Characterisation of the Health Information System in Mozambique

REPORT OF FINDINGS
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<tr>
<td>AL</td>
<td>Artemether-Lumefantrine</td>
</tr>
<tr>
<td>ANC</td>
<td>Ante Natal Care</td>
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<tr>
<td>APE</td>
<td>Agente Polivalente Elementar de Saúde (Polyvalent Health Agent)</td>
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<tr>
<td>CIBSUL</td>
<td>Comité Institucional de Bioética para a Saúde</td>
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<tr>
<td>DANIDA</td>
<td>Denmark’s development cooperation; Danish International Development Activities</td>
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<tr>
<td>DHIS2</td>
<td>District Health Information Software 2</td>
</tr>
<tr>
<td>DHSS</td>
<td>Demographic and Health Surveillance System</td>
</tr>
<tr>
<td>DNT</td>
<td>Doenças Não Transmissíveis (non-communicable diseases)</td>
</tr>
<tr>
<td>DPS</td>
<td>Direcção Provincial de Saúde (Provincial Health Directorate)</td>
</tr>
<tr>
<td>DPT</td>
<td>Diphtheria, pertussis, tetanus vaccine</td>
</tr>
<tr>
<td>ENL</td>
<td>Ear-Nose-Larynx specialty</td>
</tr>
<tr>
<td>EPI</td>
<td>Expanded Programme on Immunisation</td>
</tr>
<tr>
<td>FCS</td>
<td>Faculdade de Ciências de Saúde</td>
</tr>
<tr>
<td>FORSSAS</td>
<td>Fortalecimento dos Sistemas de Saúde e Accção Social</td>
</tr>
<tr>
<td>Global Fund / GF</td>
<td>Global Fund to Fight AIDS, Tuberculosis and Malaria</td>
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<tr>
<td>HCD</td>
<td>Human Centred Design</td>
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<tr>
<td>HF</td>
<td>Health Facility</td>
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<tr>
<td>HIS</td>
<td>Health Information System</td>
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<td>HIUS</td>
<td>Health Information Use System</td>
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<td>HMIS</td>
<td>Health Management Information System</td>
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<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>IMCI</td>
<td>Integrated Management of Childhood Illnesses</td>
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<tr>
<td>INS</td>
<td>Instituto Nacionnal de Saúde</td>
</tr>
<tr>
<td>LLIN</td>
<td>Long-lasting insecticide-treated nets</td>
</tr>
<tr>
<td>LMIC</td>
<td>Low- and middle-income countries</td>
</tr>
<tr>
<td>JHPIEGO</td>
<td>Johns Hopkins Program for International Education in Gynaecology and Obstetrics</td>
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<tr>
<td>MISAU</td>
<td>Ministério da Saúde (Ministry of Health of Mozambique)</td>
</tr>
<tr>
<td>M&amp;A</td>
<td>Monitoria e Avaliação (Monitoring and Evaluation)</td>
</tr>
<tr>
<td>MTB</td>
<td>Mycobacterium tuberculosis</td>
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<tr>
<td>NRI</td>
<td>National Research Institution</td>
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<tr>
<td>ODK</td>
<td>Open Data Kit</td>
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<tr>
<td>OPD</td>
<td>Out-patient department</td>
</tr>
<tr>
<td>ORT</td>
<td>Oral rehydrationtherapy</td>
</tr>
<tr>
<td>PAV</td>
<td>Programa Alargado de Vacinações (EPI)</td>
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<tr>
<td>PBF</td>
<td>Performance Based Financing</td>
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<tr>
<td>PEPFAR</td>
<td>President’s Emergency Plan for AIDS Relief</td>
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<tr>
<td>PESS</td>
<td>Plano Estratégico do Sector Saúde (Health Sector Strategic Plan)</td>
</tr>
<tr>
<td>PHC</td>
<td>Primary Health Care</td>
</tr>
<tr>
<td>PNC</td>
<td>Post Natal Care</td>
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<tr>
<td>PNCTL</td>
<td>Programa Nacional Controle Tuberculose e Lepra (National tuberculosis and leprosy control programme)</td>
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<tr>
<td>PRN</td>
<td>Programa de Reabilitação Nutricinal (nutrition rehabilitation programme)</td>
</tr>
<tr>
<td>PTV</td>
<td>Prevenção da Transmissão Vertical (Vertical Transmission Prevention)</td>
</tr>
<tr>
<td>REMTIL</td>
<td>Redes Mosquiteiras Tratadas com Insecticida de Longa Duração (Long lasting insecticide treated nets)</td>
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<tr>
<td>RIF</td>
<td>Resistance to rifampicin</td>
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<tr>
<td>SAAJ</td>
<td>Serviços Amigos do Adolescente e Jovem (Friends of Adolescents and Youth Services)</td>
</tr>
<tr>
<td>SAND</td>
<td>Serviços de alimentação, nutrição e dietética (alimentation, nutrition and dietetics service)</td>
</tr>
<tr>
<td>SCIH</td>
<td>Swiss Centre for International Health</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>SDC</td>
<td>Swiss Agency for Development and cooperation</td>
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<tr>
<td>SIS</td>
<td>Sistema de Informação de Saúde (HIS)</td>
</tr>
<tr>
<td>SMI</td>
<td>Saúde Materna e Infantil (Maternal and Child health)</td>
</tr>
<tr>
<td>Swiss TPH</td>
<td>Swiss Tropical and Public Health Institute</td>
</tr>
<tr>
<td>SWOT</td>
<td>Strengths, Weaknesses, Opportunities and Threats</td>
</tr>
<tr>
<td>TARV</td>
<td>Antiretroviral Treatment</td>
</tr>
<tr>
<td>TB</td>
<td>Tuberculosis</td>
</tr>
<tr>
<td>UniLúrio</td>
<td>Universidade Lúrio</td>
</tr>
<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
</tr>
<tr>
<td>USD</td>
<td>US Dollar</td>
</tr>
<tr>
<td>VAT</td>
<td>Vaccination Anti Tetanus</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
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Sumário executivo

A saúde da população é directamente afectada pelas decisões tomadas pelos fazedores de políticas, gestores, provedores de serviços de saúde e pela própria população. Portanto, as acções para melhorar a segurança das decisões devem abranger todo o processo de tomada de decisões, começando ao nível da unidade sanitária. O projecto PHISICC (Sistemas de Informação em Saúde Baseados em Papel nos Cuidados da Criança) foca as componentes em papel do sistema de informação em três países africanos (Costa do Marfim, Moçambique e Nigéria). A nossa pergunta de pesquisa é: Quais são os efeitos das intervenções dos sistemas de informação baseados em papel na qualidade e na utilização dos dados e nos resultados relacionados com a saúde nos Cuidados de Saúde Primários (CSP) em Países de Baixa e Média Renda (PBMR)? Com este fim, o projecto PHISICC avaliou, primeiramente, o Sistema de Gestão de Informação de Saúde (SGIS) de forma a entender como os dados são produzidos, armazenados e transmitidos e qual é a experiência humana à volta dos dados e da tomada de decisão. Posteriormente, numa parceria criativa com os países parceiros, iremos envolver-nos em actividades co-creativas, colaborativas e intencionais de desenho, para inovar nas ferramentas e nos processos de modo a melhorar os sistemas baseados em papel. Iremos, posteriormente, testar estas inovações, recorrendo a ensaios aleatorizados controlados. Este relatório refere-se à primeira parte do projecto: a avaliação do SGIS em Moçambique.

Nós utilizámos uma abordagem de combinação de métodos de várias perspectivas: saúde pública, sistemas de saúde e o Desenho Centrado em Humanos. Os métodos incluíram: a revisão do plano estratégico do sector de saúde abarcando vários anos, formulários de dados e ferramentas de apoio, e dez dias de trabalho de campo em Maputo e na província de Nampula, de modo a levar a cabo entrevistas e seminários com stakeholders, análises dos stakeholders, entrevistas com os trabalhadores de saúde, exercícios de verificação de dados nas unidades sanitárias e observação não participante das actividades de trabalhadores de saúde. Nós não pretendíamos obter achados generalizáveis, mas sobretudo adquirir um conhecimento profundo do status do SGIS, sintetizando vários tipos de evidências, de várias fontes. Embora nós não possamos excluir algum grau de enviesamento nos nossos achados, tomámos todo o cuidado de aderir aos padrões de pesquisa largamente aceites. Esta pesquisa foi aprovada pelos comitês éticos competentes no país.

Em Moçambique, existem quatro níveis de prestação de cuidados de saúde: (i) centros de saúde onde os Cuidados de Saúde Primários (CSP) são levados a cabo, (ii) hospitais rurais e gerais, (iii) hospitais provinciais e (iv) hospitais centrais que prestam serviços de especialidades diversificadas e de maior complexidade. Consequentemente, o Sistema de Gestão de Informação de Saúde (HMIS-SIS), está organizado de acordo com a hierarquia do Sistema Nacional de Saúde que começa nas unidades sanitárias, segue para o distrito, província até o nível nacional do Ministério da Saúde (MS).

O SGIS é um assunto prioritário para o MS de Moçambique, em especial as componentes baseadas em papel.

As ferramentas do SGIS estão bem estruturadas à volta de várias áreas de cuidados de saúde (e.g. crianças em risco, consultas de saúde materna e infantil), com formulários de registo, a nível das unidades sanitárias, e formulários de
Sumário executivo

reporte, a nível provincial. Contudo, pudemos observar no campo muitos formulários não padronizados a serem utilizados, ou porque os livros de registo esgotaram nas unidades sanitárias, ou porque havia necessidades de registo e reporte de informação que não podiam ser alcançadas utilizando os formulários padrão.

Os desafios do SGIS de Moçambique reportados comumente, incluíram: (i) financiamento limitado e recursos humanos inadequados; (ii) fornecimento irregular de livros de registo e fichas de resumo de dados; (iii) recolha colateral de dados por parte dos parceiros; (iv) ausência de análise de dados ao nível da recolha de dados; e (v) falta de utilização de dados na tomada de decisão.

A integração com o DHIS2 está a decorrer a nível distrital, embora não tenhamos podido testemunhar que o DHIS2 possa ser utilizado como um sistema paralelo ao ainda existente processamento de dados manual. Percebemos que nem todos os módulos do DHIS2 estão de facto a ser utilizados.

Existem alguns stakeholders envolvidos no SGIS no país, o que coloca um fardo pesado na coordenação e no verdadeiro trabalho em relação ao SGIS. O compromisso entre os parceiros com a qualidade de dados é muito elevado, sendo um problema conhecido. De facto, os exercícios ad hoc de verificação da qualidade de dados levados a cabo, demonstraram conforme esperado, exemplos de descrepâncias de dados, moderadas a sérias, entre as fontes de dados. A consciência, a compreensão e a visão do pessoal da DPS foi notável, sendo uma invalorável fonte não só para o entendimento dos assuntos ligados ao SGIS, mas também para a concepção de soluções inovadoras. De facto, o projecto PHISICC irá também aprender a partir das experiências anteriores para a melhoria da sub-componente de vacinação do SGIS em Nampula, levada a cabo pela DPS. Os Stakeholders também cederam o seu conhecimento profundo essencial de modo a complementar e completar a estrutura do SIS que teve início na Costa do Marfim e se desenvolveu na Nigéria. Por exemplo, a componente ‘comunicação’ da tomada de decisão, foi incorporada na estutura final do SIS.

A percepção geral entre os trabalhadores de saúde era que os dados que eles estavam a colher dificilmente eram utilizados a nível periférico e que levam muito tempo a serem colhidos. Outras preocupações incluíram dificuldades em manusear as ferramentas de apoio de dados, a quantidade de dados a serem registados, e que os incentivos parecem promover a qualidade de dados ao invés da qualidade dos cuidados.

Parece haver acordo em considerar que as adaptações anteriores feitas ao SGIS não seguem necessariamente uma abordagem sistemática e informada por evidências, mas que as alterações são influenciadas por aqueles parceiros que possam ser capazes de exercer influência em alturas específicas. O PHISICC é visto como uma oportunidade de experimentar e testar com rigor novas abordagens visando a melhoria da qualidade e da utilização de dados.
Executive summary

Population health is directly affected by decisions taken by policy makers, managers, health care providers and by the population itself. Therefore, actions for improving the soundness of decisions need to embrace all decision making processes, starting at health facility level. The PHISICC project (Paper-Based Health Information System in Child Care) focuses on the paper components of the information system in three African countries (Côte d’Ivoire, Mozambique and Nigeria). Our research question is: what are the effects of paper-based information systems interventions on the quality and use of data and on health related outcomes in Primary Health Care (PHC) of Low- and Middle-Income Countries (LMIC)? To this end, the PHISICC project first assessed the status of the Health Management Information System (HMIS) in order to understand how data are produced, stored and transmitted and what is the human experience around data and decision making. Then, in creative partnership with country partners, we will engage in co-creative, collaborative and intentional design activities to innovate on the tools and processes to improve paper-based systems. We will then test these innovations using randomised controlled trials. This report refers to the first part of the project: the assessment of the HMIS in Mozambique.

We used a mixed methods approach from several perspectives: public health, health systems and Human Centred Design. Methods included: the review of the multi-year health sector strategic plan, data forms and supporting tools, and ten days of field work in Maputo and in Nampula province to carry out interviews and workshops with key stakeholders, stakeholders analyses, interviews with health workers, health facility data verification exercises and health workers ‘shadowing’. We did not aim to obtain generalizable findings, but rather to acquire an in-depth knowledge of the status of the HMIS, synthesising several types of evidence from several sources. Although we cannot rule out some degree of bias in our findings, we took all care to adhere to the widely accepted research standards. This research was cleared by the competent ethical review boards in country.

There are four levels of health care delivery in Mozambique: (i) the national level with teaching hospitals and specialist hospitals providing complex health care; (ii) the provincial level, with provincial hospitals; (iii) districts with rural hospitals; and (iv) health centres where Primary Health Care (PHC) takes place. Accordingly, the Health Management Information System (HMIS-SIS) is organised following the same hierarchy of levels, from the health centres up to the national level.

The HMIS is a priority issue for the MOH in Mozambique, particularly the paper-based components.

