Data Quality in Vaccination Surveys?

10th Annual African Vaccinology Course (AAVC):
Developing Vaccinology Expertise for Africa
10 -14 November 2014, Double Tree Hilton Hotel, Cape Town

VACFA vaccines for africa

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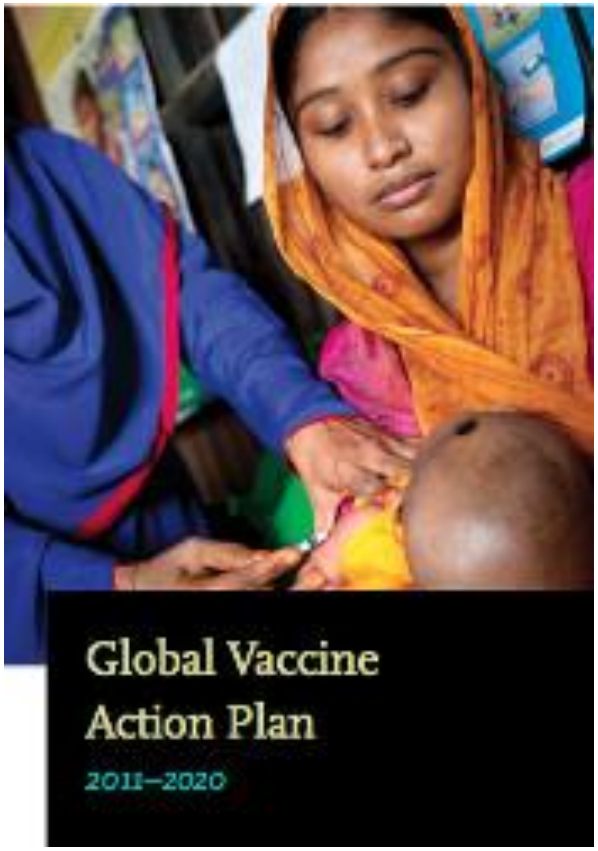
Global Vaccine Action Plan

1. Strengthen routine immunization to meet vaccination coverage targets
2. Accelerate control of vaccine-preventable diseases
3. Introduce new and improved vaccines
4. R & D new vaccines and technologies.



Global Vaccine Action Plan 2011 - 2020
Six Strategic Objectives

1. All countries commit to immunization as a **priority .**
2. Individuals and communities understand the **value** of vaccines and demand immunization as their right and responsibility.
3. Benefits of immunization are **equitably** extended to all people.
4. Strong **immunization systems** are an integral part of a well **functioning health system**.
5. Immunization programmes have sustainable access to predictable **funding, quality supply and innovative** technologies.
6. Country, regional and global research and development **innovations** maximise the benefits of immunization

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Table 5 : Summary of Recommended actions for Strategic Objective 4

GVAP Strategic Objective 4: Strong immunization systems are an integral part of a well functioning health system

1. Develop comprehensive and coordinated approaches.
2. Strengthen monitoring and surveillance systems
3. Strengthen capacity of managers and frontline workers
4. Strengthen infrastructure and logistics.

GVAP Table 5 : Summary of Recommended actions for Strategic Objective 4

GVAP Strategic Objective 4: Strong immunization systems are an integral part of a well functioning health system

1. Develop comprehensive and coordinated approaches.

- **Eradication** (Polio) & **Elimination** (NT, measles, CRS) Campaigns should be coordinated as part of EPI not as independent efforts

- **The introduction of a new vaccine** should be be linked to
  a. Surveillance and control of the specific disease
  b. Coordination between public and private sectors:
     => reporting, administration and quality.

Consider **expanding EPI** to include adolescents, pregnant women and adults.

