Mapping existing knowledge, identifying priority research questions of the health systems

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1. Background:

Research priority setting is recognized as a key function of national health research systems. It is also perceived to be an important process for ensuring the alignment of research funding with national evidence needs. The last priority setting exercise for health sector research in Sudan was conducted in 2000. The study was a large scale one covering the whole country. The sources for data included, in addition to the health sector, other related sectors and the community. The outcome included priority areas in epidemiological research, biomedical research and health system research. Since then and until recently all priority setting exercises have been limited in both scale and methodology. The lists of research priorities are prepared and submitted to the Federal Research Department by the different directorates and programmes. In most instances the priority setting processes do not follow scientific methods and are not standardized.

Through an initiative by University of Medical sciences and Technology, An exercise for research priority setting, funded by connecting health Research in Africa and Ireland Consortium (ChRAIC), had being coordinated by the Federal Research department in association with Public health institute. However, the focus of the study was limited to three health system themes; namely governance, human resources for health, and equity and access.

To insure that the fund allocated to research from different sources is used efficiently it was suggested that a comprehensive mapping process is to be conducted to identify gaps that can be filled either through research, consultation or capacity building.

Scope of researches
The following themes and sub-themes were covered in the mapping process:

A. Health system:
   1. Health systems financing
   2. Health information system
   3. Medical products and technologies

B. Epidemiology:
   1. Epidemiology of communicable conditions (communicable diseases control programmes)

2. Epidemiology of non-communicable conditions(non-communicable diseases control programme, nutrition programme)

Types of researches
- Health system researches (policy level)
- Operational researches including programme level and health services researches
- Epidemiological researches
- Situation analyses / Evaluations
- Cost effectiveness studies (building on evaluations)
- Feasibility studies
- Pilots
- Biomedical/clinical out of scope in this exercise.

Objectives:

General Objectives:

To map the current existing knowledge and identify priority questions around health system and epidemiology aiming at obtaining priority questions

Specific Objectives

1. To identify the major concerns and research/consultation priorities relevant to health system and epidemiology

2. To assess the extent to which existing knowledge addresses these concerns and research/consultation priorities in the thematic areas

3. To develop a preliminary list of core research/ consultation priorities/questions in the thematic areas

2. Methods:

The same process was applied in the five thematic areas. Each theme has a team consisting of principal investigator and documents reviewers. The process to identify priority research areas includes four key steps. These are:

1. Agreeing on terms definitions used around the thematic areas of Human resources, Health information system, Health finance, Medical and Pharmaceutical Products, epidemiology of communicable and non communicable diseases

2. Collecting data about current health system concerns and knowledge gaps in the five thematic areas through:
    a. Review and appraisal of the following types of documents:
        i. Policy document
        ii. Reports of published and unpublished local research – including review articles- in the three thematic areas

    b. Key informant interviews/group discussions

2. Overview of research report and literature reviews to identify research completed to date that provide data to fill knowledge gaps identified in step 2 above

3. Inputs from steps 2 and 3 are then to be discussed at a workshop of stakeholders for ranking of the research issues, and brainstorming around the top-ranked issues.

During step 1, terms and definitions used around the five thematic areas were identified through a review of relevant literature to define the theme and define the scope to be covered under it.

For step 2, the policy appraisal questions were incorporated into the predesigned policy appraisal form and this was pretested on two of the most relevant documents to ensure all data needed have been extracted using these questions. The form was ratified for use and the key documents were appraised by a team of appraisers from Public Health Institute – Sudan. See appendix (2) for the list of documents appraised.

On completion of the policy appraisal, unanswered questions were put to key informants from the MoH departments and programme to elicit answers, or perceptions of priority of

these research questions, or further documents for appraisal. Unanswered/potential research questions are and policy gaps were identified. See annex (3) for the list of key informants interviewed.

For step 3, a workshop was held at the PHI gathering all stakeholders the methodology of arriving at the long list of research questions was described and the long list of research questions was presented. During the next step attendees were split into four group for addition to the long list of researches and to discuss prioritizing the researches according to importance and impact giving score out of 5 for each. See appendix (3), for the scoring criteria.

3. Results:

3.1. Health information system

A lot of work has been done in identifying the problems and setting the road mp for strategic change and reform. But all these efforts did not translate into actions. Plans were not operationalized. Policies were there but there is lack of the power to enforce them. Policy gaps and some unanswered questions did emerge from the policy appraisal.

3.1.1 Summary of policy gaps:
- Stakeholder analysis identifying all key stakeholders in health and non health sectors
- Formulation of a national regulatory body involving all HIS key stakeholders and partners to facilitate coordination and data sharing.
- HIS laws and legalizations need to be compiled and assembled in one document
- The convening power for enforcement and application of laws and legalization
- Need for standardized organization structure of HIC specifying the entailed skills at the three levels in addition to the facilities
- Integration and streamline of vertical program surveillance systems in a unified scheme
- The scope of the core indicators to include public health performance indicators
- Adoption of community based HIS
- Mobilization of extra resources in support of the health information system, HIS institutions at all levels of the health care delivery system.

3.1.2. Research gaps:

According to the phases of the HIS reform project

- **Phase 1: Establishing the foundation and necessary structures for HIS reform:**
  1. To rationalize the in depth diagnostic tool for HIS e.g. data mapping, stakeholder engagement.
  2. What is the current organizational capacity of HIS at different levels including data producers?
  3. Evaluation of the quality of HIS training institutes
  4. Assessment of Performance of Routine Information System Management
  5. What are the needs and utilization of HIS by policy makers ?
  6. To examine the perceptions, attitudes and values of senior managers and other organization members in relation to information related functions. Such an assessment can comprise tools from various disciplines, including epidemiology, performance improvement, behavioral change and policy analysis.