The tools of the HMIS are well structured around several health care areas (e.g. children at risk, antenatal care), with recording forms at health facility level and reporting forms up to the provincial level. However, we could observe in the field many more forms being used, either because health facilities run out of register books or because there were recording needs which could not be achieved using the standard forms.

Commonly reported challenges of the HMIS in Mozambique included: (i) limited funding and inadequate human resources; (ii) irregular supply of data tools; (iii) co-lateral data collection by partners; (iv) lack of data analysis at the level of the data collection; and (v) lack of data use in decision making.
The integration with the DHIS2 takes place at district level, although we could witness that DHIS2 can be used as a parallel system to the still existing manual processing of data. We realised that not all DHIS2 modules are actually being used.

There are a few stakeholders in the country involved in the HMIS, which puts a heavy burden into coordination and actual work in relation to the HMIS. Commitment to data quality is very high among partners and a well know problem. In fact, the ad hoc data quality verification exercises carried out showed, as expected, examples of moderate to serious data discrepancies between sources. The awareness, understanding and vision of the Nampula DPS staff was remarkable and an invaluable resource not only to understand the issues of the HMIS but also to conceive innovative solutions. Actually, the PHISICC project will also learn from previous experience in improving the vaccination sub-component of the HMIS in Nampula, carried out by the DPS. Stakeholders also provided essential insights in order to complement and complete the HIS framework that was started in Côte d’Ivoire and further developed in Nigeria. For example, the ‘communication’ component of decision making was incorporated in the final HIS framework.

The general perception among health workers was that the data they were collecting was hardly used at the peripheral level and that it takes too much time to collect. Other concerns included the difficulties in handling data support tools, the amount of data to records, and that incentives seem to promote quality of data instead of quality of care.

There seems to be agreement in considering that past adaptations of the HMIS do not necessarily follow a systematic and evidence-informed approach, but rather that changes are influenced by those partners who may be able exert more influence at specific times. PHISICC is seen as an opportunity to try and rigorously test new approaches aiming at improving data quality and use.
1 Project background

Population health is directly affected by decisions taken by policy makers, managers, health care providers and by the population itself. Decisions are taken by applying judgements to evidence describing problems or suggesting solutions. However, judgments are influenced by personal, organisational and political factors; besides, evidence has always some degree of bias. Therefore, actions for improving the soundness of decisions need to embrace all decision making processes, from the production of better quality evidence up to the development of more transparent and systematic evidence-informed judgements.

One of the sources used for decision making in health care is the information routinely produced in health facilities in the course of clinical, public health and management activities, which is sequentially aggregated and sent to the higher levels of the system up to the national level (Health Management Information Systems – HMIS).

While some or most of the processes involved in data production, transmission and use can and have been digitalised in many countries, paper tools continue and will continue to be used, especially at the point of care in Primary Health Care (PHC) and in remote areas, where technical requirements for digital systems are not fully available.

In an era of increasing digitalisation, paper based information components have been neglected. However, they are essential because they are often the very source of all data used where it is produced and upstream the systems and, therefore, data issues and errors at the point of care at PHC level are inevitably transmitted and amplified to the highest levels of the health system.

In the current project (Paper Health Information Systems in Child Care – PHISCC) we focus on the paper components of the health information system in three African countries, namely Côte d’Ivoire, Nigeria and Mozambique. In Mozambique, the project is organised in a partnership between the Swiss TPH (Switzerland), gravitytank/Salesforce (the USA), the Universidade Lúrio (UniLúrio) and the Ministério da Saúde (MISAU; ‘Ministry of Health of Mozambique’).

Our overall project research question is: what are the effects of paper-based information systems interventions on the quality and use of data and on health related outcomes in PHC of Low- and Middle-Income Countries (LMIC)?

To this end, we have assessed the status of health information systems in the three countries, in order to understand how data is produced, stored and transmitted and what the human experience around data and decision making is. Then, in creative partnership with the country, we will engage in co-creative, collaborative and intentional design activities to redesign the tools and processes to improve paper-based information systems. Finally, we will design and implement three cluster randomised controlled trials to test the effects of the interventions designed.

This report refers to the first part of the project: the assessment of the HMIS in the country through an observational, mixed-methods approach. The fieldwork of this assessment in Mozambique took place in January 2017. The objectives of the assessment were to:

1. understand the Health Information System (HIS) within the national priorities of the country, including recent developments of the HIS and plans for the next years;
2. identify to what degree the HIS is used in the country;
3. identify the strengths, weaknesses of the HIS;
4. clarify which parts of HIS will remain paper-based.
2 Approaches and methods

We summarise in the next section the approaches and methods used in WS3 in Mozambique. For a full description of methods, see the WS3 protocol.

2.1 Desk review

The Ministério da Saúde (MISAU) and project partners were asked to provide key strategic documents from the governmental health sector to understand the overall health policy context, strategies and priorities, especially in relation to the HMIS. Documents provided were scrutinised and relevant statements related to HMIS, decision making, evidence and use of evidence were searched and extracted. Information on HMIS guidelines, flow of data and processes was especially searched and extracted to provide background guidance for the field work.

Both the MISAU and the Direcção Provincial de Saúde (DPS; ‘Provincial Health Directorate’) were requested to provide a set of forms routinely used in PHC in the governmental health sector. Besides, in the visits to health facilities, snapshots of available forms were taken, avoiding any personal information that would breach confidentiality. We could only retrieve part of the tools that were currently used, though. With this material, we compiled an initial list of forms used and data items in each form were analysed and tabulated, detailing its characteristics (e.g. name, topic, presentation, format).

2.2 Stakeholders engagement and workshops

Stakeholders in the country with direct or indirect interests and contributions to the HMIS were identified with the help of MISAU officials and members of the UniLúrio. Stakeholders were invited to two meetings/workshops: one at the beginning of the fieldwork, to present the project and the plan and rationale of the fieldwork; and another one at the end, to share preliminary findings.

The first workshop consisted of a mix of plenary sessions and discussion parts. It was structured in three parts:

(a) project background and introductions;
(b) discussion on the current state of PHC and HMIS;
(c) discussion on PHISICC aims and approaches;
(d) presentation of the field work to characterise the HMIS in the country.

The second workshop consisted of a mix of plenary sessions and discussion sessions and was structured as follows:

(a) welcoming;
(b) review of initial findings;
(c) discussion, based on questions to participants;
(d) feedback session, using scenarios, brainstorm solutions to improve the HIS.

The stakeholders’ landscape in Mozambique was relatively limited to governmental entities and some international agencies. Therefore, we decided not to carry out a stakeholders positioning exercise during the workshops, as we did in Côte d’Ivoire and Nigeria, for which a reasonable number of stakeholders is needed.

A subset of stakeholders which were identified as active contributors to the HMIS in the country were individually interviewed in Maputo and in Nampula in order to gather additional, first-hand information on the functioning of the HMIS, challenges, opportunities and, overall, on how stakeholders would see the future of the HMIS and the paper components of it. Interviews were documented through interviewers notes, which were later on complied and synthesised for this report. See Annex 1 for a list of people attending the workshops and/or met in face-to-face interviews; and Annex 2 for an outline of the interview questions.

2.3 Visits to sites

A purposive sample of health facilities was agreed with project partners. The sample included rural and urban, good and poor performing health facilities, as perceived by country project partners, as well as remote health facilities.

The activities carried out in health facilities were:

1) Interviews with the facility main staff, typically with the head of the health facility. Interviews were meant to understand the general functioning of health facilities and the staff experience with data and data use. The generic questionnaire can be found in Annex 2.

2) Verification of primary filled forms against reports containing aggregated data in order to estimate concordance (accuracy) between the aggregated figures in reports sent by the health facilities to the district health office and the figures obtained by re-counting the number of health care events as seen in the recording forms (registers) of the health facility. This allowed the estimation of a ‘verification ratio’ for each item checked (e.g. number of deliveries in a given month); this ratio represents the reported number versus the re-aggregated (or re-counted) number. We also compared primary forms with actual events. This could only be done in pharmacies keeping stock cards or equivalent records which could be compared with counts of existing medicines. We used
standard Data Quality Audits (DQA)\(^a\) methods to guide the data verification activities. Data collection was supported by the ODK\(^b\) system and quantitative data was analysed using R\(^c\).

3) Shadowing of health workers activities (see below, section 2.4).

### 2.4 Human-centred design approach

A human-centred design approach was used as background across all activities aiming at understanding information use and decision-making by health care providers and stakeholders. The human-centred design understands health care processes, including data production, management and use, as a human experience and from the perspective of the passive or active actors of health care events. From this perspective, the relevance and appropriateness of health care activities is assessed in terms of actors’ views and perspectives, and not only in terms of efficacy or efficiency. The underlying hypothesis dictates that sound interventions have to be adapted to improve users’ experience.

At the primary health care facilities, we engaged health workers in three different human-centered design research activities:

1. **Observation:** We watched as health workers cared for their patients.
2. **Demonstration:** When no patients were present, health workers showed us how they use the forms and registers while caring for patients and preparing the monthly reports.
3. **Stimulation:** We showed health workers early intervention prototypes to elicit feedback on the impact of potential changes to the paper-based system.

For this activity, we visited six primary health care centres, one district office where monthly report data is entered into the system and attended one district meeting:

1. 25 Setembro Health Unit in Nampula
2. Mutava Rex Health Unit in Nampula
3. Muheleia Health Unit in Rapale
4. Namaita Health Unit in Rapale
5. Namina Health Unit in Mecuburi
6. Unidade Moçambique Health Unit in Mecuburi
7. Rapale Statistics Office
8. Nampula Statistic Office
9. Mecuburi District meeting

### 2.5 Data management, administrative and ethical clearances

Visits to health facilities were partially video recorded and photographs were taken using standard equipment by gravitytank/Salesforce, after asking for permission. In any case, care was taken not to record patients and when this was accidentally done, these parts of the recording or the whole recording were securely destroyed. Informed consents were obtained before any recording took place.

\(^b\) ODK. Open Data Kit. https://opendatatkit.org/.
Qualitative and quantitative information from workshops and informal meetings were recorded into text based applications and safely stored in the Swiss TPH server. Qualitative information was revised and rewritten to be included in this report. No specific qualitative data management techniques were used. Quantitative data were imported and analysed using R to produce estimates and graphs.

The research protocol was translated into Portuguese in order to obtain administrative and research ethical clearances. Documentation was submitted by the UniLúrio to the appropriate authorities in the country to approve the research, provide clearances to national research partners and to allow visiting of health facilities, particularly to the “Comissão Científica” and the “Comité Institucional de Bioética para a Saúde” (CIBSUL), both at UniLúrio (November 2016).

2.6 Limitations

The methods of this research do not allow the generalisation of findings. Our aim was not to describe specific health facilities or events, but rather to gain an in-depth understanding of emerging issues when dealing with HMIS in settings with constrained resources. By producing a synthesis from several perspectives (i.e. public health, health systems and HCD) and sources of information (e.g. stakeholders, health workers, partners), we have been able to offer a landscape of the main issues related to HMIS in PHC. Some of these issues are well known and already reported in the literature; some others are not so prominent but have shown worth to take into account, and others are relatively new and specific to the country setting.

Our findings are indeed subject to bias. In one hand, we have tried to minimise bias by adhering as much as possible to best research practices, taking care the questionnaires are built in a ‘neutral’ manner, minimising interventions during the shadowing processes and by using standard methods and approaches (e.g. DQA). On the other hand, our findings have entered several cycles of critical reviews by stakeholders and partners and, while we cannot be reassured of whether these findings are close to reality, we can comfortably assume that the problems identified in this research are consistent across sites and settings and have the potential to undermine the use of data for decision making at PHC level.
3 Findings

The work presented in this report took place in Maputo and Nampula, in January 2017. Some other work took place with specific teams in Basel (Switzerland) and in Chicago (USA) from some weeks before to some weeks after the fieldwork; mainly related to the documents reviews, synthesis of findings and HCD implications. See the chronogram of the fieldwork in Annex 3.

3.1 Country profile

With a surface of 801,590 square kilometres, Mozambique is the 16th largest country of Africa. Mozambique had an estimate of 27 million inhabitants in 2017 which places it as the 12th most populated country of Africa and the 47th most populated in the world. In terms of the Gross National Product, the World Bank ranked Mozambique 113th in 2015. Table 1 provides an overview of selected health related indicators of Mozambique.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Finding (in 2017 if not indicated differently)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>27 million</td>
</tr>
<tr>
<td>Life expectancy at birth</td>
<td>54.4 years</td>
</tr>
<tr>
<td>Maternal mortality ratio</td>
<td>489 per 100'000 live births*</td>
</tr>
<tr>
<td>Infant mortality rate</td>
<td>75.9 per 1000 live birth</td>
</tr>
<tr>
<td>General government expenditure on health as a % of total government expenditure</td>
<td>8.8% in 2013*</td>
</tr>
<tr>
<td>General government expenditure on health as a % of total expenditure on health</td>
<td>46.4% in 2013*</td>
</tr>
<tr>
<td>Out-of-pocket expenditure as a % of total expenditure on health:</td>
<td>6.4% in 2013*</td>
</tr>
<tr>
<td>Distribution of years of life lost by major cause group (%) in 2012</td>
<td>73%*</td>
</tr>
<tr>
<td>Prevalence of HIV (% of ages 15-24 years)</td>
<td>10.8%*</td>
</tr>
</tbody>
</table>

Sources: Instituto National de Estatistica, Moçambique* and *Mozambique Factsheets of Health Statistics 2016, WHO Afro*.

Four kinds of providers perform health services in Mozambique. The public sector, grouped under the National Health Service is the most comprehensive, both geographically and technically. The private sector is divided into for-profit (found almost exclusively in urban areas) and not-for-profit (which has strong ties to the public sector). The community health worker programme is formally integrated into the National Health Service and community providers meet some of the basic needs in areas difficult to reach for the National Health Service. Practitioners of traditional medicine offer non-allopathic medicine and are popular.

The National Health Service is organized into four levels of services provision. Health centres and health posts are at the primary level. The secondary level is composed of the district (general and rural hospitals) and represents the primary referral level. The primary and secondary levels are devoted to providing Primary Health Care. Provincial hospitals (third level) and central and specialized hospitals (fourth level) offer differentiated care using specialized professionals. According to the Strategic Health Sector Plan (2014-2019), only half the health facilities (HF) have electric power systems and 60% have a water supply.