GVAP Table 5 : Summary of Recommended actions for Strategic Objective 4

GVAP Strategic Objective 4: Strong immunization systems are an integral part of a well functioning health system

2. Strengthen monitoring and surveillance systems

On-going development, promotion, assessment & support for:

- Improved quality and analysis of administrative and survey data
- New Technologies
- Strengthening and expanding surveillance systems
- Strengthening vaccine safety activities

GVAP Table 5 : Summary of Recommended actions for Strategic Objective 4

GVAP Strategic Objective 4: Strong immunization systems are an integral part of a well functioning health system

3. Strengthen capacity of managers and frontline workers

- **Human resources :** able to schedule & deliver predictable services of acceptable quality. (Both EPI & PHC)

  Teams should involve Health Professionals & CHWs

- **Training** : pre-service, in-service and post-service curricula - Immunization = component of comprehensive disease control.

- **Regular Support and Supervision :** able to assess, problem manage & encourage.

GVAP Table 5 : Summary of Recommended actions for Strategic Objective 4

GVAP Strategic Objective 4: Strong immunization systems are an integral part of a well functioning health system

4. Strengthen infrastructure and logistics.

- **Cold-chain capacity and logistics:** Innovate*

  also for management of waste.

- **Environmental impact:** Minimize the use of fossil fuels, materials & processes

- **Staffing:** proactively recruit & support personnel levels

- **Information systems** : track the available supply accurately

GVAP Table 5 : Summary of Recommended actions for Strategic Objective 4

Proposed extended strategic objective Indicators*

- Domestic expenditures per person
- NITAG
- Public confidence Surveys
- Proportion of Districts with >80% DTP3 cover
- Drop out rate DTP1 => DTP3
- WUENIC grade of confidence
- Case based surveillance (polio, measles & NNT)

* GVAP Table 13

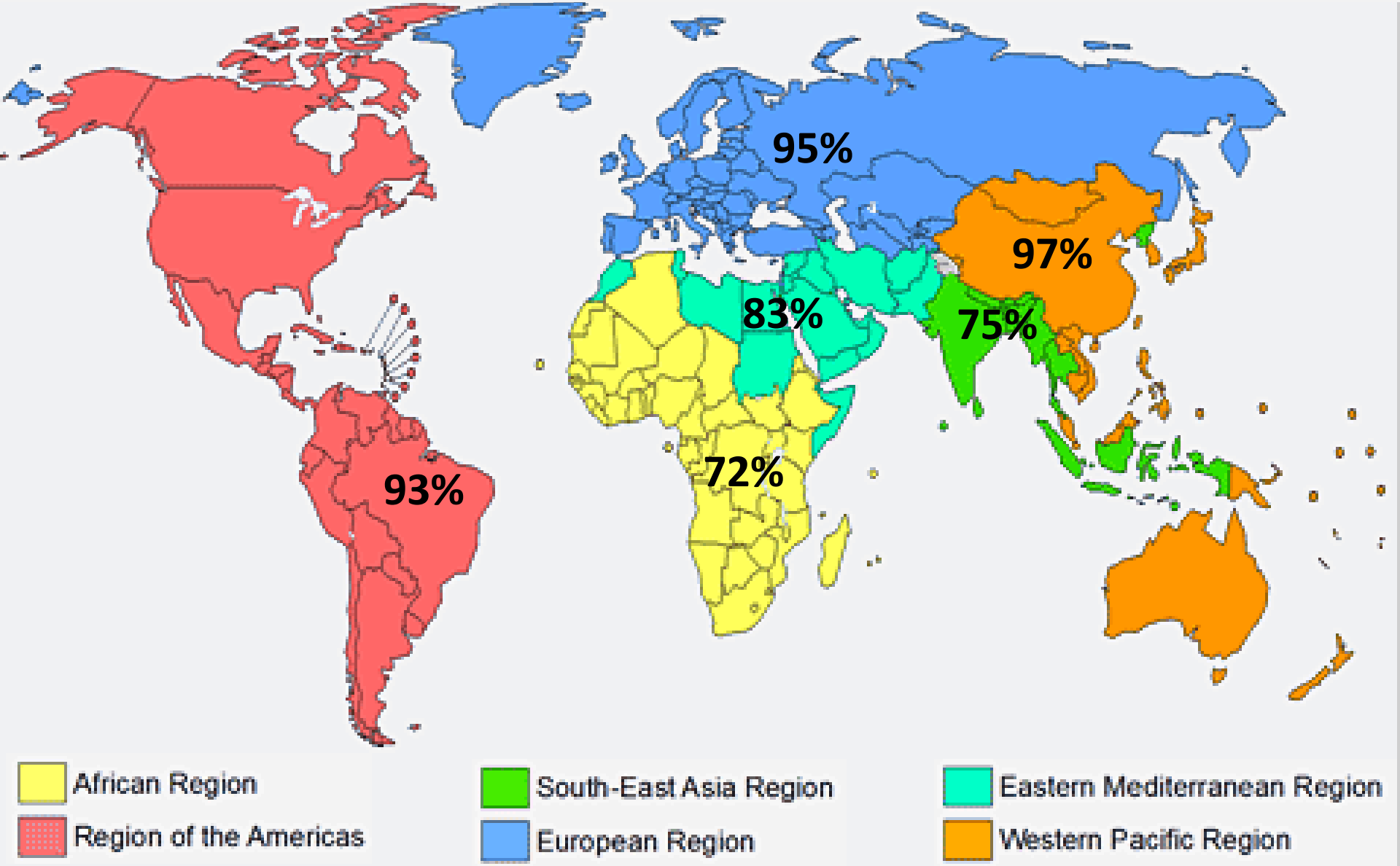
Rationale for measuring immunization coverage*