- **Phase 2: develop the data management systems and information products:**
  7. Review the required core indicators relevant to each level
  8. Review and update data collection tools
  9. Assessment of data quality
  10. Review the current data management and feedback.
  11. Explore information flow in the new e-health project

- **Phase 3: Integration and digitization using appropriate ICT:**
  12. Conduct in-depth analysis of the current vertical surveillance systems aiming at identify the strengths, weaknesses and the potentiality for integration with the national health information system.
  13. The feasibility of integrating the HIS with other information systems and Health System Observatory
  14. The feasibility of applying community based HIS; including community death registry (verbal autopsy) and the use of mobile phones in birth registry.
  15. Financial business case to explore options for investment in HIS

16. Operational research to evaluate the effectiveness of integrating surveillance system (electronically).

17. Operational research to evaluate the effectiveness of integrating HIS (electronically).

18. Operational research to evaluate the effectiveness of community based HIS; including community death registry (verbal autopsy) and the use of mobile phones in birth registry.

19. Operational research to test options for indentifying staff to improve data quality

20. Piloting the e-health project (testing and amending)

3.1.3. Ranking of the researches:

Research questions	Rank of the question (importance/ impact)
1. Conduct in-depth analysis of the current vertical surveillance systems aiming at identify the strengths, weaknesses and the potentiality for integration with the national health information system.	**5/5**
2. The feasibility of integrating the HIS with other information systems and Health System Observatory	**5/5**
3. The feasibility of applying community based HIS; including community death registry (verbal autopsy) and the use of mobile phones in birth registry.	**5/5**
4. What are the needs and utilization of HIS by policy makers?	**5/5**
5. Review the current data management and feedback.	**5/5**
6. Review and update data collection tools	**4/4**
7. Assessment of Performance of Routine Information System Management	**4/4**
8. Financial business case to explore options for investment in HIS	**3/5**
9. Operational research to test options for indentifying staff to improve data quality	**3/5**
10. Evaluation of the quality of HIS training institutes	**4/2**
11. Review the required core indicators relevant to each level	**4/2**
12. To rationalize the in depth diagnostic tool for HIS e.g. data mapping, stakeholder engagement.	**3/2**
13. What is the current organizational capacity of HIS at different	**3/2**

levels including data producers?	
14. To examine the perceptions, attitudes and values of senior managers and other organization members in relation to information related functions. Such an assessment can comprise tools from various disciplines, including epidemiology, performance improvement, behavioral change and policy analysis.	**3/2**
15. Assessment of data quality	**3/2**
16. Piloting the e-health project (testing and amending)	**2/5**
17. Operational research to evaluate the effectiveness of integrating surveillance system (electronically).	**1/4**
18. Operational research to evaluate the effectiveness of integrating surveillance system (electronically).	**1/4**
19. Operational research to evaluate the effectiveness of community based HIS; including community death registry (verbal autopsy) and the use of mobile phones in birth registry.	**1/4**
20. Explore information flow in the new e-health project	**2/2**

3.2. Medical and Pharmaceutical Products

Sudan is one of the few countries in EMRO region (and in other developing countries) that started to formulate policies and strategies for the pharmaceutical sector. In 1981 Sudan introduced the first national pharmacy policy and this prompted WHO to extend its assistance to the Sudan in the implementation of its NDP, especially for the physical rehabilitation of Central Medical Stores buildings and facilities, capacity building of its human resources; and for the implementation of Sudan Essential Drugs Programme. It was evident that Sudan pioneer NDP (1981) has played a great role in promoting the concept of essential Medicines, and in improving the national medicines supply system, as well promoting rational prescribing, dispensing and use of medicines, and improvement of education and training of health workers, and strengthening medicines information, medicines research, and capacity building of human resources. The last updated policy that has been adopted in 1996 but the currently official policy has been updated and adopted in 2005 as a five years vision. It is part of the national pharmacy strategy 2004-2029 that represent the vision of the government in the next 25 years for the pharmaceutical sector in Sudan. This policy is formulated and adopted with commitment to implement the concept of essential medicines and its principles in selecting essential medicines, and in general this policy follow the WHO guidelines and formula regarding the development of such documents.

3.2.1. Identified policy gaps:

o The lack in the collaboration between public sector parties in the area of drug supply with clear and agreed policy on that.

o Deficiency in the human resource (numbers and capacities) and other resources those are available for these plans in different pharmacy sectors. There was no defined policy that guides the HR management for pharmaceutical sector in the country.

o The problem of counterfeit medicines and its compact as there is large area to be covered throughout the country. There is still clear gap in identifying the suitable policy options that could be adopted to solve this problem.

o The spreading of medicines misuse problems among the communities due to weak knowledge, economic factor, social believes and other factors. The current

NDP doesn't give any practical sense on how to materialize the selected strategies into clear effective work plans.

o There is no policy or legal mandate for ADRs reporting, but staff at the Medicines Regulatory Authority does acknowledge responsibility in this area. There is no standard reporting forms, nor is there evidence that reports have ever been submitted. Therefore the ADR reporting system appears to be nonexistent at the national level for the time been.

o Policy on establishing Drugs & Therapeutics Committees (DTCs) is very poor, although many hospitals staff has been trained on DTC role and establishment but still there is only small number of hospitals that work on this part.

o The issue of medicines supply services coverage in general and especially by RDF systems at states level is still not clear in some areas as the system is changed due to many factors e.g. politics and functioning capacity considerations.

o We don't know up to this report issuing whether or not the priorities at national and states levels were adjusted in accordance to consumption, needs, expenditures, funds availability and other factors that are important in the process and largely have direct impact on the efficacy of the system.

o One of the most important policies that could be help to decrease the prices especially in the public sector is the implementation of generic substitution policy as previous study indicate that the patients can save 49% of medicines cost if the buy the lowest generic available rather than the brand products; and even this variation is more obvious in the private sector due to multi types of suppliers. So that if this policy is implemented it will be helpful in order to increase the affordability margin in the public sector as the major partner for health services provision in Sudan.

o One of the most important notes that even when essential medicines under generic name (which are relatively affordable), prescriptions can be very expensive. They often contain many products, some less essential than others and at very high prices and all of these address the issue of that are the public suppliers efficient in their system, does this issues are considered when they determine their policies and processes.

o The promotion of medicines in the private sector in Sudan usually exceed the limit of the private sector to the public sector and its effects on the system and pushing of certain ideas and concepts toward companies site benefits lead to real problem;

in addition to that there is absence of regulations enforcement and no monitoring activities taken at the regulatory bodies to control this part.

o No guidelines or policy to control donation to/from public and private sectors.

o As the health insurance doesn't widely spreads in Sudan (only 17.3% of total population are covered), still the pharmaceutical services in this sector need to be developed more and more to face the expected expansion and coverage since the total health facilities covered is very week and the reports indicates that medicines represents 38% of the total cost of services provided at the national level in this sector.

o Clear policy on the involvement of the pharmacy personnel into the management of specific projects developed for groups at risk (e.g. Disasters, Extremes of age and HIV/AIDS, etc) was still not clear and not considered in the national pharmaceutical priorities plans.