PHC is delivered through three types of ‘Health Centres’. Type 1 have a medical doctor and most of the diagnostic services (e.g. laboratory, X rays) and have more staff than the other types; clinical services in type 2 facilities are handled by ‘Técnicos de Medicina’, medical practitioners who have received clinical training, and have more limited services, although they can admit patients for short stays. Some of them can have HIV/AIDS treatment services. Type 3 facilities are the smallest and can have two to four staff. Some of the largest health facilities may have ‘statistics technicians’ dedicated to data management.

In the systems there are also ‘health posts’ in remote areas, managed by a one or two staff. However, these types of facilities are being eliminated in favour of Agente Polivalente Elementar de Saúde (APE; ‘Polyvalent Health Agent’) who carry out home visits. In Mozambique, even the most peripheral APE have also forms to fill in to account for their home visits.

3.2 Desk review

3.2.1 Health Sector Strategic Plan

The main document guiding the multi-year national health sector policy and strategy is the Health Sector Strategic Plan 2014 to 2019 (PESS). This document is the result of interactions between a number of stakeholders organised around a working group, led by the Ministry of Health: DANIDA, Fortalecimento dos Sistemas de Saúde e Accção Social (FORSSAS), Johns Hopkins Program for International Education in Gynaecology and Obstetrics (JHPIEGO), entities from the MISAU, provincial directorates, Swiss Agency for Development and Cooperation (SDC), United States Agency for International Development (USAID) and the World Health Organisation (WHO).

The vision of the PESS is: “to contribute that all Mozambican people, especially the most vulnerable, can enjoy the best possible health, at affordable costs (for the country and citizens) and contributing, in this way, to fight poverty and for the promotion of national development”. PHISICC approach is consistent with the vision, with a focus on vulnerable populations: as we argue, paper-based tools will be the backbone of information systems even more in remote, rural areas where the most vulnerable people live; and also in deprived urban areas.

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The PESS outlines as well seven general principles that we have coupled with PHISICC approaches:

**Table 2. PESS principles and PHISICC approaches.**

<table>
<thead>
<tr>
<th>PESS</th>
<th>PHISICC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Primary Health Care</td>
<td>The focus of PHISICC is on PHC</td>
</tr>
<tr>
<td></td>
<td>The assumption in PHISICC is that by improving decision making in the most peripheral levels of the systems the most vulnerable groups will be better served and present in the information recorded and reported to higher levels.</td>
</tr>
<tr>
<td>2. Equity</td>
<td>PHISICC is in itself a wide partnership across several constituencies and incorporates stakeholders views all along the project.</td>
</tr>
<tr>
<td>3. Quality</td>
<td>PHISICC has acknowledged the importance of community involvement and users’ issues are incorporated into the decision-making framework informing the project.</td>
</tr>
<tr>
<td>4. Partnerships</td>
<td>PHISICC is a research initiative and understands ‘paper systems’ as being a particular type of technology which requires a ‘technological process’ to develop them.</td>
</tr>
<tr>
<td>5. Community involvement</td>
<td>PHISICC assumes that better data will lead to a more accurate and fairer portrayal of the status of health services and population health to facilitate sound decision making.</td>
</tr>
</tbody>
</table>

The PESS distinguishes between (i) Health programmes and (ii) service provision support systems. The HMIS in the PESS has a full section (5.2.3) under the latter. The objective of the SIS and vital statistics is to “produce quality and relevant information in relation to health determinants, health services performance and health status, to support evidence-informed decision making”.

The SIS includes disease notifications (ICD10), the hospital aggregated data system, the causes hospital deaths register as well as other demographic data. Together with the SIS, the MISAU has been developing a complementary Monitoria e Avaliação (M&A; ‘Monitoring and Evaluation’) systems as well.

In the year 2013 a new SIS was produced in order to collect the following information:

- routine health sector indicators, according to the PESS indicator matrix;
- health programmes (first phase): SMI, Programa Alargado de Vacinações (PAV; EPI), HIV, Prevention of Vertical Transmission (PTV), malaria, nutrition;
- health programmes (second phase): Tuberculosis (TB), community involvement and Doenças Não Transmissíveis (DNT; non-communicable diseases).

The PESS indicates that the system will be implemented at national level using an ‘open source’ technology. It also encourages the use of information technologies for data collection, analyses and dissemination (internet and e-Health); however, there is no further detail of the scope and timing for this.

In the section describing the reforms agenda and health system strengthening (section 6), the information system has a full sub-section (section 6.7). The first statement in this section clearly links between data collection and data use, and mentions the main characteristics that the information system should have: concise and reliable to produce timely and relevant information for users, managers, policy makes and the public. Several issues are pointed out as requiring further development: integration between the SIS and the M&A system, tools to support the system, use of information technologies and the role of the MISAU.
The PESS foresees as well mechanism to monitor its implementation. In this section, concerns about the past quality of data are clearly raised. The main quality problems were:

- incompleteness;
- lack of concordance;
- poor reliability;
- delays in data transmission to higher levels.

Factors contributing to these problems include: lack of data quality controls, non-standard tools, overload of health care staff and duplicate information; factors which were again widely reported by stakeholders in workshops and interviews.

Issues related to the use and dissemination of data are also detailed in the PESS. It lists some of the existing mechanisms, such as national meeting and coordination with partners, production of dashboards at national and provincial levels and data review meetings.

### 3.2.2 Initiative to improve the vaccination subcomponent of the information system

The PHISICC partners in UniLúrio, in collaboration with the DPS in Nampula, has carried out a study aiming at reducing the vaccination lost to follow up through three intervention components in the areas of Mutava Rex, Anchilo and in the health centre annexed to the psychiatric hospital:

- monitoring of children lost to follow up for vaccination, by community units or neighbourhoods, with the introduction of new forms to record vaccination activities and training of staff to handle these new forms;
- community leaders involvement in vaccination activities: mapping of community units and neighbourhoods and involvement of community leaders in the planning and monitoring of vaccination services;
- intensified of face-to-face communication, by training vaccination staff in face-to-face communication techniques and production of key messages to address mothers with children due for vaccination.

Existing tools collecting vaccination information included:

- vaccination nominal registry book: this is filled in daily; children are assigned a sequential number with the following data items: date of register entry, name of the child, birth date, sex, place of residence and data of vaccination for the different vaccines in the vaccination calendar. This tool is also used in outreach activities;
- tally sheets: this is filled in the vaccination sessions together with the vaccination nominal registry book according to the different antigens by age ranges (i.e. 0 to 11 and 12 to 23 months); in the tally sheets it is also possible to tally each time a vaccination vial is opened. This tools is also used in outreach activities;

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*See: Relatório Técnico da Oficina de Trabalho sobre Auto-avaliação do Sistema de M&A no SNS (2007); o relatório do seminário organizado pelo DIS para informar a elaboração de um Plano Estratégico do SIS em 2008.*

*This activity did not actually take place because of lack of responsiveness from the municipal council.*
- home based record: this is filled in the vaccination sessions together with the vaccination nominal registry book;
- monthly report with aggregated data from the nominal registry and tally sheets, both from the health centre and outreach activities. A copy is sent to the district authorities and another copy is kept in the health centre.

The new tools were based on the health management committees and on the vaccination nominal registry book, which contains information about the place of residence of children. They include:

- a daily vaccination control form to record the traffic of vaccination vials: opened and returned vials in each vaccination session;
- a tool to list the vaccinated children with information on the place of residence. Information is organised by alphabetical order of neighbourhoods, which facilitates the data management by community leaders.

During the mapping activities, each neighbourhood is assigned a target of children who need to be vaccinated each month. Children residents or vaccinated outside the catchment areas of health facilities are classified as ‘other areas’. Data from the list of children lost to follow up for vaccination allows the identification of neighbourhoods with the largest number of children missing vaccination and to establish targets with community leaders.

This was a cross-sectional single and before and after non-comparative study, carried out in March and April 2015 and used as main outcome vaccination with the first dose of pentavalent vaccine.

The main findings included:

- differences in the number of vaccinations recorded in the new tool as compared with the monthly report: non-significant differences for all vaccines except for measles and CCV (March) and no differences in any vaccine (April);
- selected data quality and communication criteria: all attributes improved with the new tools except for the accessibility of data and significant improvements were found in data consistency, utility of communication messages and positive contribution of the health workers training.

The study concluded with a synthesis of strengths and weaknesses of the system.

**Strengths:**

- easiness in filling the new tools;
- easy follow up of vaccination activities by neighbourhood or community unit;
- better verification of data across different forms;
- availability of key communication messages.

**Weaknesses:**

- complexity of the process to produce reports;
- workload to fill in the counting sheet at the end of the month with the information related to children place of residence;
3.2.3 Recording forms

We asked for the templates of the tools (i.e. forms, books) that are routinely used in health facilities. The DPS provided us with the tools listed in Table 3.

<table>
<thead>
<tr>
<th>Health care area</th>
<th>Tool code</th>
<th>Summaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children at risk consultation book</td>
<td>MOD-SIS-BO7</td>
<td>Health facility (monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>District (monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Province (monthly)</td>
</tr>
<tr>
<td>Reproductive health and family planning</td>
<td>MOD-SIS-BO5</td>
<td>Health facility (daily and monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>District (monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Province (monthly)</td>
</tr>
<tr>
<td>Antenatal care register</td>
<td>MOD-SIS-BO1</td>
<td>Health facility (monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>District (monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Province (monthly)</td>
</tr>
<tr>
<td>Maternity register</td>
<td>MOD-SIS-BO3</td>
<td>Health facility (daily and monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>District (monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Province (monthly)</td>
</tr>
<tr>
<td>Maternity admission</td>
<td>MOD-SIS-BO2</td>
<td>Health facility (daily)</td>
</tr>
<tr>
<td>Post-delivery and postnatal</td>
<td>MOD-SIS-BO4</td>
<td>Health facility (monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>District (monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Province (monthly)</td>
</tr>
<tr>
<td>Gynaecological emergencies</td>
<td>MOD-SIS-BO6</td>
<td>Health facility (monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>District (monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Province (monthly)</td>
</tr>
</tbody>
</table>

These tools were produced using MS Excel and were very well organised in one workbook for each health care area. Workbooks contained the following sheets:

- Cover page
- Instructions for the register book (with a note referencing a separate MS Word document)
- Indicators (with a note to reference a separate MS Word document)
- Template of the register book
- Health facility monthly summary
- District monthly summary
- Province monthly summary
- Instructions for the monthly summaries (with a note referencing a separate MS Word document)

Register books are formatted to be printed in DIN-A3 format, in books of 150 pages. Register books are structured in rows and columns. Subjects are organised in rows and then each column or group of columns are meant to collect the information described in each column heading. Subjects are identified in the first rows of each page with information such as name, place of residence, contact details and/or phone number. Interestingly, in all books there is room to record the subject antiretroviral treatment (TARV) identification number. See an example in Annex 4.
One double-page of register books have room for 30 (gynaecology) 25 (maternity admission), 20 (maternity), 7 (reproductive health), 6 (Post Natal Care (PNC)), 4 (Ante Natal Care (ANC)) and 2 (child at risk) subjects; using consecutive rows across the pages, from top to bottom. In some forms, and for each subject, several visits or encounters can be filled in consecutively; this is the case of child at risk (8 visits), ANC (6 visits) and PNC (4 visits). For the rest, each row has room for a single subject-visit.

Most of the data items in the tools do not have masks or any data entry template, but rather empty cells in the intersection of subjects-event rows and data items column headers. In some occasions, though, there are codified options for some data items which have to be selected by circling the desired option (e.g. if there is proteinuria, ‘Y’ for yes, ‘N’ for no and ‘NF’ for not done).

At the end of the rows corresponding to a given subject, there may be an additional row to produce summary indicators for that subject. This is the case in ANC, PNC and child at risk register books; particularly because these books have the possibility to enter information for more than one visit for each subject and, therefore, it does make sense to have a sort of ‘summary’ row for all the health care events of the same subject (see again the example in Annex 4).

The number of data items to be entered for each subject-event row varies across forms: 88 (maternity), 81 (reproductive health), 71 (gynaecology), 59 (PNC), 53 (ANC), 47 (maternity admissions) and 46 (child at risk). Although not all items have necessarily to be filled in (e.g. field ‘Observations’; or some others which do not apply to all cases), the amount of data to be recorded for each subject-event ranges from 46 to 88, which can be considered a remarkable amount of information.

Some other forms were identified in the field and collected by photographing them. These included:

- Childhood vaccinations register book (SIS-A01-A)
- EPI daily register from (SIS-A01); tally sheets
- Vaccination Anti Tetanus (VAT) daily register from (SIS-A02); tally sheets
- Nutritional surveillance form
- Malnutrition treatment and food supplements register book PRN
- Outpatient Department (OPD) consultations register book
- Counselling and testing in health in the clinical context register book (SIS-H-24.a)
- TPI register book
- Stock control form
- Microbiology book
- Temperature register form (cold chain)

Not all of these tools were identified in all health facilities; partially because not all health facilities have all services (e.g. HIV/AIDS care) and partially because some health facilities just did not use them (e.g. the cash summary).

Besides these, we could also find in health facilities ad hoc forms designed on blank paper by staff, either to address shortage of forms or because some information judged to be relevant was not captured by existing forms (see Figure 1).
3.2.4 Reporting forms (monthly summaries)

Monthly summary templates provided by the DPS were smartly configured, since there is perfect correspondence in the contents and items numbering between summaries at the three levels (i.e. health facility, district and province), for each health care area. District summaries had columns to record data from one health facility in each column; likewise, provincial summaries with district level data.

The layouts are clear and extend over a single page for each health care area in the health facility summary sheet, and over two landscape pages for the district and provincial levels, where information from more than one subunit, in each level, is collected.

The number of items varied by health care area: 84 (maternity), 66 (reproductive health), 52 (gynaecology), 48 (PNC), 47 (child at risk) and 44 (ANC); in total 341 data items from the DPS templates, without counting other monthly summaries. All these data is to be produced monthly and the vast majority of it includes re-classification (e.g. by age groups) and aggregation (e.g. by month).