1. Monitor trends in performance of immunization services Locally, Nationally and Internationally
2. Guide strategies for Eradication, Elimination & Control for vaccine-preventable diseases
3. Identify areas needing resources and focus on areas of low coverage and early warning systems of outbreaks
4. Assess the need to introduce new vaccines
5. Measles coverage – Progress to MDG 4?
6. Link to Service Delivery & Disease Risk

*WHO and UNICEF estimates of national infant immunization coverage: methods and processes WHO Bulletin June 2009

Anthony Burton [a], Roeland Monasch [b], Barbara Lautenbach [b], Marta Gacic-Dobo [a], Maryanne Neill [b], Rouslan Karimov [b], Lara Wolfson [a], Gareth Jones [b] & Maureen Birmingham http://www.who.int/bulletin/volumes/87/7/08-053819/en/

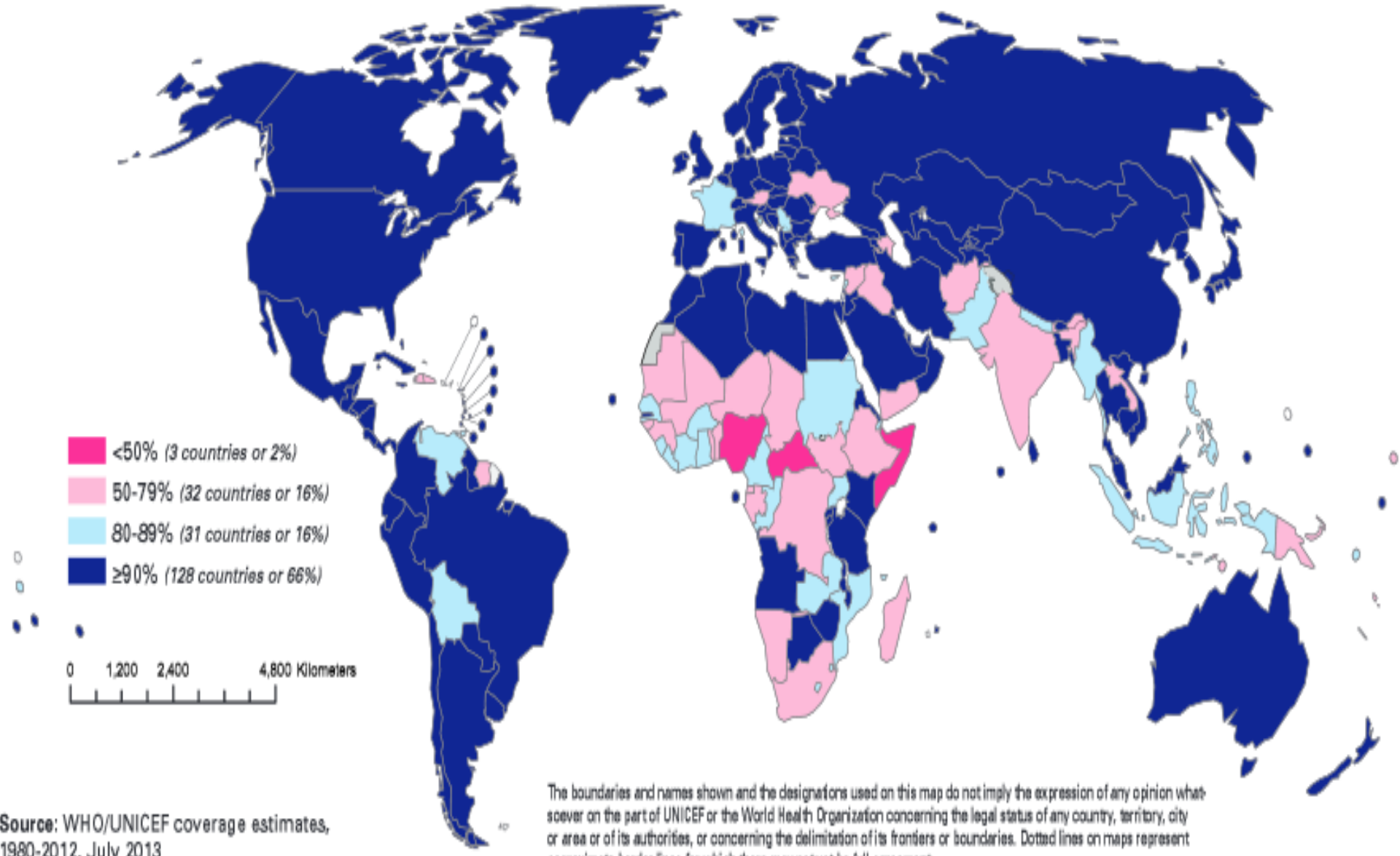
DTP 3 Coverage 2012 WHO 6 Regions



Vaccination coverage (%), by vaccine and World Health Organization (WHO) region* — worldwide, 2012