3.2.2. Identified research question:

Areas	Research Question	Rank of the question (importance/ impact)
Access to essential medicines	What is the proportion of the population with regular access to essential medical products? What purposes this figure was used for? **Proposed method to answer:** conducting household survey, separate or part of SHHS	4.0/5.0
	Do we have clear policy on improving the access to medical products at PHC level? **Proposed method to answer:** situational analysis of measures or policies that aimed to improve the access to medical products at PHC level.	4/4
Key mechanisms identified to strength the governance function on medical products	Does the governance capacity at states level is adequate to decentralize the regulatory functions of medical products? **Proposed method to answer:** assessment of states governance function versus well established benchmarking standards	3.5/4
Capacity of the regulatory systems	Does the current capacity of different regulatory bodies is adequate compared to its mandate and role? **Proposed method to answer:** Assessing the capacity of the regulatory bodies using standardized method developed internationally by technical	3.5/4.5

	partners.	
Policies, norms, standards and guidelines for improving the quality, safety and use of medical products	what are the priority policies, norms, standards and guidelines currently undermining the capacity of the pharmacy sector to ensure the quality, safety and use of medical products? **Proposed method to answer:** rapid assessment exercise.	**4.5/5.0**
Safety and effectiveness of medical products	Does the currently implemented measures to ensure the safety and effectiveness of medical products were adequate and effective? **Proposed method to answer:** impact evaluation of priority measures.	**2.5/3.0**
Counterfeit and substandard medicines	What is the proportion of circulated medical products that are counterfeit and substandard? What measures were in place to combat this problem? **Proposed method to answer:** multi-dimensions operational research to identify the current situation.	**5.0/5.0**
Public health expenditure on medical products and its management	What are the reasons behind the high expenditures on pharmaceuticals and health technologies in the country? **Proposed method to answer:** studying, qualitatively and quantitatively, the expenditures on pharmaceuticals and health technologies.	**4.5/5**
Strategies to improve the affordability of key/essential medical products	Does the current strategies to improve the affordability of key/essential medical products were effective? if no, what are the alternative strategies? **Proposed method to answer:** study on outcome and impact evaluation of the current strategies and its alternatives	**5/5**
Local production of medical products	why the local production of medical products in the country was not improved despite the availability of enabling policies and environment? What	**3.0/2.5**

	are the barriers to increase the production volume in comparison to importation? Do we have selected strategies to improve the local production of medical products? **Proposed method to answer:** comprehensive assessment and analysis of the local production capacity and the affecting factors.	
Procurement systems	Does the current mechanism to procure the essential medical products are effective and efficient? **Proposed method to answer:** Operational research to assess the effectiveness and efficiency of the procurement systems	**5.0/5.0**
Supply chain systems	Does the efforts to integrate the current medicines supply systems were based on evidence? **Proposed method to answer:** Operational research to assess effectiveness of the current integration mechanism.	**3.5/3.5**
Intellectual Property Rights (IPRs) of medical products (focusing on local and traditional medicines)	Does the laws and measures to maintain/ preserve the IPRs of medical products in the country, including Sudanese traditional medicines, were adequate and effective? **Proposed method to answer:** Situational analysis is needed in this area to inform the policy context.	**1.0/1.0**
National Essential Drugs list	Does the mechanism to develop the EDL is effective? does the selected medicines for the national list were the most cost- cost-effective options? **Proposed method to answer:** Evaluation of the mechanism to develop the most recent EDL in the country, and comprehensive cost-effectiveness of	**5.0/5.0**

	items included in that list.	
	what is the knowledge and perception of health care providers about the essential medicines and its usefulness **Proposed method to answer:** survey	**2.5/2.5**
Standard treatment guidelines (protocols)	Why there is a huge gap in developing and enforcing the standard treatment guidelines (protocols)? **Proposed method to answer:** operational research.	**5.0/5.0**
Drug utilization review (analysis)	Does the drugs prescribing and use were coherent with the epidemiological situation in the country? **Proposed method to answer:** Conducting drug utilization review study.	**3.0/3.5**
Antimicrobial resistance	What are the strategies currently used to contain this problem, and does it effective? **Proposed method to answer:** operational research.	**4.5/4.5**
Rational use of medicines	to what extent the health professionals and the public have access to independent, unbiased and transparent medicines information **Proposed method to answer:** survey	**2.5/2.5**
Herbal medicines	How to describe the contribution of herbal medicines in heath care in Sudan and how to regulate this sector to be part of the health system in the country? **Proposed method to answer:** in-depth evaluation and qualitative research	**3.5/4**

3.3. Epidemiology of Communicable diseases

The epidemiological profile in Sudan is largely dominated by communicable diseases (WHO, 2009).In addition to the huge burden of communicable diseases Sudan is also prone to the epidemics of communicable diseases such as meningitis and hemorrhagic fevers.

Here in this review we are trying to sort out the priority questions on epidemiology of communicable disease in Sudan by scanning all the relevant data.

