Equipment in the Delivery Room	20
Essential Equip in NBU	18
Fluids & Feeds in NBU	8
Essential NBU Drugs	17
TOTAL	126

Structural capacity of 31 new-born Units in Nairobi measured as % of the 126 items present in working order

Number & Types of Hospitals

■ Private ■ Mission ☐ Public

Structural Scores an a percentage

51-60% · 61-70% · 71-80% · 81-90% · 91-100%