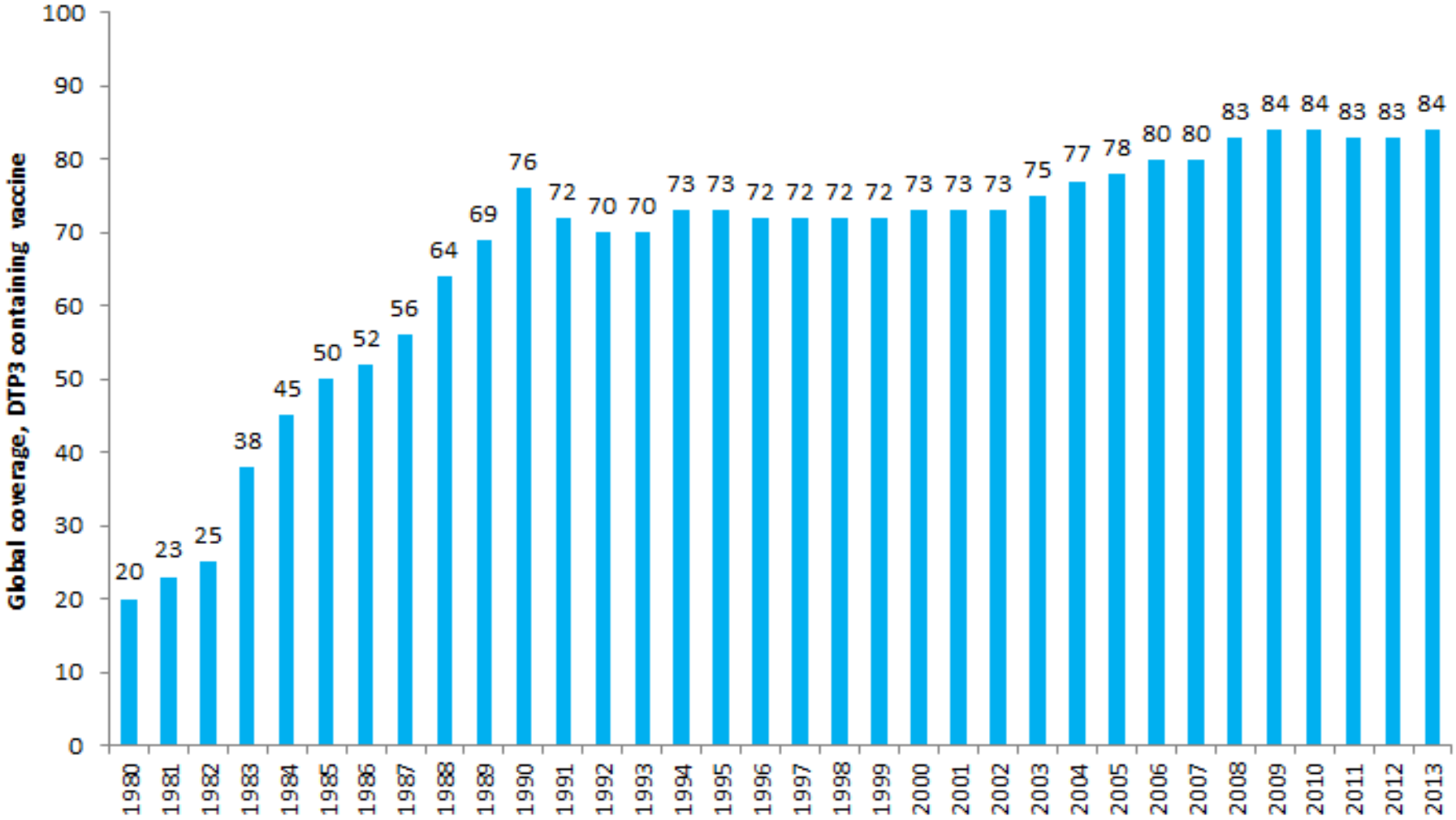
WHO Region	BCG	DTP3	Polio3	MCV1	HepB3	Hib3	Rota last	PCV3
Total (worldwide)	**89**	**83**	**84**	**84**	**79**	**45**	**11**	**19**
African	82	72	77	73	72	65	5	21
American	96	93	93	94	91	91	69	77
Eastern Mediterranean	88	83	82	83	81	58	14	13
European	93	95	96	94	79	83	2	39
South-East Asian	88	75	74	78	72	11	—	0
Western Pacific	97	97	97	97	91	14	1	1

Map 1: Immunization coverage with measles-containing vaccines in infants, 2012



Source: WHO/UNICEF coverage estimates, 1980-2012, July 2013

Global coverage (%) of three doses of DTP-containing vaccine, 1980–2013 WHO/ UNICEF Estimates



Coverage estimates %

2013	South Africa		Zimbabwe		Kenya		Brazil	
	estimate	official	estimate	official	estimate	official	estimate	official
DTP 3	65	90	95	95	82	84	95	95
	*		**		**		**	
Measles 1	66	87	93	97	93	79	99	108
	*		**		*		**	

*** Estimate is supported by reported data with revision by independent population agencies and recalculation the data and the denominator with at least one supporting survey < 2 years

** Estimate supported by at least one data source

* No direct supporting data

Nothing is certain.
People's certainty of the past is limited by
the fidelity of the devices that record it,
their knowledge of the present is always incomplete,
and their knowledge of the future is but speculation.

Cohen PR, Grinberg MR. A theory of heuristic reasoning about uncertainty. AI Magazine 1983; 4(2): 17-24

Heuristic is about problem solving, learning, and discovery that find a solution which – is not guaranteed to be optimal, but good enough for a given set of goals

WUENIC

WHO and UNICEF Estimates of National Immunization Coverage

" WUENIC is a rule based system implemented as a logic program, developed by WHO and UNICEF for estimating global, country by country, infant immunization coverage. .." facilitating "decisions that are consistent, transparent and replicable.

[Developed by Robert Kowalski ICL & Anthony Burton WHO]

WHO and UNICEF Estimates of National Immunization Coverage

"based on ...information of varying and … uncertain quality."