3.3.1. Research Gaps

Theme	Existing knowledge	Major Concern	List of Core research need to be done	Priority research questions in the future	Expected outcome
Ranking of Communicable Diseases base on their burden (Health impact such as annual morbidity, mortality and their or economic impact perhaps in term of DALYS and QALY.	Only some information about Malaria, however lack of knowledge regarding the other infectious diseases is prevailed.	Allocate and prioritize the scarce resources based on the burden of the infectious diseases.	1-Ranking of the communicable Diseases based on their health and economic burden (nationally and on the state level). 2- Evaluation of communicable diseases programs at the federal level and highlight successful stories if available.	1-What are the morbidity, mortality and disability of major infectious diseases such as Malaria, TB (including other neglected diseases such as Meningitis, Human papiloma virus, Rift valley fever, hepatitis etc.) that threaten the life of the Sudanese? 2- Systematic review of interventional programmes (such as TB, HIV and other neglected tropical diseases) and the national protocols for diagnosis and treatment of diseases.	Prevalence, economic impact and burden of disease.
Bseline for the status	No such baseline in the	Risk associated	1- Development of	1-What is the	Quantify the

of Zoonotic Diseases in the country.	country	with the zoonoses in the country	National zoonotic diseases list 2- addressing the one health approach to Confront them. 3- Improving the reporting system of the zoonotic diseases that could be notified 4- Anticipate the trend of the zoonotic disease in the country	epidemiology for the status of zoonotic diseases in Sudan? 2- Is the surveillance and reporting system able to map and add the emerging zoonoses such as Rabies and Brucellosis?	problem and understand the impact and epidemiology and risk factors.
Documentation of accumulative experiences of incidents and outbreaks with focus on the quality of the reports.	The documentation need to be revised and seems to be not used in terms of lessons learnt or knowledge transfer.	It is a routine procedure	Documentation of accumulative experiences of incidents and outbreaks in order to be used as an evident base health intervention as well as a source of knowledge transfer.	1-What are the outbreak performance indicators? 2-Did we use the lessons learnt as an evident base for the decision makers and knowledge transfer?	Assessment of the performance indicators.

Update food/ water safety and vector surveillance in collaboration with respective departments.	The data is scattered between the respective departments and could not come up with informative picture.		Health impact assessment of food/ water and vector surveillance in collaboration with respective departments.	1-Evaluation of the monitoring process of water safety? 2- What are the most common water and food borne diseases?	Quantification of the problem and understanding the impact and epidemiology and determinants.
Communication with Public during an outbreaks	No clear Strategy, it depends on the one who deal with the problem and WHO guidelines are not followed.	No clear concern	Improve the communication with public during the outbreaks following the WHO guidelines on that.	1-How to design an effective message to the public during an outbreak and could it help to mitigate the impact and burden of the outbreak? 2-Assessement of health promotive activities.	Improving knowledge, attitude, practice and quality of health promotive activities.
Role of PH Lab in the proactive strategy of diseases prevention and control.	The PHL almost responds to alerts after taking place thus it acts as reactive strategy.	Highlighting the significance proactive role of PH lab before outbreaks occur	Improve the capacity of PHL Lab to act as a part of proactive strategy of diseases prevention as well as control within the country.	1-Evaluation of the adherence of the NHL(National Health Lab) to the international guidelines.?	Identification of strengths and weaknesses of NHL.

Priority research questions in the future	Ranking by Importance / impact
1-What are the morbidity, mortality and disability of major infectious diseases such as Malaria, TB (including other neglected diseases such as Meningitis, Human papiloma virus, Rift valley fever, hepatitis etc.) that threaten the life of the Sudanese?	3.5/3.5
2- Systematic review of interventional programmes (such as TB, HIV and other neglected tropical diseases) and the national protocols for diagnosis and treatment of diseases.	4/5
3-What is the epidemiology for the status of zoonotic diseases in Sudan?	3/2
4- Is the surveillance and reporting system able to map and add the emerging zoonoses such as Rabies and Brucellosis?	3/2
5-What are the outbreak performance indicators?	4/4
6-Did we use the lessons learnt as an evident base for the decision makers and knowledge transfer?	4/4
7-Evaluation of the monitoring process of water safety?	3/4
8- What are the most common water and food borne diseases	2/4
9-How to design an effective message to the public during an outbreak and could it help to mitigate the impact and burden of the outbreak?	4/2
10-Assessement of health promotive activities.	4/2
11-Evaluation of the adherence of the NHL (National Health Lab) to the international guidelines?	4/2

3.4. Epidemiology of non communicable disease

3.4.1. Research gaps summary

- Assessment of different type of treatment provided by health care worker to patient with NCDs.
- Assessment of diagnostic procedure, methodology and criteria of NCDs .
- Burden of NCDs disease.
- Assessing the prevalence and risk factors for NCDs
- Assess the current situation screening and surveillance system
- Assessment of health information system including documentation and registry   .
- KAP for NCDs and risk factors.
- What are the most effective methods of health education or promotion to be used to decrease the risk of NCDs.
- What are the problems related to the management at different health care level towards NCDs .
- Assessing the present situation of coordination between the NCDs and others sectors
- Assessment of Trauma and Road Traffic Accident (TRA) and related disability (risk factors and outcomes0.
- What`s the role of communities participation in control and prevention of NCDs.

3.4.2. Detailed research questions

Theme	Major Concern	Existing knowledge	Priority question in the future	Expected outcome
Policies and strategies	- Are there documented policies for NCDs ? - Are there specific guidelines for the policies stated? - What are these guidelines? - Are there specific strategies for NCDs? - What are the objectives of these strategies? - what is the target of the objectives? And what has been achieved?	1- National multisectoral frame work for the prevention and control of Non communicable disease 2-Policy Development 3- Strengthening the health system and Integrating the prevention and control of NCD 4- Capacity Building and human resource development 5- Health promotion and primary prevention through high level multi- sectored action 6- Monitoring and Evaluation 7- Research and Surveillance **Objectives of NCD strategy** The WHO action plan for the global strategy for prevention and control of NCDs sets out 6 objectives which are to be tailored to each country. <u>These are:</u> 1-To raise the priority accorded to NCDs at global and national levels and to integrate prevention and control of such diseases into policies across all government departments	1-What are the current services of NCD strategy and what are the barriers to implementation? 2- What are the best ways of prevention and control of NCDs in Sudan?	Realizing the gap in services (including human resources, products, medications, diagnostic teaching etc)

		2-To establish and strengthen national policies and plans for the prevention and control of NCDs 3-To promote interventions to reduce the main shared modifiable risk factors for NCDs 4-To promote research for the prevention and control of NCDs 5-To promote partnerships for the prevention and control of NCDs 6-To monitor NCDs and their determinants and evaluate progress at the national, regional and global levels		
Prevention programs	- Are there well structured prevention programs?	**(No Existing knowledge)**	1- What is the KAP of people towards NCDs?	Realizing the gap and to improve knowledge, attitude and practice.
Protocols for diagnosis and treatment	- Are there clear protocols for diagnosis and management of NCDs? Are the implemented? To what extent?	**No protocols**	1- Assessment of the national protocol (after situation analysis, systematic literature review) and how can the international protocol be adapted to Sudan and evaluation of dissemination methods to the primary health care level?	Identify gaps in national protocol and dissemination of the protocol.
Health information about NCD	-What are the sources of H.I. for NCDs . - Structure and organization of the HIS including screening activities	No organized HIS. No case registry . No screening programs.	1- Do we need screening fro specific NCDs? 2- Assessment of NCD registry and reporting.	Realize gap in knowledge.