As was the case with primary forms, some other monthly summaries where found in health facilities:

- EPI monthly summary form for health facilities (SIS-A03-A)
- Stomatology monthly statistic
- Stomatology activities monthly summary
- TARV or Program Nacional Controle Tuberculose e Lepra (PNCTL; ‘National tuberculosis and leprosy control programme) OPD treatment in patients 15 years or older monthly report
- Vitamin A monthly summary
- Antiretrovirals monthly map
- Monthly Arthemeter - Lumefantrine consumption in health facilities
- Monthly health facility cash summary

In order to make sure that the research team could identify all available forms actually being used by health facilities to report to the district level, we also requested to inspect the package of forms that
health facilities would send to the district. The research team was alerted when this took place and rendered itself to the district office in order to list the forms received from a particular health facility. Additional forms included:

- Monthly activities map
- Monthly malaria data compilation
- Mebendazole monthly summary (SIS-N07)
- Ferrous salt and folic acid in adolescents monthly summary
- Ferrous salt and folic acid monthly summary (version SIS-N12)
- Serviços de alimentação, nutrição e dietética (SAND; alimentation, nutrition and dietetics service) Clinical Nutrition monthly summary (3 pages)
- Counselling and testing in health daily register
- One-stop Serviços Amigos do Adolescente e Jovem (SAAJ; Friends of Adolescents and Youth Services) monthly summary (2 pages)
- Outpatient malnutrition treatment in children from 6 months to 5 years
- Treatment nutritional products for acute malnutrition monthly report
- ENL consultation
- Ophthalmology monthly statistics
- Vaccines request form
- Injections monthly summary
- Laboratory statistical form
- Public Health education activities monthly summary
- Consumables use monthly summary (2 pages)
- Redes Mosquiteiras Tratadas com Insecticida de Longa Duração (REMTIL), (mosquito nets) distribution monthly stock
- Laboratory consumables (2 pages)

Finally, we also counted the number of items another health facility was producing from a cover letter sent to the district level. The list included 58 forms in 17 health care areas!

As was the case with the primary forms, not all monthly summaries are used by all health facilities. It is also worth noting that some forms, even if used, tended to have blanks in most of the data items; either because a given activity did not take place in that health unit or because there were hardly any events in that area (see example below).
3.3 Stakeholders interactions

Advised by country partners, the research team contacted a number of stakeholders that have key roles related to the HMIS in the country, including MISAU, DPS Nampula, Village Reach, Elizabeth Glaser Pediatric AIDS Foundation (both are International NGO) and people from three universities: Faculdade de Ciências de Saúde of UniLúrio, Mozambique Institute of Health Education and Research (MIHER), and Universidade Eduardo Mondlane (UEM). Stakeholders participated in interviews or workshops and some of them in both events (see section 2.2). Annex 1 lists the people met.

Stakeholders at national and provincial level were approached. At national level, the importance of the HMIS within the context of the health sector strategy was clearly stated. Concerns were raised about the potential conflict between an initiative like PHISICC to improve paper-based systems and the always relevant considerations related to the future digitalisation of the systems at all levels, in the whole country. These issues are difficult to predict but the case was made in the sense that (i) it is rather unlikely that digitalisation of the systems can be deployed in the next few years, (ii) that it is rather unlikely that digitalisation will totally remove paper from the information system and (iii) that PHISICC will not only eventually contribute to the improvement of the paper-based information systems, but also produce lessons learned on the processes required to understand the information system, the decisions it is meant
to support and the mechanisms to rationally operate changes in health information system (e.g. human-centred design approaches, see section 2.4).

The issue of scaling up successful interventions was also briefly tackled to raise concerns about funding and implementation issues. However, it was also noted that this decision is now beyond the scope of PHISICC but that, in any case, PHISICC should be able to produce robust evidence to support (or not) further investments in HMIS changes.

Certainly, there has been dynamism in the country to adapt HMIS tools. This has been promoted by programme officers and the country has experienced several forwards and backwards in some of the forms (e.g. on how to record the different types of deliveries). For example, the SMI books have totally changed in the past but there are currently nine different books.

Overall, the PHISICC team had the perception that stakeholders at provincial level were particularly aware, knowledgeable and active in addressing HMIS issues. Despite that the HMIS is ‘governed’ at the central level at the MISAU, provincial health authorities and stakeholders provided very rich insights in concordance with the aims of PHISICC; it was extremely informative to understand the HMIS in the province and, by extension, in the country.

3.3.1 Views on health information systems and decision making

The HMIS and decisions

It has been widely acknowledged that the HMIS is suffering from a wide array of problems. Some of the structural problems, as pointed out at provincial level, were the co-existence of the paper-based and electronic systems, which are not always complementary but work in parallel in some instances. For example, data that may be available in electronic systems, particularly at district level but also at provincial level, may be overruled by the use of data on paper, either being the source of the electronic data or being electronic data transcribed back into paper support. This was also directly observed by the research team in a district office (see 3.4.5 for further details).

Programme managers at provincial level were approached in a group meeting. Unfortunately, at the time of the visit, the manager of the maternal and child health programme was absent. Nevertheless, plenty of insights were gathered from other programmes, including maternal and child health, from the staff present at the meeting, especially from the participating provincial programme managers (see Annex 1). Indeed, the maternal and child health information tools were somehow considered as being the backbone of the HMIS in health facilities.

HMIS problems mentioned by stakeholders included:

- generic issues related to health planning;
- stakeholders’ pressure to add data into the systems, causing fragmentation, redundancies and increased workload (raised at both national and provincial levels); data on HIV was reported as being a good example of duplication;
- lack of integration of programmes (mentioned by several stakeholders) which operate in a ‘vertical’ manner, which may contribute to duplication, inflation and complications in data handling (e.g. maternal and child health, HIV, TB);
- limited human capacity to handle all aspects data recording, reporting and analyses;
• overload to human resources to handle data; the excessive number of data items was mentioned as a contributor to this problem (e.g. numerous nutritional indicators in SMI forms);
• inadequate tools; particularly:
  o inadequacy in relation to the skills and behaviours of staff to use them;
  o design problems (e.g. font size of SMI forms);
• lack of internal and external communications on the issues of the systems and how to address them;
• lack of consultation processes involving data users in previous attempts to adapt or change the HMIS;
• lack of capacity due to competing responsibilities and priorities to handle mistakes;
• poor supervision and absence of feed-back to health workers and of a clear policy of incentives and penalties related to the performance of the HMIS;
• diversity of non-standard tools across locations and programmes, which was also verified in situ by the research team;

The feed-back from the DPS was particularly detailed and analytical. For example, extensive discussions took place with the research team on the relation between data and decision making. It was mentioned that there are discrepancies between the availability of data and the use of data; i.e. some of the data collected are not used while some data which would be needed is not actually collected. There is the view that the priority is to improve health care and that health workers cannot really be asked to collect more and more data.

One of the senior officials at the provincial health directorate level interestingly elaborated on the idea of the evidence supporting the identification of problems and production of solutions. The interviewee mentioned that most of the issues identified and solutions proposed were based on ‘opinions’ (as opposed to robust evidence). This was the case, as was reported, when discrepancies between malaria cases and malaria treatments consumed were identified and solutions proposed were mainly based on ‘opinion’.

Data quantity

One of the main drivers to the amount of data recorded and reported are the demands from specific programmes. All programmes are ultimately the responsibility of the DPS but it is also the case that some programmes or components are supported by other stakeholders with influence on the HMIS.

For example, since 2011, the President’s Emergency Plan for AIDS Relief (PEPFAR) has promoted the introduction of a performance based financing (PBF) scheme in the province, as part of their activities on ‘Health System Strengthening’. PBF works in health facilities of capital districts, with an approximate coverage of 30%. Health facilities have to have HIV/AIDS programme activities although not all that have them are implementing the PBF scheme. Every quarter performance indicators are assessed and payments from PEPFAR are issued depending on that data⁶. The programme is based on 21 indicators, mainly on

⁶Pagamento Baseadono Desempenho.

⁷ It was reported that ceiling payments can reach approximately 70,000 USD per year approximately or even 90,000 (around 3 to 5 USD per capita and year).
HIV/AIDS but also on SMI; and some of them are common to those in the HMIS. USAID did an assessment of the capacity of the HMIS and there were issues on how this information was actually used at local level. It was reported that filling of forms was not good enough, mainly because of lack of human resources and therefore there were increasing concerns about the quality of the data obtained. However, there is a perception that PBF may have improved the filling of forms and PEPFAR carried out data verification exercises, mainly checking recounts. There seemed to be openness to consider modifications of the 21 indicators set.

Additionally, it was reported that some agencies could ask for additional data items. While some of them can be extracted from the regular HMIS, some data may also be obtained through surveys or specific research.

**Data quality**

At provincial level, programme managers had the clear perception that the quality of data (i.e. ‘accuracy’) coming from districts was compromised. Some of the reported factors which might contribute to quality issues may be related to the district understanding about the importance of data and their quality, but also related to the understanding of the tools and how to use them by those in charge of recording and reporting data. In some cases, accidentally or not falsified data had been detected at higher levels, as well as other types of errors, such as double counting in conditions where there are records of ‘new’ and ‘total’ cases.

Long discussions took place, mainly in the second workshop but also in interviews, on the ideal level of data quality that should be aimed at. While the general view pointed at the best possible quality, particularly accuracy, stakeholders were prepared to reconsider this when prompted with the challenges of the practical implications of striving for maximal data quality (e.g. overloading health workers) and with the rationale of subordinating data issues to its finality, which is sound decision making.

An issue that had been discussed in several instances and sites was the need to make the information systems responsive to decision making as a whole. This was especially relevant to the extent that fragmentation of sub-systems, even at the level of individual forms, was perceived as a factor contributing to excessive workload and poor data recording practices. PHISICC would therefore look at the system as a whole.

Provincial health authorities suggested that data quality tended to worsen at higher levels of the system; partially because of poor data quality issues being brought in from the peripheral PHC levels (where data is recorded) and also due to the additional data management activities at higher level (the districts), which do not necessarily correct errors but rather may amplify them. In other words, errors are transmitted and amplified towards to higher levels of the system.

Data quality issues had also been detected and reported at the most peripheral level of the health care delivery systems (APE). The APE basically have to mark whether they have detected cases of diarrhoea, pneumonia and malaria. The APE bring their data to their health centre supervisor where data is verified for consistency and counts. The supervisor eventually ‘clears’ the data and the community leaders certify as well that the APE has been active in his or her community. APE keep copies of their books and community sheets. These ‘clearances’ are brought to the monthly meeting held with APE and the district
official responsible of AP. In these events, it is often detected that APE classification of cases is not always consistent, particularly in the cases of suspected malaria.

Mecubúri district level monthly meeting

The research team had the great opportunity to witness part of the district monthly meeting held with district authorities and staff responsible of health facilities in the district. In this meeting, we also had the opportunity to present PHISICC.

One of the items in the agenda was related to data reporting. Each head of health facility read the data reported for the current month and there was the possibility for participants to ask each presenter about the data being reported.

During the meeting several issues were raised. For example:

- in the family planning register there is room to record ‘new users’ but this data item has no place in the aggregated data of the monthly summary;
- it was acknowledged that some mothers may seek for care outside the health facility catchment area or in the same area but in alternative services and data of these events is lost and not reflected in monthly summaries, underestimating the number of ‘mothers’ in the area;
- while there is interest in knowing the number of vaccine vials opened in the EPI, there does not seem to be a place to record it in the monthly summary;
- in the area of measles vaccination, the instrument is designed to record two different vaccines; however, there is only one vaccine being administered;
- in the OPD register there is no place to record ‘control’ (or follow-up) consultations;
- in the area of malaria, and given that some health facilities may not have diagnostic facilities or simply that some cases may not be confirmed, it was observed that there is no room to record ‘suspected’ malaria cases or ‘clinical malaria’;
- still in malaria, it was suggested that the limit of four doses for ‘Fansidar’ in the forms may be too restrictive for some cases;
- in the area of criança em a risco (‘child at risk’), it is not straightforward to record situations where more than one risk criteria is met;
- there is a lack of tools to aid the preparation of the monthly reports (although, as observed by the research team, some books actually have instructions to filling in);
- in the area of the inpatients register it was noted that while there is space for several diagnosis in the recording form, the monthly report only allows for a single main diagnosis. This issue raised a long discussion on the criteria to consider a given diagnoses as the ‘main’ one, as compared to other diagnosis which would be considered as ‘secondary’, without reaching a definitive common view on the issue.

The research team raised the issue of decision space and capacity, based on some of the concerns and examples raised during the first part of the meeting: what to do when there are cases lost to follow up or to address the problem of early pregnancies. We could confirm that (a) the link between data and decisions is weak, despite sharing a generic understanding that data and decisions should be intimately linked; (b) the capacity to make decisions and act to address problems tends to be limited to a more or less well articulated intention to intensify community sensitisation.
3.3.2 Entry points for improvements in the HMIS

Both in workshops as well as in face-to-face interviews, stakeholders either spontaneously or when prompted were able to issue ideas or entry points for improving the information system (see section 3.5.9 for further details). We collected these ideas to be fed into work stream 4, the intervention design. Some of the ideas included:

- in terms of the HMIS as a whole, there have been initiatives, both at national and at provincial level (including in Nampula) to redesign paper-based tools (see, for example, section 3.2.2);
- in 2005, an EPI register was introduced to complement the vaccination tally sheets in order to reduce ‘creative’ reporting, allow for data quality checks and provide tools for follow-up. At that time, qualitative evidence suggested that to fill in the tool by health workers did not entail a lot of additional time;
- at national level, the need to elaborate a dictionary of indicators for the HMIS was suggested; this dictionary would determine the type of information to gather at each level and would also serve as a framework for future developments of the HMIS, especially before stakeholders pressures to add more data into the system;
- there is a potential to better integrate health care at PHC level and, therefore, to integrate as well recording and reporting tools, making the HMIS more organic and simple;
- establishing ‘end of the month’ management sessions in health facilities to detail the actions required for children and pregnant women (e.g. identification and follow up of children due for vaccination), which could be supported by a ‘tickler file’;
- improvements, already implemented, on referral cards, with clearer indications of the destination emergency level;
- provide patients with some type of written information to remind them about next appointments; this would be a sort of ‘home based record’ but focusing only in ‘next appointments’ and extended to other programmes, beyond child health;
- community involvement was an issue also raised in Mozambique, as was the case in Côte d’Ivoire and in Nigeria. One idea was to figure out a system by which community members would have the capacity to act as reminders of next appointments (e.g. vaccination).