" not classical measures of uncertainty (eg CIs)"but on empirical estimates (or trial and error) = grade of confidence (GoC)

Not a judgment of data reported by countries

http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0047806
http://www.doc.ic.ac.uk/~rak/papers/WUENIC%20JURASIN.pdf

Immunization coverage

The world wide effort to obtain valid and reliable information on vaccination coverage is one of the comprehensive public health programme.

Chris Murray WHO

Administrative coverage is always higher than DHS data & must be validated[1]

- Data quality Assessment
- Household surveys (+ other health information)
- Time series

1. Validity of reported immunization coverage in 45 countries. Chris Murray , Bakhuti Shengelia , N Gupta, Moussavi, A Tnadon el al. Lamcet 2003:362:1022-27

Measuring coverage

1. Administrative methods:

Number of doses administrated ÷ total target population

Problems:

- Target population : movement & incomplete denominator data
- Lack of a vital registration system
- Administrative issues
- 'The human factor". Data collection is time-consuming, not very interesting and poorly rewarded, and replacing paper by electronic systems does not change the problem.
- Inadequate disease surveillance
-

Data Quality Assessment (DQA) regular ongoing self assessment of accuracy & quality)

http://www.who.int/immunization/monitoring_surveillance/routine/coverage/en/index3.html

Measuring coverage

2. Coverage surveys

Numerous challenges:
Selection bias: sampling, field procedures, missed populations
Information biases: mistakes, misclassification, complex schedules, recall

Sero-surveys: useful, but population denominator problem

Need:
Better recording tools
Strengthened vaccine delivery & procedures
Best practices for design, implementation, & analysis of surveys

PLoS Medicine May 2013 l Volume 10 l Issue 5 l e1001404

Common survey methods

Demographic and Health Survey (DHS)

Population, nutrition and health topics

Stratified cluster samples (Census areas)

> Household members (capacity building by Measure DHS)

Multiple Indicator Cluster Samples (MICS)

Population & Child Topics

Stratified cluster samples (Census areas)

> Women 14 – 49 (support from UNICEF)

Expanded programme on Immunization (EPI)

Neighbourhoods / villages

30 x 7 cluster sampling

Lot Quality Assurance Sampling (LQAS)

Stratifies lots (districts/catchment areas) for coverage of various public health interventions as adequate or inadequate

Likelihood Frameworks –

Estimates based on cross-sectional surveys (DHS) & admin data[1]

1. Lessler J, Metcalf CJE, Grais RF, Luquero FJ, Cummings DAT, et al. (2011) Measuring the Performance of Vaccination Programs Using Cross-Sectional Surveys: A Likelihood Framework and Retrospective Analysis. doi:10.1371/journal.pmed.1001110 PLoS Med 8(10): e1001110.

Table 1. Characteristics of common surveys used to measure vaccination.