Epidemiology	-Are there specific indicators set to be targeted or achieved in relation to MDG4 and national targets ?	disease prevalence, affected age groups, risk factors, and linkage to other diseases, deaths and financial burden on the health system. However it also emphasizes the need for an adequate continuous surveillance system to properly measure prevalence and so enable tailored responses. It focuses on the most common NCDs as a priority for health intervention in Sudan	1- Prevalence of the specific NCDs 2- Risk factors of the specific NCDs 3-What is the burden of NCDs?(NCDs including road traffic injuries, mental health, renal, cardiovascular and cancers)	Morbidity, mortality and disability.
Financial and human resources	- What is the annual cost of the NCD program? - Are there guidelines to the training, deployment remuneration and career development of human resources at all levels?	(No data)	1-What is the cost of disease specific NCDs? (including HRH surveys, National health accounts, expenditure surveys)	Better understanding of the economic burden.
Co-ordination with other health structures and organizations	- Is there a plan for co-ordination between NCDs and the other health directorates or departments in the health system? - What sort of co-ordination is it ? - Is there a plan for co-ordination between NCDs and NGOs	2/The integrated provision of NCD prevention and care requires a flexible health system that can coordinate care planning across services, settings, sectors and over time. This means commitment from a range of services and sectors, and the ability to work together to achieve shared goals. Multidisciplinary care planning must be person centered, incorporate prevention, self-management and co-morbid conditions, and be responsive to changing patient needs.	1-What is the current role of other partners? (including the community)	To assess intersectoral collaboration.

Priority research questions in the future	Ranking by Importance / impact
1-What are the current services of NCD strategy and what are the barriers to implementation?	**4/5**
2- What are the best ways of prevention and control of NCDs in Sudan?	**3/4**
3- What is the KAP of people towards NCDs?	**???**
4- Assessment of the national protocol (after situation analysis, systematic literature review) and how can the international protocol be adapted to Sudan and evaluation of dissemination methods to the primary health care level?	**3/4**
5- Do we need screening fro specific NCDs?	**2/2**
6- Assessment of NCD registry and reporting.	**4/4**
7- Prevalence of the specific NCDs	**5/5**
8- Risk factors of the specific NCDs	**5/5**
9-What is the burden of NCDs?(NCDs including road traffic injuries, mental health, renal, cardiovascular and cancers	**5/5**
10-What is the cost of disease specific NCDs? (including HRH surveys, National health accounts, expenditure surveys)	**2/2**
11-What is the current role of other partners? (including the community)	**3/5**

3.5. Health finance & expenditure

A sustainable health financing system considered as an essential component for achieving important population health goals. Appropriately arranged health care financing (HCF) helps governments mobilize adequate financial resources for health, allocate them rationally, and use them equitably and effectively.

The need for a health financing research is crucial for the health services in Sudan, simply because it reflects and analyze the health situation on a monetary screen. This will help planner, reformers and other partners of health to co-ordinate collaborate and lead initiatives for the benefit of the Sudanese people.

The fragmentation of the health organization in Sudan (multi sources of finance without co-ordination) together with the weak health information system and the lack of National Health Accounts policies (recently adopted) led to meager information regarding the health financing status of the country.

In this review we set many research questions and prioritized them to get more evidence so to feed in setting health financing policies and achieve our goals .

3.5.1. Research gaps

Sub Domain	Research gaps	Research questions	Comments &Recommendations
Public spending on health Distribution of health finance budgeting	1. Uncertain or lack of information about the government expenditure on health (since 2005) *(financing the health system in Sudan,2005, p. 1)*	1. List (map) the items of public (government) spending on health? 2. What are the channels of government expenditure on health?	• Review the final report of the national health accounts • The overall health finance figures need to be updated (there should be a mechanism to update them regularly) • A crucial policy challenge for health financing is to increase government investment in health, reduce financial burden on households and remove social inequalities in access, utilization and health outcomes. • The need for health finance system reform (*Sudan Health policies*) • Ensuring that financing mechanisms such as cost-sharing are not affecting access to services by poor and disadvantaged groups (*the national strategy for reproductive health 2006-2010*)
	2. In adequate and sustainable flow of funds (Flow of funds are not clearly mapped) *(financing the health system in Sudan,2005, p. 2)*	1- hat is the discrepancy of requested budget and the budget in the operational plan?	
	3. Challenges of free care policies implementation in Sudan*(financing the health system in Sudan,2005, p. 3)*	Determining the challenges in free care policies implementation in Sudan	
	4. the gap in the budget allocation between what have been set in Abuja and what was actually implemented *(financing the health system in Sudan,2005, p. 4)*	Causes behind the gap in the budget allocation between what have been set in Abuja and what was actually implemented	
	5. Weak capacity of ministry of health in estimating the health budget *(financing the health system in Sudan,2005, p. 4)*	What are the Factors affecting the weak budgeting at the level of ministry of health?	
	6. The majority of the informal sector (85.5%) is still uncovered by any policy and vulnerable to the user fee and the private for profit services, why? This is a policy gap *(financing the health system in Sudan,2005, p. 12)*	What are the available options to cover the informal sector with the health insurance?	