Despite the relevance of the HMIS among provincial health authorities and stakeholders, an added problem is the lack of capacity to train health workers once a new initiative is put in place, as happened after the introduction of innovations in the “maternal and child health” tools in the province.

3.3.3 Stakeholders contributions to the ‘decision framework’

In order to inform WS4 (i.e. interventions design), it is essential to build a framework to primarily understand the health information system as the main support for decision making. In the previous missions in Côte d’Ivoire and Nigeria, the research team attempted to integrated concepts and ideas from existing documents, forms and stakeholders’ views into a consistent and organic framework. Decision dimensions or components included, for example, the processes to reach a ‘diagnosis’ of the health problem, in clinical, public health or managerial areas; reporting data to higher levels of the system; or deciding on the best course of action, to mention only a few examples. These are processes that take
place in decision making and, therefore, will need to be taken into account in the intervention design phase. The final framework will be presented in the protocol guiding WS4.

One of the activities carried out in the second workshop was to further explore the dimensions of decision making at PHC level. This activity built upon the progress made in Côte d’Ivoire, first, and in Nigeria, later on, to achieve an overarching common understanding of how decisions are made and how information tools can support those processes.

The decision making dimensions or component presented to stakeholders included:

1. **Assessment**: interpretation of reported or observed facts in order to classify a situation following a series of criteria. The typical example is the clinical diagnosis, in which data provided by a patient is ‘translated’ into a specific diagnosis. Another assessment is the one carried out by a nurse who will classify a child as ‘eligible for vaccination’, or not, depending on the child’s age and other characteristics.

2. **Best course of action**: ‘assessments’ lead to decisions on the best course of action to address the problem assessed; be it for a disease, a risk factor or any other situation, including community or social problems. This is referred to as ‘treatment’ in clinical activities.

3. **Follow-up**: for some health conditions, the continuity of assessments is essential to achieve a health care goal. This is the case of chronic infections (e.g. tuberculosis, HIV/AIDS) and health care that expands over long time periods (e.g. vaccination or maternal health). HIS should incorporate tools that facilitate and incentivise health workers to follow up with health services users.

4. **Knowledge**: under knowledge, we include all sorts of additional information besides the HMIS, which is used in health care processes such as clinical guidelines, directives or someone else’s past experience and interaction with the health care delivery system. Examples include clinical guidelines and norms and directives from the MOH.

5. **Transformation**: refers to the whole range of changes applied to data; data production, cleaning, analysing, interpreting, disseminating, storing and filing.

6. **Reporting**: this is a particular type of data transformation in which data from one level is summarised, aggregated or analysed to feed into a higher level of the HIS. The most common case of reporting is the production of monthly reports at the health facility level.

7. **Technical audits**: include mainly clinical audits by which (clinical) supervisors assess the performance of clinical staff based on what is kept in records of health care events; for example, checking whether treatments are consistent with diagnosis or checking whether the appropriate measures have been taken depending on the case.

8. **Data quality audits**: these check data against a series of criteria; typically: accuracy, completeness and timeliness, among others.

These components were discussed in the second workshop and participants were prompted to identify processes or issues in the decision making processes not covered yet. Discussions led to consider the following additional components:

i. **Outcome**: tools should consider supporting the recording of the health care event result or outcome, in terms of curation, referral, control or any other outcome classification scheme.

ii. **Communication**: a particularly inspiring discussion suggested considering communication between providers and users as a factor that influences the success of decision making events. Communication is essential in order to produce reliable assessments and encourage adherence to best courses of action. The research team was encouraged to consider how paper tools could encourage communication.

iii. **Help and examples**: forms should also provide examples for how to fill them, especially with visual tools such as icons and graphic elements.

iv. **Filling instructions**: these are explicit statements providing instructions on how to fill the tools and tend to be normative.
Some other issues were raised by stakeholders. For example, a stakeholder at academic level suggested to look at the framework and to get inspiration from information systems in other sectors, such as the educational sector.

### 3.3.4 Stakeholders’ views on early design concepts

In the second workshop, stakeholders were also prompted with a series of design initial ideas to address some of the problems detected in Côte d’Ivoire, in Nigeria and also in Mozambique. The ideas presented and stakeholders’ reactions are described in section 3.5.

### 3.4 Visits to sites

In this section we report the findings from the site visits where the activities detailed in the methods sections were carried out. Differently from Côte d’Ivoire and Nigeria, it was known that in Nampula there is no Demographic and Health Surveillance System (DHSS) and therefore no section in the area is included in this report.

#### 3.4.1 Health facilities profile

The following health facilities were visited (see Table 4 and Figure 3):

<table>
<thead>
<tr>
<th>District</th>
<th>Locality</th>
<th>Urban / Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nampula City</td>
<td>City Health office</td>
<td>Urban</td>
</tr>
<tr>
<td>Nampula City</td>
<td>25 Setembro</td>
<td>Urban</td>
</tr>
<tr>
<td>Nampula</td>
<td>Mutava Rex</td>
<td>Rural</td>
</tr>
<tr>
<td>Rapale</td>
<td>Muleheia</td>
<td>Rural</td>
</tr>
<tr>
<td>Rapale</td>
<td>Namaita</td>
<td>Rural</td>
</tr>
<tr>
<td>Rapale</td>
<td>Rapale Health District Office</td>
<td>Rural</td>
</tr>
<tr>
<td>Mecuburi</td>
<td>District meeting of Health staff</td>
<td>Semi-urban</td>
</tr>
<tr>
<td>Mecuburi</td>
<td>Namina</td>
<td>Rural</td>
</tr>
<tr>
<td>Mecuburi</td>
<td>UnidadeMocambique</td>
<td>Rural</td>
</tr>
</tbody>
</table>
Figure 3. Map of Mozambique with localisation of health facilities visited.

Note that some sites may have no associated circle where the number of staff could not be recorded at the time of the visit.

A range of services is offered in health facilities in Mozambique; however, not all health facilities included the same portfolio of services. There are three levels of health facilities: type 1, type 2 and type 3, offering a decreasing range of health services (e.g. no delivery takes place in Type 3 facilities). Thus, only in the type 1 facilities are services presented in Table 5 are provided.

Table 5. Lists of curative, preventive and other types of activities at primary health care.

<table>
<thead>
<tr>
<th>Curative</th>
<th>Preventive</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Curative care: adults and children</td>
<td>- Family Planning</td>
<td>- Laboratory</td>
</tr>
<tr>
<td>- Maternity – Delivery</td>
<td>- Vaccination</td>
<td>- Pharmacy</td>
</tr>
<tr>
<td>- Tuberculosis</td>
<td>- Prenatal Care</td>
<td></td>
</tr>
<tr>
<td>- Malaria</td>
<td>- Postnatal Care</td>
<td></td>
</tr>
<tr>
<td>- AIDS/HIV</td>
<td>- Prevention of HIV Transmission from Mother to Infant</td>
<td></td>
</tr>
<tr>
<td>- IMCI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* During the field visit, we were informed about type 1, type 2 and type 3 facilities. However, the paper by Wagenaar et al. (Glob Health Action 2016, 9: 31980 - http://dx.doi.org/10.3402/gha.v9.31980) has the following categorisation: (i) Urban health centres: Types A, B, C. (ii) rural health centres: types 1 and 2.
Interviewees in the visited health facilities were mainly heads of facility but also lower-ranking health care workers. The number of staff ranged from 1 to 161 (median 14), in a urban health centre. Medical doctors were only available in one large urban centre (there were three doctors there). The number of clinical staff ranged from 1 to 25, and in the largest facility, this figure was missing (median 3). We found two health facilities without any nurse and three health facilities (other than the two HFs just mentioned) without any midwife.

Health workers fulfil a range of roles in the health facilities in Mozambique. In small, remote health facilities a single nurse handles all the roles, while busy, urban health centres may have multiple people in each role.

In seven of the eight of the visited health facilities where we asked, there was at least one toilette and running water. Two facilities did not have electricity grid (but one of them had solar power) and two facilities did not have soap. Five did not have incinerators. In one facility, there was no functional cold chain and no nets in the windows.

Despite the limited number of health facilities approached, we could identify remarkable differences between health facilities in the district capital and those in rural areas, in terms of size, range of services provided, number of staff and complexity. The most important differences were the limited or null capacity to provide services in the areas of deliveries, tuberculosis and HIV/AIDS.

3.4.2 Data management in health facilities

A consistent finding across health facilities was the lack of organisation and order of paper tools with poor archiving facilities. There were also shortages of paper tools which health facilities heads solved by creating manual forms, adapting existing forms changing headings and sections or by using local reproduction facilities in their areas. Photocopying is used to create missing forms or to reproduce reports, but it is usually of poor quality. It was reported that supplies from higher levels of the health systems were erratic. There are situations when the existing forms do not seem to respond to health facility need. This is the case, for example, to track children lost to follow up in vaccination.

Quality of data exercises were occasionally reported, but these were typically carried out at district level based on monthly reports. Quality issues related to specific topics, such as disease surveillance, seemed to be more actively addressed than in other topics. Interviewees could not consistently describe standard procedures to deal with incompleteness, inaccuracy, missing or late reporting of data. Data security and confidentiality could not be ensured in the way forms and books were organised and kept (only one health facility kept data locked).

In terms of specific management data tools available, only two health facilities had a list of human resources (one rural and one urban), only two had a duty roster (both rural), one had an inventory list, one had accounting forms, stock cards were available in all but two health facilities, summaries (e.g. tables or graphics) on clinical cases were present in two health facilities, and on vaccination in all but one health facility; finally, cold chain temperature monitoring was available in two health facilities.

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* In Mozambique, the reporting month is from the 21st day of the previous month to the 20th day of the reporting month (e.g. March 21 to April 20).
Only three interviewees had smartphones with data access, but they are only used for calls. We also enquired about the sources of population denominators to estimate coverage rates in monthly reports. Two sources were reported: the district office and the Instituto Nacional de Saúde (INS); although respondents were not clear whether these two sources were related. In any case, there were examples of coverage figures above 100% suggesting issues with the available denominators.

Challenges reported by interviewees in health facilities included the amount of data for the HIV programme and concerns about plans to digitalise these data collection and the fact that there are too many forms, too many items in each form and too much time to fill them.

3.4.3 Data verification

Data verification exercises were performed in four health facilities (represented by the four colours in Figure 4). Of the 11 data verification exercises, four had perfect accuracy (for instance, we found 152 people with positive rapid malaria test reported and also 152 when re-counted in the register). Figure 4 presents the findings.

Figure 4. Data verification activities (four health facilities), Nampula province.

Notes:
1) When there was no discrepancy (i.e. the number reported and the number re-counted in the register was identical), the dot is on the line 1 (equal): for four items this was the case (i.e. positive rapid malaria tests and number of registered TB cases in one facility for three different months). Under-reporting means that the figure found in the monthly report was smaller than the figure found through the re-
counting in the register. And over-reporting means that the figure found in the monthly report was larger than the figure found through the re-counting in the register.

2) Under-reporting with a value of 0 was found for one data verification exercise: there was no report to be found in the health facility and, thus, a 0 was given; and 8 TB cases could be found in the re-count in the register.

3) One comparison found in Figure 4 was checking of stocks (i.e. stock cards versus physical count): Paracetamol 500 mg with 33,300 tablets according to stock card and 40,000 according to the physical counting.

4) Substantial over-reporting is not captured by Figure 4 to avoid the collapse of the date in the x axis: two comparisons of stock cards versus physical count showed large discrepancies: (i) Co-trimoxazole: 25 according to the stock card but none could be found during the physical re-count; (ii) Paracetamol syrup: 30 according to the stock card but only 3 were found during the physical re-count.

5) Size of samples: the smallest verification exercise comparing monthly report with re-count in the register was 0/8 (all TB cases); the largest was 670/663 (number of consultations).

3.4.4 Data use for decision making

We set out to understand how the health workers make clinical, public health and managerial decisions in visited PHC facilities. Specifically, we wanted to understand the role the paper-based SIS plays in the decisions health workers make.

The team prompted clinicians and managers with several questions regarding decision making: which types of decisions were routinely made, how where they made or the information used to make them. These questions were not easily answered or were hardly clearly related to data use. For example, health workers would mention that they may decide to carry out outreach activities but did not point at a clear set of data that would inform this decision. To some extent, decision making and data use perceptions are not consistently connected. Examples on health care decisions (e.g. referral) were of similar nature: health workers seemed to acknowledge that these decisions require some information but decisions seemed to be taken based on an ‘overall impression’ of the cases rather than on what was actually recorded. More strategic decisions were almost everywhere reduced to supervision, social mobilisation activities vaguely described or outreach. Another source of decisions, as found in Côte d’Ivoire and Nigeria, were linked to instructions received from levels above, without necessarily any particular need to justify them on the grounds of information on the current situation.

Data was mainly seen as something to keep track of what has been done (regardless whether this was actually used or not; and often it was not) and to report to the district level. This was seen ‘normal’, as if reporting would by itself justify all efforts to collect, transform and transmit data.

3.4.5 DHIS2 at district level

Although the DHIS2, implemented in the province, is not the focus of PHISICC, we sought to understand how it might interact with the paper-based system in order to detect further problems with the system that can be addressed within PHISICC and to avoid that the PHISICC interventions jeopardise the district level system.

The DHIS2 system is widely deployed in the country, including in Nampula province, as reported to us by several stakeholders and as witnessed by the research team. The DHIS2 is working at district and provincial levels.
A common finding related to the DHIS2 at district level was that its scope tends to be much larger than the scope of data received from health facilities (see Table 6): clearly, only a proportion of data items in the DHIS2 is actually entered from data received from health facilities. This does not seem to be a problem, as such, because data items which are not used can be simply ignored. It was not clear to us, though, whether the user-friendliness of the system and some technical features (e.g. speed and reliability) could be affected by those areas which remain blank.