Survey Characteristic	DHS	MICS	EPI	LQAS
Primary objectives	Collection of information on a wide range of population, health, and nutrition topics, plus additional optional modules	Collection of information on population health, child protection, and child development	Estimation of vaccination coverage	Classification of lots (catchment areas) into two groups: those with adequate coverage and those with inadequate coverage
Sampling scheme	Stratified cluster sampling; clusters selected using PPES; clusters are usually census enumeration areas	Stratified cluster sampling; clusters selected using PPES; clusters are usually census enumeration areas	Cluster sampling with or without stratification; clusters are usually villages or urban neighborhoods, selected using PPES	Classic method uses simple random sampling within a lot; when lots are large, cluster sampling is sometimes employed
Household selection	Household selected randomly based on a complete household listing and mapping in the sample clusters	Current practice is random selection of households based on a complete listing and mapping of enumeration areas	Varies; usually non-probability; the first household is selected randomly, then neighboring households are selected until seven children can be enrolled	When cluster sampling is used, the first household is selected randomly before moving in a consistent direction, sampling every *k*th household
Total sample size	Based on desired precision for key indicators at the regional level; the number of children aged 12–23 months covered in recent surveys is typically around 1,800 at the national level	Based on desired precision of key indicators selected by implementing agencies; usually >2,000 women and several hundred children aged 12–23 months	Usually 30 clusters of seven children aged 12–23 months; sized to yield estimate of ±10% assuming design effect of two	Varies greatly; 19 respondents per lot is a common size with simple random sampling; 50 or 60 is common when using cluster sampling
Respondents	All men and women aged 15–49 years; vaccination data on children <5 years if biological mother is interviewed, and on women of childbearing age	All women aged 15–49 years; vaccination data on children <5 years if primary caretaker is interviewed, and on women of childbearing age	Mother or primary caretaker of children aged 12–23 months	Varies; field workers interview caretaker and when possible substantiate response with vaccination record or sometimes indelible ink finger mark on child
Questionnaire length	Household: 25 pages; woman's questionnaire: about 70 pages	Household: 18 pages; woman's: 38 pages; children under 5 years: 18 pages	1–2 pages	Often 1 page
Implementers	Usually National Statistical Office or equivalent, with capacity-building from MEASURE DHS	Usually National Statistical Office, with support from UNICEF and other partners	Varies; often national- or district- level Ministry of Health employees	Varies; usually independent from vaccination team
Duration	12 months or more to plan, implement, analyze, and report	12 months or more to plan, implement, analyze, and report	Several months to plan; weeks to implement, analyze, and report	Varies; 1–2 days per lot to implement and analyze

Cutts FT, Izurieta HS, Rhoda DA (2013) Measuring Coverage in MNCH: Design, Implementation, and Interpretation Challenges Associated with Tracking Vaccination Coverage Using Household Surveys. http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.1001404

Measuring Coverage in Maternal, Neonatal and Child Health

Design, Implementation, and Interpretation Challenges Associated with Tracking Vaccination Coverage Using Household Surveys)

- Vaccination coverage is an important indicator of public health, if well designed and well executed
- Administrative reports over estimate inaccurate numerators & denominators
- Home-based records and clinic records need to be improved
- Probability sampling surveys essential with minimized selection and information bias, sample size < = program needs, Strict QC measures for data collection &analysis.
- Potential bias in surveys must be checked before interpretation
- Partners play an important role
- National Immunization Programs and partners: work to improve collection, interpretation, and use of vaccination coverage data and other indicators.

Cutts FT, Izurieta H & Rhoda DA (2013)
http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.1001404

DATA QUALITY AUDITS (DQA)

- Assist countries receiving GAVI support improve the quality of their information systems for immunisation data. In addition, it
- calculates a measure of the accuracy of reporting.

GAVI

DATA QUALITY AUDIT

COUNTRY: LIBERIA

From 18th July to 4th August 2005

LIVERPOOL ASSOCIATES IN TROPICAL HEALTH, UK

in association with

EURO HEALTH GROUP, DENMARK

DQA Indicator Dashboard:

	2011	2012	2013	
Verification Factor (> 0.8) (Cf recounted to reported DPT3)				
Core Indicators:				
DTP3 Coverage				
Drop Out Rates				
Safety of Injections & Vaccine Safety				
Wastage Rate				
Completeness of Reporting				
Vaccine Stock-Outs				
Action Plans for Districts				
QSI at National Level NA				
Average QSI for Districts				
Average QSI for Health Units				

Summary of the principal findings and recommendations.

Category	Positive	Key Issues
National Level	✓ The standard operational procedures (SOPs) for EPI activities have been worked out, ✓ National standardized formats for registration and reporting ✓ Integrated reporting ✓ Storing and backups well done ✓ Completeness and timeliness of reports monitored ✓ Charts and tabulation on core EPI indicator displayed (excepted drop-out rate) ✓ Written monthly feedback	✓ The denominator definition not consistent with WHO definition ✓ Data inconsistency to the next lower level ✓ No national SOPs or formats for reporting AEFI; ✓ Monthly monitoring of stock outs of vaccines in districts; ✓ Drop-out not monitored ✓ No vaccine ledger for the audit year ✓ Annual report not produced