7. Uncertainty about The exact and recent revenues of the user fees policy *(financing the health system in Sudan,2005, p. 16)*	What are the exact revenues of the user fee policy in Sudan?	• Create some form of coordination and link between the chamber of the Auditor General and the national accounts *(Health Governance in Sudan)*
8. The Out of pocket private sector and abroad treatment is estimated to be very high in a range of 2.5-3.5%of the GDP which amounted to 15-20 US$ per capita annually *(financing the health system in Sudan,2005, p. 16)*	What are the causes behind the very high out-of-pocket private sector and abroad treatment in Sudan?	• A crucial policy challenge for health financing is to increase government investment in health, reduce financial burden on households and remove social inequalities in access, utilization and health outcomes. (*country cooperation strategy for WHO and Sudan 2008-2013* 2.1.17& 2.4.1.17*)*
9. The health sector is under-funded *(Country Cooperation Strategy for WHO and Sudan 2008–2013)*	1. Determine potential sources of health finance 2. How to manage limited financial resources	
10. Currently, only a small proportion of the Sudanese population is covered by health insurance schemes. (National Health Ploicy-2007 p.11)	1. Review the current situation of the national health insurance 2. Identify factors creating barriers to access 3. Evaluate the possibilities for the expansion of coverage	
11. Lack of adequate funds at the national , regional or international levels (*National population policy 144)*	1. How funds or budgets are initially calculated or estimated? 2. What are the sources of funds (at both local and national levels)	
12. Public Health spending is skewed towards curative services (82%) which are concentrated at the urban big towns that constitute less than 30% of the population *(financing the health system in Sudan 2005 table 7)*	Determinants of public health expenditure (factors affecting public health expenditure)	
13. Health spending is skewed towards hospital care, and Primary and first-referral care is under-funded and Lack of	1. What is health spending priority? 2. Determinants of health	

	resources, particularly in the poorer states. (*country cooperation strategy for WHO and Sudan 2008-2013*)	spending	
	14. low health insurance coverage (*country cooperation strategy for WHO and Sudan 2008-2013*)	1. Barriers limiting health insurance coverage 2. Factors affecting the health insurance coverage	
	15. There are no official criteria for quick release of funds and cuts in the budget are mostly inevitable. Critical services and events such as epidemics mostly enjoy a shortcut in budget release. This holds true for most of hospital services that usually carries political implications. Release of budget is also largely dependent on personal initiatives and relations and no organization or person is held accountable for delay in releasing a budget *(Health Governance in Sudan 2.1:30)*	1. What are the official mechanisms for quick release of funds? 2. What are the Factors affecting budget release?	
	16. Limited impact of public spending and external aid on growth and human development 1. Inappropriate allocation of resources 2. Resources do not reach service delivery units 3. Poor quality of service delivery 4. Services are not used by the population	How can we improve our understanding of the determinants of poor service delivery	• PETS
	17. Discuss priorities in public financial management, including to protect against external shocks 18. Identify measures to improve debt	How to assist Government to critically review its operations and the use of public resources?	• PER

	management, and reduce debt vulnerability 19. Assess the implications of changing allocation of resources across sectors for growth, poverty, and MDGs		
Actors in supporting the health budgeting and donation The donor funding charcterstics	Donors funds to the whole Sudan 3.5 US$ per capita.1 The international community allocated US$ 4.7 *(financing health care system in Sudan)*	What are the determinants o f the international community funds?	NHA
	The tax-based funding of the health care sector has long been used all over the world to finance certain components of health care services and it have to be known as the most important source of health care financing In Sudan the government is using the general tax and the earmarked tax as tax-based approaches to finance the health care system. *(financing health care system in Sudan)*	What is exactly the amount allocated to finance health care system in Sudanand How it is distributed among the different health care services?	
	Community financing is a term that has been widely used to financial activities involving community in its operation *(financing health care system in Sudan)*	1. How it is collected and distributed among the community?	
	Donors funding varies in sources and patterns where the money is supposed to be given (owned) as is the case with the WHO and UNICEF or to be lent often with low interest rate and long duration as the case of the World Bank *(financing health care system in Sudan 24)*	1. list the donors and 2. What is their exact amount of funds provided to the health sector? (*Available in the NHA?!*)	
	The regular budget for 2006–2007 was almost fully implemented, while there is no clear information regarding the total funds collected from other sources and how they were	1. How the total funds were collected 2. How the total funds were distributed?	

	distributed. *(country cooperation strategy for WHO and Sudan 2008-2013)*		
MDGs 4,5&6	In 2005 the total expenditure on immunization services was 38.3 million US$. 38% of spending was on routine immunization while 62% was on Supplementary Immunization activities *(EPI 5 years plan 41)*	No available update regarding the total expenditure on immunization services since 1995? *(What about the NHA!?)*	• To review is there PHC sub- account ? PHC costing, sub –account , MBB
	There is total dependency on the donor's funds, leading to limitations in the time frame regarding the planning and human resource availability. In addition to that the lack of security in some areas is negatively affecting the donors fund and the investment in the private sector *(National strategy for nutrition)*	1. The negative impact of the donors fund 2. What are other alternatives to the donor's fund?	Is there financing policy
	Sustainable financing requires guaranteed funds from all sources combining domestic and external funds which include those provided by the Sudanese government, GFATM, Work Bank, Bilateral agencies, UN agencies, *(Five years Strategic Plan for the National Malaria Control Program 2.2.33)*	How to ensure the financing sustainability to the NMCP?	TB sub –account
	The National TB program is currently receiving considerable funds through different partners including Norwegian Heart and Lung Association, Global Fund and World Health Organization. The local component needed for administrative and supervisory activities is insufficient (*TB/HIV strategic plan 2007.2.2.2*)	What are Other financial resources to support the program?	

Priority research questions	Ranking by Importance / impact
1-What is the most appropriate mix of health financing mechanism? ➤ Mapping of financing sources ➤	4 /5
2- How to expand health insurance? ➤ Existing barriers ➤ Best option ➤ coverage	4/4
3-What is the most suitable and feasible formula for distribution of available resources ? ➤ Different health care level of provision ➤ Geographical area ➤ Population domains	3/4
4- what are the Causes behind the gap in the budget allocation between what have been set in Abuja and what was actually implemented ?	3/2
5-.what is The negative impact of the donors fund ?	2/2

APPENDIX 1. Policy appraisal forms

Desk Review Guide for Health Information system (HIS) domain

Name of the document under reviewing: ………… **Health Information System Reform Project**……………

Soft/hard…………………………….. **First edition year:** … ..……………………….. **Name of program:** …….…… …………… **Dept/ agency/ies ministry/ies** ………….. **Draft/Final** …….…..