In the DHIS2 that we witnessed and that we were introduced to, several issues were raised. For example, it is not obvious how ‘zero’ and missing values are handled. It was not always possible to understand whether a blank data item was actually a ‘zero’ or a blank item. We also tried to obtain summary indicators of activity (e.g. coverage rates). These were not so easy to obtain because population data was not necessarily complete and up to date or just because they were not programmed into the system.

The following table lists the data areas in the SIS-MA and the level of deployment as witnessed by the research team on the spot.

**Table 6. DHIS2 (SIS-MA) areas.**

<table>
<thead>
<tr>
<th>SIS-MA áreas (in English)</th>
<th>Level of deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAV</td>
<td>Used</td>
</tr>
<tr>
<td>VAT gravida</td>
<td>Used</td>
</tr>
<tr>
<td>Pré-natal</td>
<td>Used</td>
</tr>
<tr>
<td>Pós-parto</td>
<td>Used</td>
</tr>
<tr>
<td>Maternidade</td>
<td>Used</td>
</tr>
<tr>
<td>Consulta criança risco</td>
<td>Used</td>
</tr>
<tr>
<td>Planeamento familiar</td>
<td>Used</td>
</tr>
<tr>
<td>Redes mosquitoiras</td>
<td>Unclear</td>
</tr>
<tr>
<td>Antirretrovirales farmácia MIA</td>
<td>Depends on health facility</td>
</tr>
<tr>
<td>Consumo AL</td>
<td>Depends on health facility</td>
</tr>
<tr>
<td>Malária</td>
<td>Used</td>
</tr>
<tr>
<td>Aconselhamento e testagem saúde</td>
<td>Depends on health facility</td>
</tr>
<tr>
<td>Consultas externas</td>
<td>Used</td>
</tr>
<tr>
<td>Internamento</td>
<td>Depends on health facility</td>
</tr>
<tr>
<td>VIH</td>
<td>Depends on health facility</td>
</tr>
<tr>
<td>Estomatologia</td>
<td>Depends on health facility</td>
</tr>
<tr>
<td>Saúde Reprodutiva Jovens Adolescentes</td>
<td>Unseen</td>
</tr>
<tr>
<td>Vigilância nutricional</td>
<td>Used</td>
</tr>
<tr>
<td>Saúde mental e psiquiatria</td>
<td>Unseen</td>
</tr>
<tr>
<td>Laboratório</td>
<td>Depends on health facility</td>
</tr>
<tr>
<td>PMCTL (TB e Lepra)</td>
<td>Depends on health facility</td>
</tr>
<tr>
<td>Infecções de transmissão sexual</td>
<td>Depends on health facility</td>
</tr>
<tr>
<td>Boletim epidemiológico semanal</td>
<td>Used</td>
</tr>
<tr>
<td>Lixo, água, dispersões sanitária</td>
<td>Not seen</td>
</tr>
<tr>
<td>Consulta de trabalhador</td>
<td>Not seen</td>
</tr>
<tr>
<td>Saúde escolar</td>
<td>Not seen</td>
</tr>
<tr>
<td>Doenças não transmissíveis</td>
<td>Unclear</td>
</tr>
<tr>
<td>Doenças negligenciadas</td>
<td>Unclear</td>
</tr>
<tr>
<td>PBF</td>
<td>Unclear</td>
</tr>
</tbody>
</table>

Despite the relatively large scope of data in the electronic system, it was also mentioned that some areas (e.g. small surgery) could not be found in the SIS-MA, and therefore the district statistician had to build another form (e.g. in MS Excel) aside the SIS-MA to collect that data.

Some discrepancies between paper tools and the electronic systems were detected. For example, malaria contains disaggregated data in the health facility tools but aggregated figures have to be entered into the
systems. To address this issue, the district level data manager ‘manually’ aggregates the data and adjusts it to have consistent figures across platforms.

We also could witness how paper monthly reports from health facilities and the electronic systems coexisted in one district. Health facility reports reached the district and the data manager entered them into the DHIS2 system. However, and in parallel, programme officers collect as well the paper reports from health facilities and manually calculate aggregated figures for the district across health facilities and fill in their paper district summary reports. When discrepancies are detected, there is some sense that paper summaries prepared by district programme officers prevail over the DHIS2 outputs and, accordingly, the DHIS2 data may be modified according to the former. In summary, paper reports from health facilities are used twice: to feed into the DHIS2 and into the paper-based district summaries hold by each programme officer. The reasons underlying this behaviour were not totally clear, but seemed to be related to a sense of having more trust on the ‘manual’ aggregation by programme officers rather than on the outputs of the electronic system.

In another district, the process was similar, except that what was entered into the electronic system was not the data from health facilities, but the aggregated data manually produced by district level programme officers. This was justified on the grounds of avoiding discrepancies between health facilities and programme officers’ data.

The data managers in districts have created parallel mechanism, often using MS Excel, to have some additional functionalities. These included:

- a sheet to monitor health facilities reports arrival and follow up of data entry;
- control of paper based reports produced by programme managers at district level;
- disaggregation of malaria data, which do not fit into the DHIS2;
- sheets to record data not foreseen in the DHIS2 (e.g. small surgery).

Some additional discussions took place. A DPS official, for example, suggested that the transition toward electronic registers tools was premature because the existing problems in the paper-based systems had not been fully understood or addressed. Therefore, the electronic system does not necessarily address and solve those problems.

Stakeholders at provincial level suggested that some of the issues in the electronic system may also be shared at central level, but this was not fully substantiated during the field work.

### 3.5 The human-centred experience with the HMIS

#### 3.5.1 Decision making in PHC facilities in Mozambique

We set out to understand how the health workers in Mozambique make primary and secondary decisions in Primary Health Care (PHC) facilities. Primary decisions are those made at the point of care where patients and health workers interact. Secondary decisions are more strategic decisions that result from analyzing data from a group of individuals over time. Specifically, we aimed at understanding the role the paper-based health information system plays in the decisions primary health workers make.
We found that health workers in the PHC facilities make primary decisions only. They are hardly making secondary decisions based on aggregated data. The primary decisions that health workers make involve caring for patients who come to the facility and the tracking of missing patients who fail to come to the facility for a follow up appointment or fail to arrive at another facility to which they were referred.

Additionally, in some health facilities, health workers spend several days each month preparing monthly reports for the district. From the health workers’ perspective, these reports, and the aggregate data they contain are solely for use by others. We saw and heard of minimal to no secondary decisions being made at the facility from the data compiled for monthly reporting. Systematic feed-back of data from higher levels of the systems to health facilities was neither reported.

3.5.2 The paper-based HIS in Mozambique

We observed health workers in Mozambique providing antenatal care, immunizations, ambulatory care and completing the monthly reports. Rather than talking about the decisions they make, health workers talked about their responsibilities. Their main responsibility is caring for patients. They also talked about tracking missing patients and reporting data to the district every month.

Regarding the flow of information, Figure 5 presents an overview of the activities of the health workers related to HIS and immunisation. Figure 6 and Figure 7 present examples from the OPD and the ANC programme, respectively.

Figure 5. Overview of the paper-based HIS used in immunization in Mozambique.
Health workers spend a lot of time reporting data to the district. However, they are not making secondary decisions based on this aggregated data. Health workers do make primary decisions in caring for patients. While some of the paper-based tools support these decisions, like the treatment history captured on the child health card, the paper-based HIS could do much more in support of those decisions. Health workers also make primary decision when tracking missing patients, like deciding to visit the referral health centre on the way home to see if the patient they referred for a HIV test was actually tested. The current paper-based HIS requires data to be captured chronologically by date of visit, which does not support the more ongoing, intermittent nature of decision-making when tracking missing patients.

**Figure 6. Overview of the paper-based HIS used in out-patient department care in Mozambique.**
Figure 7. Overview of the paper-based HIS used in antenatal care in Mozambique.
### 3.5.3 Health workers’ main responsibilities

We categorised the activities health workers do into the three responsibilities about which they spoke. “Caring for Patients” includes the activities when health workers interact with patients in their presence. “Tracking Missing Patients” is about getting patients to show up for follow up care and/or referral. “Handling Data” includes recording, aggregating and counting data for the use at the national level.

<table>
<thead>
<tr>
<th>CARING FOR PATIENTS</th>
<th>TRACKING MISSING PATIENTS</th>
<th>HANDLING DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listening to complaints</td>
<td>Engaging community leaders to encourage people to visit health centres</td>
<td>Copying data into registers</td>
</tr>
<tr>
<td>Taking vitals</td>
<td>Visiting health centres to follow up on referral patients</td>
<td>Counting data in registers</td>
</tr>
<tr>
<td>Examining patients</td>
<td>Lecturing waiting patients to encourage other community members to visit health centres</td>
<td>Creating draft reports</td>
</tr>
<tr>
<td>Encouraging breastfeeding mothers</td>
<td></td>
<td>Recounting data</td>
</tr>
<tr>
<td>Education couples about HIV and syphilis screening</td>
<td></td>
<td>Creating final reports</td>
</tr>
<tr>
<td>Convincing referral patients to go to the hospital</td>
<td>Planning mobilizing brigades</td>
<td>Presenting data at district meetings</td>
</tr>
</tbody>
</table>

Let’s look at the challenges posed by the paper-based health information system to the health workers. We organize these challenges within the three main responsibilities of the health worker at the primary health care (PHC) facility.

### 3.5.4 Challenges with handling data

#### Reporting takes time

Staff stay after hours to complete tally sheets and dedicate entire days to completing all the required monthly reports, without using the aggregated data to make decisions.

“Every month we close two of our four antenatal care rooms for two days so we can do the reports as a group.”

— Nurse

“I take note of everything. It helps me from being harassed by headquarters.”

— Nurse

“I plot program initiative graphs every month. They help me see...how many children come get shots.”

— Nurse
Data management tools go out of stock
Health staff spend time and mental energy improvising workarounds for out of stock registers. These workarounds can cause more confusion regarding the data.

“It ran out of the new registers with the space for the full set of vaccines a child needs until 18 months. We have been asking the Ministry but they said they don’t have more. So, we use the old registers and add measles in other columns.”
— Health technician

“I didn’t understand what they did in this improvised register, so it is hard for me to fill in the monthly report correctly.”
— Facility director

Incentives reward behaviors that lead to unreliable data
When confronted with real-world messiness of data, staff do not have the option to explain or to qualify their entries. Since completeness is more easily measured than correctness, they make up the data, to avoid being punished.

“She doesn’t know her age. I can’t leave it blank. Maybe she’s 26. I’m just guessing here.”
— Health technician, in a consultation

“I type a zero if the report leaves a blank, otherwise my rate of completion is affected.”
— At data entry office

“Target vaccinations: 45. Actual vaccinations: 90.”
— At monthly district review

“People don’t know usefulness of data. They don’t know the value of it. There’s not a specific type of training where they are told the value of data.”
— At stakeholder meeting
System doesn’t address absent and negative results
From individual form fields to test results, the importance of negative results—and the information behind different types of empty form fields—in’t being communicated. In the case of disease surveillance, though, there is an explicit practice of ‘zero reporting’.

“You see these two blank spaces and don’t know if someone forgot to fill it, if it’s duplicate results, or what.”
— Facility director

“A health facility that sends a test to a national lab, for example for acute polio, will not hear back about a lab result if it’s negative!”
— At stakeholder meeting

3.5.5 Challenges with the flow of information
There is some evidence that the flow of information between the health facilities (PHC facilities) and the district health office is not adequate. During field work, we came across the following:

1) Drug-resistant TB: the Nampula province has 8 GeneXpert Mycobacterium tuberculosis (MTB) / resistance to rifampicin (RIF) machines (GeneXpert), two of them in the city of Nampula. All Districts have trained MDR-TB focal points. These focal points are immediately informed when GeneXpert shows RIF. However, the problem is that the flow of information from district to the health centres is not always smooth. DPS was aware of this constraint. We were in the Namaita health centre (type 1 health centre) where the GeneXpert results of patients who had submitted their sputum several months ago were not known yet. There was no clarity about why this happened but a suggestion was made in the sense that in general districts do not inform the health centre when the GeneXpert result are negative. In the Namaita facility, we were also told that this problem of not receiving results of examinations is also happening regarding CD4 counts, which led to having to collect blood afresh.

2) The pharmacy in Namaita ran out of stock cards for several months. It was not clear to the facility director if the district was not properly informed or if the district simply delayed sending new stock cards.
3.5.6 Challenges with caring for patients

Keeping up with records means not keeping up with patients
Records take up concrete time and space during patient consultations. Stretches of consultations take place in silence as staff scribble in registers and patients sit waiting and idle. The desk, with its stacks of papers, becomes the focus, rather than the patient.

“…..”
— Nurse, for first two to three minutes of patient consultation, as she copies information from patient booklet into register.

“Where is it?”
— Nurse, accidentally knocking off stack of vaccination cards stacked in the order of patient arrival, as she searches for the tally sheet on her desk.

Patient history is disconnected from current visit
Because it is so hard to find listings from previous consultations, and patients lose their own records, it’s hard to provide continuity of care informed by patient histories.

“I asked the patient for her last prescription so I can give her the same drug that worked last time, but she lost it.”
— Health technician

“We always have to chase patient history.”
— Nurse

“When an old entry can’t be found (or there isn’t time to look for it), new entries are started all the time.”
— At stakeholder meeting
Tools don’t support high patient traffic
Systems break down in facilities that treat large populations. Forms runs out, fill every available space—unused sinks, desks surfaces, floors— and make individual records hard to find. While ample attention is paid to how to fill out forms, protocols for the storing of forms and managing documents were not in evidence. Facility managers create their own, more or less effective, file storage systems.

“In the old book you can see 50 patients but only one consult at once. For follow-ups you had to start on a new page. In the new one you can have six follow-ups, for four patients, on the same page. The disadvantage is you run out of stock and have to improvise.”
— Health technician

“I believe the Ministry should do two types of registers, one for centres with high flow, one for centres with low flow. This center does half of what the entire district does.”
— Facility director

Tools don’t speak to illiterate patients
Patients often do not speak Portuguese, and cannot read or write. Forms are only in Portuguese, and instructions are given verbally by staff in the local language—briefly, often while filling in forms, and occasionally even as patients have already begun to leave.