Positive

District Level

- ✓ All districts used the same denominator as the National Level
- ✓ Health structures reporting to Districts consistently defined,
- ✓ Report formats from HU level consistent
- ✓ Immunization chart/table displayed,
- ✓ Monitoring of the vaccine batch numbers and expiry dates,
- ✓ Same reporting forms used in all Districts for 2005,
- ✓ All available HU reports processed

Key Issues

- ✓ 3/4 Districts have a micro plan
- ✓ 2/4 districts with feedback format from district to HUs (oral feedbacks) in some districts,
- ✓ Data inconsistency to the next lower and higher level
- ✓ Inconsistent monitoring of completeness/timeliness of incoming reports (in 3/4 districts),
- ✓ Supervision activities not monitored in all districts
- ✓ No annual report/publication established,
- ✓ No coordination unit for social mobilization at district level,
- ✓ Ledger book for vaccine used in 2/4 districts in the audit year
- ✓ Current ledger book for vaccine not up-to-date for DTP and TT in 2/4 districts
- ✓ Vaccine stock out not recorded in all districts,
- ✓ Irregular coordination meetings for HU staff (3/4 have monthly meetings).

HU Level

Positive

- ✓ The SOPs and standard formats for vaccination are being used,
- ✓ All reports for audit year available (excepted war period with no activities),
- ✓ Tally sheets are being used and filed according to SOPs,
- ✓ Reports and tallies also filled in when no vaccination activity,
- ✓ Vaccination registers complete and well kept,
- ✓ Vaccine ledger books being introduced in 2005
- ✓ The vaccination monitoring charts displayed.

Key Issues

- ✓ Few vaccine ledger books updated,
- ✓ No or incomplete Vaccine ledgers for audit year,
- ✓ Generally, no record keeping of syringes and safety boxes,
- ✓ No annual tabulation of vaccination activity,
- ✓ Stock outs noticed for EPI forms.
- ✓ No monitoring of vaccine wastage, drop out
- ✓ Few catchments area map

Main Recommendations:

- ✓ Redefinition of health structures for districts levels,
- ✓ Avoid data inconsistency at all level
- ✓ Improvement of monitoring and evaluation activities
- ✓ Introduction of vaccine ledger book at all levels according to the international guidelines
- ✓ All fixed vaccinating HUs shall keep vaccine ledger books
- ✓ Introduction of out reach activities and data should be reported by tallies to, and filed at, fixed HUs
- ✓ Capacity building at levels below national level
- ✓ Computerization of the districts

Think global ...

act local.

Quality Data is not about numbers

It’ s really about

People doing their job at local level

Regular support and supervision

Expertise and good relationships
in a joint learning environment,
Communication
Partnership and joint decision making to solve problems

AFIX is a quality improvement strategy - improve immunization coverage and standards of practice.

Assessment of the healthcare provider's vaccination coverage levels and immunization practices,

Feedback of results to the provider along with recommended strategies to improve processes, immunization practices, and coverage levels,

Incentives to recognize and reward improved performance,

eXchange of healthcare information and resources necessary to facilitate improvement.

Purpose : to move health care personnel from a state of unawareness about the problem (low immunization rates in their practice) to one in which they are

- aware, concerned and knowledgeable
- motivated to change
- ready to try new behaviors/strategies
- capable of sustaining these new behaviors.

Barriers to immunization

Barriers to immunization

- Access to services
- Staff attitudes & practices
- Reliability of services
- False contraindications
- Fear of side effects
- Practical knowledge vaccinations
- Conflicting priorities
- Parental beliefs
- Underlying family dynamics

Managing the barriers

- Quality services: accessible convenient , reliable ,friendly, affordable & acceptable;
- Elicit feed back from families and community leaders
- Monitor missed and under vaccinated children: Assess and address causes
- Local enquiry and follow-up are essential

The costs, effects and cost-effectiveness of strategies to increase coverage of routine immunizations in low- and middle-income countries: systematic review of the grey literature Batt K; Fox-Rushby[l]J.A.; Castillo-Riquelme M Bull World Health Organ vol.82 n.9 Genebra Sep. 2004 http://dx.doi.org/10.1590/S0042-96862004000900011