Component and functions of HIS	Related statement/topic to be reviewed	Quoted / capture or modified text
1. HIS resources (inputs): 1.1 leader ship	Are the key units and institutions of HIS identified (e.g. ministry of health, central health information unit, disease surveillance and control programs and central statistical office)? Conclusion: ……………………………………… ……………………………………… ………………………………………	
	Is there a national body representing the key stakeholders to ensure data sharing? Conclusion: ……………………………………… ……………………………………… ………………………………………	

1.2 Policies	Is there HIS policy frame work (identify the main actors, coordinating mechanisms, ensure links to programme monitoring and identify accountability? Conclusion: …………………………………… …………………………………… ……………………………………	
	What is the relevance to the revised IHR (2005)? Conclusion: …………………………………… …………………………………… …………………………………… ……………………………………	
1.3. Financial and human resources	What is the annual cost of a comprehensive His? Conclusion: …………………………………… …………………………………… ……………………………………	
	Are there guidelines to the training, deployment, remuneration and career development of human resources at all level? Conclusion: …………………………………… …………………………………… ……………………………………	
2. HIS indicators (data processes)	Is there a nationally defined minimum set health indicators used regularly in national programme	

2.1. Domains of health information	planning, M&E? (it should reflect changes over time in determinants of health, health system and health status) Conclusion: ……………………………………. ……………………………………. ……………………………………	
2.2. Defining core indicators	Is there a frame work for choosing core indicators? Conclusion: ……………………………………. ……………………………………. ……………………………………	
	Are they linked to international and global key indicators e.g. MDGs GAVI? Conclusion: ……………………………………. ……………………………………. ……………………………………	
3. Data sources (data processes) 3.1. Institution based	What are the core institutional base data sources? Is there any validation for the data? Conclusion: ……………………………………. ……………………………………. ……………………………………	
	What types of health services data are collected? (morbidity, mortality, services delivered; drugs and	

	commodities provided
	                    Conclusion:
	          ……………………………………
	          ……………………………………
	          ……………………………………	

	Are they including non health sectors e.g. police records, occupational reports?
	                    Conclusion:
	          ……………………………………
	          ……………………………………
	          ……………………………………	

3.2. Population based	Are there any population based data sources?
	                    Conclusion:
	          ……………………………………
	          ……………………………………
	          ……………………………………	

	What is the role of health research as a source of information?
	                    Conclusion:
	          ……………………………………
	          ……………………………………
	          ……………………………………	

4. Data management (data processes)
    4.1.   Data storage
	What are the measures to ensure confidentiality and easy irretrievability of the data?
	e.g. coding, restrict access, SOPs.
	
	Is there a uniform system for classification of documents?
	                    Conclusion:	

	………………………………… ………………………………… ……………………………………	
	Is there a system for storage of reports of surveys, epidemiological bulletins etc? Conclusion: ………………………………… ………………………………… ……………………………………	
	Transforming paper-based data into digitalized data occurs at what level of the information cycle (recording, reporting, aggregating, storing, analyzing and using)? Conclusion: ………………………………… ………………………………… ……………………………………	
4.2. Data quality	What are the management actions to improve data quality? (e.g. reduce necessary amount of data, regular checks, clear definitions, training and frequent feedback to data collectors) Conclusion: ………………………………… ………………………………… ……………………………………	
	Is the data quality assessment based on an internationally recognized frame work e.g. IMF data	

	quality assessment (DQAF) Conclusion: ………………………………………. ………………………………………. ………………………………………	
	What are the criteria for assessing data quality? (timeliness, periodicity, consistency, representativeness, disaggregation and confidentiality) Conclusion: ………………………………………. ………………………………………. ………………………………………	
4.3. Data processing and compilation	How the data extraction and integration done? Conclusion: ………………………………………. ………………………………………. ………………………………………	
	Is there an integrated data repository or storehouse? Conclusion: ………………………………………. ………………………………………. ………………………………………	
5. Information products, Dissemination and use (outputs) 5.1. Information	Is the collected data transformed in to information (compiled, managed and analyzed)? Conclusion: ……………………………………….	

	…………………………………. ……………………………………	
5.2. Evidence	Is the information integrated within a context to become evidence? Conclusion: ……………………………………. ……………………………………. ……………………………………	
5.3. Knowledge	Is the evidence formatted for presentation, communication or dissemination to influence decision makers to become knowledge? Conclusion: ……………………………………. ……………………………………. ……………………………………	
6.	What are the policy gaps? Conclusion: ……………………………………. ……………………………………. ……………………………………	

	What is not known? What are the research gaps? What are the unanswered questions?	
	Conclusion:	
	…………………………………….	
	…………………………………….	
	……………………………………	

Reviewed by: ……..…………………..   **Date:** ……………………………

Desk Review Guide for: Medical Products, vaccines and medical technologies

Name of the document under reviewing: ………………..   Soft/hard ………………..   First edition year: ………………………… Name of program: ……………..   **Dept/ agency/ies ministry/ies ………………..   Draft/Final …………………………….**

1. Although the document mentioned medical product in its statements, still the same should be applied when reviewing documents related to vaccines and that related to medical technologies. While some of the questions may be applicable for all of it, but other questions will be applicable for only one or two of them.

2. In some areas we should distinguish Blood and its products from other medical products, if needed?

Related statement/topic to be reviewed	Quoted / capture or modified text	Page no.	Reviewer comments
Population with regular access to essential medical products? What purposes this figure was used for? Conclusion: ……………………………………… ………………………………………			
Availability of key essential medical products at public and private health facilities Conclusion: ………………………………………			

…………………………………..			
Key mechanisms identified to strength the governance function of medical products (policy development, law development/ enforcement, partnership, coordination, etc) Conclusion: …………………………………… ……………………………………			
What is the regulatory capacity of medical products in the country? Is this capacity was assessed recently? Conclusion: …………………………………… ……………………………………			
The gap in developing the required policies, norms, standards and guidelines improving the quality, safety and use of medical products; and how these gaps affect the current management systems of these products? Conclusion: …………………………………… ……………………………………			
What measures were taken or identified by the government to assure the safety and effectiveness of medical products? How these measures were preformed and evaluated?			