“Instead of a follow-up appointment date, we tell some patients when to come back using moon cycles.”
— Health technician

“Most patients are illiterate. They don’t know how to record day and month. To make sure they don’t forget, we ask if they have a school age child to remember for them.”
— Health technician
3.5.7 Challenges with tracking missing patients

It’s hard to locate specific people

Many patients in vulnerable communities don’t have addresses or phone numbers. Staff use community leaders as an intermediary, but they often only ask to give ‘broadcast’, general lectures, not to get help locating specific individuals.

“If the number of malaria cases goes up next month, I have to arrange with the community leader to set a date. On that date the community gets together and I give the talk—correct use of mosquito nets, environment tips. Also, I will give talks to people in the mornings before I start consultations. This way they can take it back to their communities to the people who didn’t have consultations.”

— Nurse

“I can’t go house to house. I wait for the next time they come back.”

— Nurse

Forms hide negative results

Without a space to record a negative result — a patient not showing up — the paper based system, which emphasizes only recording, does not offer an ‘alert’ to take action to track down the patient.

“The register leaves off the fifth column in this treatment that requires five visits—because patients rarely make it to the fifth visit.”

— At monthly district review
Patients are lost in the many gaps of service

For a single episode of health care need, patients often wait several times to get treated. Waiting occurs between weighing in and getting vaccinated, between consultation and getting medicine, or between referral and getting actually treated. In each of the waiting periods, patients may choose to leave the facility rather than continue on the next phase of care.

“Patients start waiting around 7, or earlier. We arrive at 7, pull out children's files while they are being weighed. Then they wait again for their consultations. Waiting again means losing patients.”
— Nurse

“I am referring this patient. I told him to come back here when he’s ready to go to town, to get a note to go to the health center. The health center can give a stamped note to refer him to a bigger center. We don’t have the stamp here. If we did I could transfer him directly.”
— Technician

“Whenever you send a patient for referral, very often they don’t go.”
— Nurse

“We improvised a one-stop shop for malnourished children, who are diagnosed at weigh-in. With a one-stop shop, you see the same faces. The receptionist talks to patient, becomes sort of family. It improved a lot retention of patients.”
— Nurse

“Patients are dropping out. We need to connect patients to the system.
— At stakeholder meeting
Patient appointment cards are out of stock

As with registers, health staff spend time and mental energy devising workarounds to make up for out of stock appointment cards.

“We haven’t had the ANC appointment cards for about a year now. We cut boxes and make our own cards. We do that in our own time, after consultations. Twice a week we sit down for about two hours. We feel overburdened.”

— Nurse

3.5.8 Overview of the challenges with the paper-based HIS in Mozambique

Overall, the current paper-based HIS in Mozambique prioritizes reporting for secondary decision making at higher levels. However, health workers are not making secondary decisions at the facility.

While health workers do make primary decisions about caring for and tracking patients, the paper-based HIS could do much more to support and guide those decisions.

If the paper-based health information system were designed to prioritize and support primary decision-making at the primary health care facilities it is possible that the increased relevance of the data to the daily responsibilities of healthcare workers would result in not only better quality care, but better quality data recording.

This in turn, may result in the aggregated data reported by those facilities being more timely, complete and accurate for secondary decision-making at the district and national level.
3.5.9 Feedback on intervention designs

We shared early intervention prototypes with health workers and stakeholders to stimulate discussion on the impact of potential changes to the paper-based health information system in Mozambique.

**Intervention opportunity: Forms should offer guidance easily accessible in the moment of care**

| Positive | It’s the first time I’ve seen something like this in Mozambique. Very useful.  
All info is in one place.  
Particularly in the periphery, with few staff members, they don’t have a lot of time to assess the status of patients.  
We could have a record book with all info for all patients. Could have rulers on book that could overlap on forms to see if diagnosis is right. 3 in 1! |
|---|---|
| Concerns | It’s better to write the temperature as a number.  
An “x” on a line can be misinterpreted. |

| Positive | Yes, it would be helpful for less experienced people.  
Very interesting, the highlighting. The person only has to see, not think a lot. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerns</td>
<td>Easier to fill the form, but may be too fussy. This is just plastic. People can lose it.</td>
</tr>
</tbody>
</table>

| Concerns | If it’s her first pregnancy, she should deliver in 8-12 hours, maximum 24 hours. You start counting at 4cm. If she’s delivered before, she should take 6-8 hours, otherwise we have to refer her. |
Intervention opportunity: streamline aggregating data

**Positive**

Vaccination forms are simple. But for maternal health it’s more complicated.

**Concerns**

We’ve been trying to leave tally sheets. Many mistakes. See a total amount that has nothing to do with tally.

Could do a tally with actual sequence of numbers (1, 2, 3, 4,...) to cross out as you tally. So no mistakes counting.

Intervention opportunity: Show patient history to better inform clinical decisions

**Positive**

It’s more effective because you can see history of patient. All history in one place. Important because you can see what has been done and can follow up. We always have to chase patient history.

I am sure it works. But this is a small health facility. For ours it would work.

**Concerns**

In this large facility, we can’t rely on one location for records.

Problem is when you get a mass of people. You can record the same child twice.

Where do you keep the patient card? You have to produce a way of storing them.

For TB, HIV, it’s functioning well. We would have problem of starting new record next time you come back—because people don’t want to go back and find the old record.

Each disease is an episode. Is it worth the effort to document? I have doubts for non-chronic diseases.
Intervention opportunity: The system should be integrated and dynamic, just like care is

Positive
It’s a marvelous process that is very welcome. Now, I have to flip backwards through a ledger. I could go to a specific month instead. This gives you continuity.

Concerns
It would have to fit a bigger number of cards...more than 50...up to 500. Perhaps we get 200 children per month for immunization.

It could involve a bit of work, but enables better monitoring. Since this works like a file, you see those who are due and those who are late. We could make a plan to reach those who are late.
4 Synthesis and implications

4.1 The 10 key findings

The HMIS

1. **Health information is a priority and** transversal area in the governmental health sector in Mozambique. It does not only include the regular HMIS but also monitoring and evaluation.

2. **Health care provision** (and the decision making processes underlying care) is **seen as a priority**, and data as a tool to inform decisions; the HMIS has to be adapted to health care, focusing on the data that are needed and removing data that are not used.

3. **There are two health care areas which seem to get more attention than others:** HIV/AIDS and **maternal health**. This is reflected in the amount of data on these areas that are requested to be collected by frontline health workers.

Stakeholders

4. At central level, stakeholders and particularly the MISAU, are under a **heavy workload** to deal with numerous competing health priorities, which has not helped to coordinate efforts to optimise the HMIS.

5. While the HMIS is ‘governed’ at central level, **health authorities and stakeholders in Nampula province have an extremely high level of awareness and knowledge** of the issues related to the HMIS, a good level of autonomy to implement innovative solutions and are particularly active in addressing HMIS problems.

Information and decision making

6. The current SIS is the result of numerous efforts in the past to improve the information systems in the country. However, there are still **challenges** in the areas of (i) **formats** (design of the easy to use tools); (ii) **content** (inflation of indicators and data); (iii) **use** (adequacy to PHC decision making) and (iv) **logistics** (availability of standard forms).

7. There are two main issues affecting the performance of the HMIS: (i) **existing tools may not be appropriate**, particularly in relation with health workers skills and behaviour, which is consistent with the human-centred approach of PHISICC; and (ii) the **HMIS overloads health workers** by handling data that some feel may never been used.

8. **There is an overall recognition**, particularly by health workers, but also by most stakeholders, that the **HMIS is generally designed for reporting**, neglecting its use for decision making at health facility level. This adds frustration to the perceived excessive workload on data management at health facility level.

9. Current **initiatives to assess and improve data quality may need more** attention if further improvements on data quality and use are to be achieved.

PHISICC

10. **PHISICC is seen by stakeholders as an opportunity** to (i) guide current and future attempts to support assessments and improvements of the HMIS based on evidence; (ii) to better understand the current HIS; (iii) to produce innovative solutions to inform future policies and strategies on the HMIS.
4.2 Implications for WS4 (interventions design)

- Changes in the HMIS should be consistent with the health care processes; namely ‘integration’; integrating health care processes (as opposed to current ‘vertical programmes’) should be accompanied by integrated HMIS as well.
- In order to avoid fragmentation of the HMIS, it is essential that PHISICC considers the whole PHC system, and not only one specific programme or another.
- The relationship between the HMIS and the ‘human factor’ was raised several times and reinforces the human-centred approach of PHISICC. Particularly:
  - how to present and agree on incentives and penalties for health workers performance in relation to the HMIS;
  - how to involve users on future adaptations or changes of the HMIS.
- The HMIS in Mozambique extents up to the most peripheral level of the health care delivery systems, which includes the APE. The fact that not all PHC facilities have the same array of services should be taken into account in the intervention design phase.
- Adequacy between recording and reporting forms has been identified as a transversal problem across several levels, which will need special care.
- There is room for simplification of the HMIS given that some of the data collected is hardly or not at all used and that a number of data items remain blank in some forms or books.
- In collaboration with government and partners, agreement on core data elements for decision makings needs to be reached.
- Raising awareness on the importance of data and decision making among health workers may be considered as part of the intervention packages.
- Interactions between the paper-based and the electronic systems can be improved. PHISICC can be an opportunity to adapt the monthly reporting forms to the needs of data managers at district levels handling the data from health facilities and the DHIS2 entry forms.
- Community involvement remains an issue brought forward once and again as a component of health care activities which may be related to the management of information. This is an area which borders the scope of PHISICC but that will be incorporated into WS4 considerations.
- Support in country discussion for mechanism to sustainable availability of updated paper-based tools

4.3 Implications for WS5 (experimental studies)

- Careful thoughts were dedicated to consider the range of health facilities to be included in the experimental studies, particularly given the large differences between urban and remote health facilities and the wide array of PHC facilities types.
- Another issue to consider is the transition of systems at the beginning and at the end of the studies. A possibility to consider was to restrict the experimental studies to rural health facilities; an issue that it is still under careful discussion. Another possibility is to try to compare the processes and effects of the interventions between rural and urban health facilities.
- The design of experimental studies has to take into account past initiatives to improve HMIS in the study areas as well as co-interventions by other partners, which may have an impact on the HMIS.
ANNEXES
### Annex 1. People met

<table>
<thead>
<tr>
<th>Family Name</th>
<th>Name</th>
<th>Institution</th>
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<tbody>
<tr>
<td>Dos Anjos</td>
<td>Matias</td>
<td>Center for Disease Control (CDC)</td>
</tr>
<tr>
<td>Matsinhe</td>
<td>Graça</td>
<td>Ministério da Saúde (MISAU)</td>
</tr>
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<td>Telma</td>
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<tr>
<td>Arune</td>
<td>Francisco</td>
<td>Direcção Provincial de Saúde (DPS) Nampula</td>
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<td>Barata</td>
<td>Américo</td>
<td>DPS Nampula</td>
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<td>Omar</td>
<td>Costa</td>
<td>DPS Nampula</td>
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<tr>
<td>Muloliwa</td>
<td>Artur Manuel</td>
<td>Faculdade de Ciências de Saúde, UniLúrio and DPS</td>
</tr>
<tr>
<td>Belo</td>
<td>Celso</td>
<td>Faculdade de Ciências de Saúde, UniLúrio</td>
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<tr>
<td>Ali</td>
<td>Momade</td>
<td>Faculdade de Ciências de Saúde, UniLúrio</td>
</tr>
<tr>
<td>Mitano</td>
<td>Fernando</td>
<td>Faculdade de Ciências de Saúde, UniLúrio</td>
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<td>Paiva</td>
<td>Rogério</td>
<td>Faculdade de Ciências de Saúde, UniLúrio</td>
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<td>Maciel</td>
<td>Sónia</td>
<td>Rectory, UniLúrio</td>
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<td>Estrada</td>
<td>Fulgêncio Sambola</td>
<td>Elizabeth Glaser Pediatric AIDS Foundation</td>
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<td>Village Reach</td>
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<td>Sérgio</td>
<td>Mozambique Institute of Health Education and Research (MIHER)</td>
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<tr>
<td>Sacarlal</td>
<td>Jahit</td>
<td>Universidade Eduardo Mondlane (UEM)</td>
</tr>
</tbody>
</table>
Annex 2. Interview questionnaires

Stakeholders questionnaire

Stakeholder
Let me tell you a little about what we’re doing and what we’d like to learn from you.

Project goals and approach
Our focus is to design interventions to improve the accuracy of information in paper-based systems. While we are not focused on computers, mobile phones/devices or software, we believe a better designed paper-based system will result in more accurate information making its way into the digital tools and information system overall.

Design research approach
Our focus for this conversation

Start of data collection
Today’s date
Identification of the device

Location
Enter the time you start the interview
Please select your initials
If other initials doesn’t appear, enter here
Select the country
City / town
Record your location:
If record is not working, please enter the following coordinates later:
Enter Latitude
Enter Longitude

Identification
Select the institution the responder is working for
If other institution doesn’t appear, please enter the institution name here
Department
Respondent family name
Respondent first name
Respondent gender
Respondent age
Respondent position
Time in institution
Respondent email
Respondent phone

Do you have any reservation in being quoted in our website, reports or publications?
Do you have any reservation if we audio record this conversation and take pictures to publish in our website, reports or publications?

Comments on responder

1 PERCEPTIONS AND KNOWLEDGE

1a OPINIONS DATA AND DECISION MAKING
Comments on how different types of data are used for different types of decisions in the governmental health sector

1b SOURCES OF DATA FOR DECISION MAKING
What sources of information SHOULD BE used for decision making in health? [DO NOT PROMPT but aim at a complete list]
If other sources doesn’t appear, enter name of the other source here
What sources of information are ACTUALLY used in the public health sector [DO NOT PROMPT]
If other sources doesn't appear, enter name of the other source here

EXPLAIN IF THERE ARE DISCREPANCIES

How important SHOULD BE the role of the HMIS IN COMPARISON to other sources of data (e.g. evaluations, research) in decision making?

Comments on data sources for decision making

1c OPINIONS QUALITY parameters for decision making
Can you rate the following criteria related to data according to their importance for decision making?

- Relevance
- Comprehensiveness
- Completeness
- Accuracy (Concordance)
- Precision
- Timeliness
- Simplicity
- Presentation

Comments on quality parameters

1d OPINIONS HMIS
How would you qualify the overall [good] performance or quality of the HMIS in the country?