Conclusion: ………………………………… …………………………………			
What percentage of public health expenditure is usually devoted to medical products and its management? How this has implications on overall health policy in the country? Conclusion: ………………………………… ………………………………… …………………………………			
Strategies that were identified to improve the affordability of key/essential medical products; Is these strategies were effective? Do we have adequate knowledge about price and cost of essential medical products and how this affects the affordability? Conclusion: ………………………………… ………………………………… …………………………………			
Proportion of total needs for medical products that was locally produced; What are the barriers to increase this volume? Do			

we have selected strategies to improve the local production of medical products? Conclusion: ………………………………… ………………………………… …………………………………			
Do we have updated national standard list of essential medical products? What is the mechanism in place to select the essential medical products? Does this include cost-effectiveness analysis? How these mechanisms ensure that all of the national health priorities were considered? What are the efforts done to assess this mechanism versus the other mechanisms? Conclusion: ………………………………… ………………………………… …………………………………			
Mechanism in place to procure the essential medical products? What are the efforts done to assess this mechanism versus the other mechanisms? Conclusion: ………………………………… ………………………………… …………………………………			

Do we have clear policy on improving the access to medical policy at PHC level? Conclusion: ………………………………………… ………………………………………… …………………………………………			
Do we have clear mapping for current medicines supply systems? Any effort to integrate these systems? Is there any operational research done to support this? Conclusion: ………………………………………… ………………………………………… …………………………………………			
Measures used to maintain/ preserve the intellectual property rights (IPRs) of medical products in the country? Does this include or consider Sudanese traditional medicines? Conclusion: ………………………………………… ………………………………………… …………………………………………			
Proportion of circulated medical products that are counterfeit and substandard? What measures were in place to combat this problem?			

Conclusion: …………………………………… …………………………………… ……………………………………			
Key strategies used, and key policies developed, to promote and ensure the rational use of medical products? Conclusion: …………………………………… ……………………………………			
What sort of standard treatment guidelines (protocols) were currently in place? What is the gap? Conclusion: …………………………………… …………………………………… ……………………………………			
Is there any drug utilization review (analysis) conducted recently? Conclusion: …………………………………… ……………………………………			
Do we have an emergent antimicrobial resistance problem? What are the strategies			

done to contain this problem? Conclusion: ………………………………………… …………………………………………			
Does the strategies applied in managing medical products were built on scientific evidence? Is there any research activities were referred as evidence to these strategies? Conclusion: ………………………………………… …………………………………………			
What are the policy gaps? Conclusion: ………………………………………… …………………………………………			
What is not known? What are the research gaps? What are the unanswered questions? Conclusion: ………………………………………… …………………………………………			

Reviewed by:……………………   Date: …………………………………..

Desk Review Guide for Non-Communicable Diseases (NCDs) domain

Name of document under reviewing: ………………………..

First edition year: ……………………

Name of program: ………………………..

Components and functions	Related statements/ topic to be reviewed	Quoted/ capture or modified text	Page no.
Structure and management system	- Is there a cleanly stated organized system for the NCD directorate? - Is there clear description for the component units of NCD ?		
Policies and strategies	- Are there documented policies for NCDs ? - Are there specific guidelines for the policies stated? - What are these guidelines? - Are there specific strategies for NCDs? - What are the objectives of these strategies? - what is the target of the objectives? And what has been achieved?		
Specific activities	- What are the specific activities conducted at: 1- MOH level		

	2- locality level		
	3- health unit level		
	4- community level		
Health information about NCD	-what are the sources of H.I. for NCDs in Khartoum state ?		
	-What surveys were conducted before		
	-Is there any plan for specific research to be conducted (suggested)		
Indicators	-Are there specific indicators set to be targeted or achieved in relation to MDG4 and national targets ?		
Financial and human resources	- What is the annual cost of the NCD program?		
	- Are there guidelines to the training, deployment remuneration and career development of human resources at all levels?		
Co-ordination with other health structures and organizations	- Is there a plan for co-ordination between NCDs and the other health directorates or departments in the health system?		
	- What sort of co-ordination is it ?		
	- Is there a plan for co-ordination between NCDs and NGOs		
Data sources	- Is there regular reporting about NCDs at all levels of the health system?		
	- Is there contribution from the community towards		

	NCD programs?		
Research	- Are research areas for NCD specified and identified? - What are the specific areas identified? - Are research priorities identified? - Is there a plan for research support?		
	-What are the policy gaps?		
	-What is not known? -What are the research gaps? What are the unanswered questions?		

Appendix 2: list of documents reviewed

1. Sudan national health sector strategic plan 2012- 16

2. Health Information System: National Policy

3. Health Information System Reform Project

4. Sudan Health Information System: Review and Assessment - May 2007

5. National Pharmaceutical Sector Assessment in North Sudan 2007;

6. National Drug Policy 2005-2009;

7. 25 years National Pharmaceutical Strategy 2004-2009;

Appendix (3): Key Informant interview guide

Introduce yourself and that PHI is undergoing an exercise for mapping existing knowledge, and identifying priority research questions of the health systems. It is based on the WHO health system building blocks.

The methods included key document review to identify research and policy gaps as mentioned in the policy appraisal report. This is followed today by key informant interviews to discuss and explore further research and policy gaps.

1. Are there other policy issues that have not been mentioned in the policy appraisal?

2. Have you any additions to the identified research gaps?

3. Do you have any additional problems in this building block that need more information or evidence? [Explanation: these problems are potential research areas]

   [Prompt : Summarize the long list of research gaps and problems that the interviewee mentioned and those in the policy appraisal report. Then ask the interviewee]

4. What is the most important or urgent of these possible research areas? Why is it urgent or important? [Explanation: We are trying to get a sense of the criteria the interviewee is using to determine priority. We need these criteria for the prioritisation exercise later]

5. Do you know of any research conducted in this field?

6. Have you any key documents related to the topics that you raise to share with us?

7. Who else do you think we should talk to?

Appendix (4): Ranking projects in a grid of 'Importance versus impact'

Criteria:

Importance:

      What if this project does not happen?

      Can carry on for a short while without it.

      Will limit the work of the department

      Will limit the work of more than one department and/or partners

      Department cannot proceed without it.

      Catastrophic to the MoH

Impact: Who will benefit from this project and how?

      Small number of individuals or patients

      Communities, indirectly

      Individuals or patients directly

      Communities directly

      Potentially everyone benefits