Comments on quality of HMIS

What are the main problems of HMIS in the country?
Which one of these problems should be prioritised to take action?
What would you do to address the priority problem(s)?
What is the best thing of the data system in the country?

1e OPINIONS PAPER AND QUALITY

Paper components of the information system

How likely do you think that paper tools will remain as the main source of data in primary health care in 2025 in the country?

Comments on replacement of paper

Data importance

How important are the PHC tools as compared with the higher levels of the HMIS in terms of...

- Relevance
- Comprehensiveness
- Completeness
- Accuracy (Concordance)
- Precision
- Timeliness
- Simplicity
- Presentation

Comments on quality criteria

1f IMPORTANCE OF DATA (USE) IN THE MOH

How important are MOH data issues/challenges in your institution?

Comments on importance of MOH data issues

Are there problems with the use of data in your daily work? Please explain why?
Which sources do YOU (not the MOH) mainly use to take decisions?
Enter other sources if field other doesn't appear

Comments on sources
2. TECHNICAL CAPACITY
Number of staff in your institution
Number of staff mainly dedicated to data issues
Support to MOH
How many data specialists are supporting the MOH in your institution?
How many specialist communicators are supporting the MOH?
Comments on staff supporting the MOH
How many publications on data or related to data has your institution produced in the last calendar year?
Comments on publications or data produced
How many subscription to sources, portals... of research or evidence has your institution?
Comments on subscriptions

3a EFFECTIVENESS Perception influence of other stakeholders
Stakeholder
Enter other stakeholder here, if the other field doesn't appear.
To which extent (this stakeholder) influence data issues (mainly HMIS) in the MOH:
To which extent (this stakeholder) prepared to address data issues (mainly HMIS) in the MOH:
To which extent (this stakeholder) is active in addressing data issues (mainly HMIS) in the MOH:
To which extent (this stakeholder) is effective in addressing data issues (mainly HMIS) in the MOH:
To which extent (this stakeholder) should advice on data issues (mainly HMIS) in the MOH:
To which extent (this stakeholder) has reputation to address data issues (mainly HMIS) in the MOH:
To which extent (this stakeholder) is an obstacle for data issues (mainly HMIS) in the MOH:
Comments on other stakeholders influence

3b EFFECTIVENESS
Can you give examples of high level meetings or other activities in which your institution has clearly influenced MOH strategy on data?

4 SUSTAINABLE DATA PROJECTS IN THE COUNTRY
What is needed for an intervention to be sustainable overtime?
Give us examples of non-sustainable interventions and the source of their downfall.

5 Your business and engagement with PHISICC
How could the project PHISICC contribute to the objectives of your institution, in relation to data?
How could the project PHISICC obstruct the objectives of your institution, in relation to data?
Is there any person, group, institution... who may feel threatened by the project PHISICC or may be reluctant to collaborate? If so, please explain why.
Possible involvement in the project
How would you like to participate in our project?
If other type of involvement doesn't appear.
Comments on involvement in the project
End

We are nearly at the end of our conversation.
Do you have any information we missed and you would like to share with us?
Do you have any concerns if we use the name of your institution for dissemination?
Please enter the time you finished the questionnaire
Thank you very much for your time and collaboration. Next steps:
Final
Health facility questionnaire

PHISICC3 Assessment of the quality of the Health Information System (HIS) SITES
Meta data start of data collection
Meta data today's date
Meta data identification of the device

Location
Enter a date and a time:
Record your location:
If location cannot be recorded automatic, please enter your coordinates later in the fields "latitude" and "longitude"
Latitude
Longitude

Identification
Please select your initials
Enter other initials
Select the country
City / town
Select the site
Enter other site
If ‘District Office’: Please select the place
Enter other place
Take a picture of the health facility (if possible)
Family name of responder
First name of responder
Gender of responder
Age of responder
Qualification of responder
Position of responder
Phone number of responder
Site characteristics
Type of site
Number of staff at the site
Number of medical doctors
Number of clinical staff
Number of midwives
Number of nurses
Calculation total number of technical staff
Total number of technical staff
Number of additional staff
Number of administrative staff
Number of supporting staff
Number of other staff
Calculation total number of staff
Comments on staff
Total number of staff

Direct observation of researcher
Infrastructure of the site
Rooms at the site
Number of rooms at the site
Consultation
Delivery
Vaccination
Observation
Pharmacy
Laboratory
Cold chain
Storage
Toilette
Waiting room
Multifunction or ‘Other’
Calculation number of rooms
Comments on rooms at the site
Total number of rooms
Comments on rooms at the site
Infrastructure 2
Water installation from the net
Electricity from the net
Generator
Solar
Incinerator
Toilette
Windows with nets
Available medication and devices
Soap
Refrigerator
Freezer
Microscope
Blood pressure device
Thermometer
Paracetamol
Antimalarials
Co-Trimozazole
Oxitocine
DTP
Frozen-ice packs
Comments on medication and devices
Additional comments on your observation
Inputs: forms....
Within this section, information on obtaining, recording, transforming or analysing data will be captured.
How many staff have received training specific to data issues in the last 2 years
Comments on training of staff in data management
Are there designated staff responsible for reviewing the quality of data
Comments on review of data quality
The source documents and reporting forms/tools specified in the guidelines are available?
Comment to use of sources
Can you explain how (and when) you get further supplies of forms and tools (indicate whether there are guidelines)
How many hours a week do you spend on data recording or reporting or checking...
Do you have a phone with data access?
Please explain whether and how you use it for work.

**Process: data management**
The guidelines or instructions that you use contain the following:
... procedure to address late reporting
... procedure to address incomplete reporting
... procedure to address inaccurate data or reports
... procedure to address missing reports
... deadlines are harmonized with the relevant timelines of the National Program
Comments on guidelines

Quality control
Do you receive feedback on your data from upper levels?
Comments on feedback on quality of reporting
Are there quality controls for data entry?
Comments on quality controls
The reporting system enables the identification and recording of a "drop out", a person "lost to follow-up" and a person who died
Comments on the reporting of drop-outs or lost to follow-ups etc.
Relevant personal data are maintained according to national or international confidentiality guidelines.
Comments on the confidentiality of data maintenance

Database
For automated (computerized) systems, there is a clearly documented and actively implemented:
... database administration procedures
... backup procedures
... security and user procedures
Comments on database administration
Is the last back up older than 1 month?
Comments on the appropriateness of the latest back-up
Any other comments regarding the management of data (transcribing, cleaning, transmission, storage) at the health facility?
When was the last supervision visit where there were data issues discussed (we need proof of this in a letter or report)
Where do you get data for denominator from?

Submission and use of data
Data are reported through a single channel of the national information systems.
Comments on use of the national information system for reporting
What is your main challenge regarding data management and reporting?
Any other comments regarding the production, management or use of data at the facility?

**OUTPUTS. Do you have any of the following (need to be seen)**

Human resources list
Duty roster
Inventory of equipment
Accounting forms
Stock cards for the pharmacy
Graphics or tables on clinical cases
Graphics or tables on vaccination
Cold chain temperature monitoring

**Decisions and sources (try 3 decisions)**
Can you give examples of decision you have taken with data sources?
Decision
Source for decision
Enter other source for decision
Comment on decisions or sources

**FINAL**
Enter the additional information

Thank you very much for your time and collaboration.

End of survey
## Annex 3. Chronogram of activities

### Work stream 3

<table>
<thead>
<tr>
<th>Activity</th>
<th>Place</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Day 0</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-1 Arrival international</td>
<td></td>
<td>Mon 16/01</td>
</tr>
<tr>
<td>1-2 Meeting with authorities and partners (Dr. Joao Carlos Mavimbe)</td>
<td>Maputo</td>
<td>Mon 16/01</td>
</tr>
<tr>
<td><strong>Day 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 Planning and management set up</td>
<td>Maputo</td>
<td>Tue 17/01</td>
</tr>
<tr>
<td>- Chronogram, logistics, security</td>
<td></td>
<td>Tue 17/01</td>
</tr>
<tr>
<td>- Protocol and guides</td>
<td></td>
<td>Tue 17/01</td>
</tr>
<tr>
<td>- Workshops (1 &amp; 2) and presentations</td>
<td></td>
<td>Tue 17/01</td>
</tr>
<tr>
<td>- Sites and verification</td>
<td></td>
<td>Tue 17/01</td>
</tr>
<tr>
<td>- Venues and AV equipments</td>
<td></td>
<td>Tue 17/01</td>
</tr>
<tr>
<td>- Preparation and inspection of facilitators</td>
<td></td>
<td>Tue 17/01</td>
</tr>
<tr>
<td>- Piloting</td>
<td></td>
<td>Tue 17/01</td>
</tr>
<tr>
<td><strong>Day 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-1 Workshop 1</td>
<td>Maputo</td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- Set up</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- Registration</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- Official welcoming and Opening Remarks</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- Review of the agenda</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- Self-introduction of participants</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- PHISICC - general</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- Coffee break??</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- PHISICC - WS3</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- Discussion</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- Overview HMIS</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- Discussion: PHISICC focus and expectations from stakeholders</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- Stakeholders questionnaire - 1</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- Workshop evaluation</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- Closing remarks</td>
<td></td>
<td>Wed 18/01</td>
</tr>
<tr>
<td>- Group photo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Lunch</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Day 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-2 Stakeholders interviews</td>
<td>Maputo</td>
<td>-</td>
</tr>
<tr>
<td>- Domestic travel</td>
<td>To Nampula</td>
<td>Thu 19/01</td>
</tr>
<tr>
<td><strong>Day 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-1 Meeting with authorities and partners</td>
<td>Nampula</td>
<td>Thu 19/01</td>
</tr>
<tr>
<td>- DPS vice-director</td>
<td></td>
<td>Thu 19/01</td>
</tr>
<tr>
<td>- TBD</td>
<td></td>
<td>Thu 19/01</td>
</tr>
<tr>
<td>- University of Lúrio</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Day 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-2 Planning and management set up</td>
<td>Nampula</td>
<td>Thu 19/01</td>
</tr>
<tr>
<td>- Hospital Central de Nampula - Statistics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- TBD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- TBD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- TBD</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Day 4</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-3 Stakeholders interviews</td>
<td>Nampula</td>
<td>Fri 20/01</td>
</tr>
<tr>
<td>- NGOs contacted by DPS Elizabeth Glaiser; ICAP?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- TBD</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Day 6</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Arrival in Nampula (gt team)</td>
<td>Nampula</td>
<td>Sun 22/01</td>
</tr>
<tr>
<td>- NGOs contacted by DPS Elizabeth Glaiser; ICAP?</td>
<td></td>
<td>Mon 23/01</td>
</tr>
</tbody>
</table>
# 3-4 Sites visits

<table>
<thead>
<tr>
<th>Activity</th>
<th>Location</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion with responsible of HMIS</td>
<td>Nampula</td>
<td></td>
</tr>
<tr>
<td>Introduction &amp; background</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand tour of health information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health information flow, use &amp; challenges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepare data verification exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Next steps</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# Observation of care in key focus areas + stimulus discussion

<table>
<thead>
<tr>
<th>Activity</th>
<th>Location</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction &amp; video permission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observe/record activities of 3 patient visits (or equivalent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tour of Health Information + Monthly reporting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Needs &amp; Challenges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stimulus activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrap Up</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Data verification exercise

<table>
<thead>
<tr>
<th>Location</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nampula</td>
<td>Mon 23/01</td>
</tr>
<tr>
<td>Mutava Rex</td>
<td>Mon 23/01</td>
</tr>
<tr>
<td>Rapale</td>
<td>Tue 24/01</td>
</tr>
<tr>
<td>TBD</td>
<td>Tue 24/01</td>
</tr>
<tr>
<td>Namina</td>
<td>Wed 25/01</td>
</tr>
<tr>
<td>Mecuburi</td>
<td>Wed 25/01</td>
</tr>
<tr>
<td>TBD</td>
<td>Wed 25/01</td>
</tr>
<tr>
<td>Workshop preparation</td>
<td>Wed 25/01</td>
</tr>
<tr>
<td>Handing over gt -&gt; TP</td>
<td>Wed 25/01</td>
</tr>
<tr>
<td>3-5 Debriefing session</td>
<td>Wed 25/01</td>
</tr>
<tr>
<td>Travel to Maputo</td>
<td>Thu 26/01</td>
</tr>
<tr>
<td>4-1 Preliminary analysis</td>
<td>Thu 26/01</td>
</tr>
<tr>
<td>4-2 Restitution workshop</td>
<td>Fri 27/01</td>
</tr>
<tr>
<td>Welcome</td>
<td>Fri 27/01</td>
</tr>
<tr>
<td>Introductions &amp; Project Background</td>
<td>Fri 27/1</td>
</tr>
<tr>
<td>Data Verification Findings</td>
<td>Fri 27/01</td>
</tr>
<tr>
<td>Fieldwork Immersion</td>
<td>Fri 27/01</td>
</tr>
<tr>
<td>Stimulus Discussion</td>
<td>Fri 27/01</td>
</tr>
<tr>
<td>Questionnaire criteria WS4</td>
<td>Fri 27/01</td>
</tr>
<tr>
<td>Workshop evaluation</td>
<td>Fri 27/01</td>
</tr>
<tr>
<td>Wrap Up</td>
<td>Fri 27/01</td>
</tr>
<tr>
<td>4-3 Final meeting with partners</td>
<td>Fri 27/01</td>
</tr>
<tr>
<td>Dinner team</td>
<td>Thu 26/01</td>
</tr>
<tr>
<td>4-4 Departure</td>
<td>Sat 28/01</td>
</tr>
</tbody>
</table>
Annex 4. **Extract of ANC register**

**Figure 8. ANC register (extract).**

<table>
<thead>
<tr>
<th>Livro de Registros da Consulta Pré-Natal</th>
<th>MOD - SIS - B01</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data</strong></td>
<td><strong>Identificação</strong></td>
</tr>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
</tr>
</tbody>
</table>

*Note: The table represents a part of the ANC (Antenatal Care) register with columns for data, identification, phase of pregnancy, maternal record, patient's name, residence, emergency contact, and final state of the mother.*