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BREAKING NEW GROUND

THINKWELL

A Time and Motion Study on Primary Health Care in Mozambique

Maputo, May 2018

Contents

ACKNOWLEDGMENTS

This study was conducted in partnership with the Faculty of Medicine of the Eduardo Mondlane University, including the conceptualization of the protocol and the data collection tools, as well as collection of field data. The participation of collectors and supervisors with significant field experience facilitated the training of collectors and their supervision during the fieldwork. Saraiva Munguambe, MD, Tavares Madede, MD, and Vasco Muchanga, all lecturers at the Faculty of Medicine, supervised the fieldwork. **Annex 1** includes a list of the data collectors.

The E-Novation company prepared the application for data collection (and daily communication to the server) as well as the database.

The proposal for this study was fully endorsed and supported by the Ministry of Health, notably the National Directorate of Human Resources (DNRH). The DNRH was also helpful in communications with the provincial health directorates, who facilitated the organization of all fieldwork.

The district health directorates in districts with selected health facilities were strong study collaborators who facilitated pre-study visits by supervisors and supported the logistics of the collectors in some remote areas.[1]

Health professionals at all facilities welcomed the collectors and were indispensable in providing all key information. All health professionals selected for observation gave their consent to participate in the study and showed an understanding of the message to "carry out their work as usual."

Technical leaders and their teams at the Ariel Glaser Foundation and at the Maputo office of the U.S. Centers for Disease Control and Prevention (CDC) were highly supportive throughout the entire study, from preparation of the protocol to field data collection and analysis.

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[1] To preserve confidentiality and anonymity, the districts are not named in this report.

EXECUTIVE SUMMARY

This report presents the results of a descriptive and observational study on the utilization of time by the main types of health professionals at the primary health care level in Mozambique. The study responds to the need to include data in the planning tools about the workload and the distribution criteria of health professionals, as well as to the need to know how the rapid increase of HIV-positive patients is being handled by these professionals at the level of frontline services. The primary health care level utilizes 50% of the total number of health professionals in Mozambique.

The study observed 296 working days of professionals in general nursing, maternal child health (MCH) nursing, curative medicine (basic and middle levels), general medicine (physicians), and laboratory and pharmacy, as well as a more limited number of counselors and data typists. The sample included 29 health units in 9 of the 11 provinces in the country, making the sample representative of the primary care network in terms of geography (rural and urban), typology of health units, and levels of HIV prevalence. The professionals were observed directly during entire days of their work in health units; the clinical professionals were observed in continuous mode, and the laboratory and pharmacy professionals in work-sampling mode (alternate periods). The utilization of time by the professionals—with or without activity—was registered directly in tablets with an application designed specifically for this study. Apart from the utilization of time, the study team also registered how the professionals conducted their caring activities through a list of baseline task protocols for each type of service. In each health unit, the professionals were observed for two consecutive days. Characteristics of the days and/or locations of observation that might influence the performance of the professionals under observation were also recorded.

The results are uniquely descriptive statistics. The following illustrates some of the findings:

- Clinical professionals in the health centers invest between three to four hours daily in direct work with patients.
- They spend another 1.5 to two hours daily at the facility, without any type of work (clinical or non-clinical).
- The amount of time invested in clinical care and the number of clients attended are both higher on Mondays.
- The last clients are attended between 12:30 and 13:30.
- The professionals assigned to triage (nurses or clinical officers) attend to more patients, although each patient visit is shorter.
- The average duration of consultations is higher for the types of services that normally serve patients with HIV; other services for these patients also have a longer average duration, when compared to similar services for non-HIV patients. Consultations for HIV patients also include a higher number of clinical procedures for each patient.
- Professionals invest a higher number of hours in direct patient care when working in facilities located in the areas with highest HIV prevalence.
- In the triage and healthy child consultations (including vaccinations and weight control), the duration of contact with the professionals is short, and the patients experience fewer clinical procedures.

– Professionals from all cadres (nursing, MCH nursing, clinical officers, physicians) share responsibility for the various types of services in the health centers.
– Based on a limited number of observations of assisted deliveries and inpatient care, the data suggest that the time invested by professionals for these two types of services is lower than expected.
– The productivity of health professionals could be increased if the organization of the allocation of resources and the daily service delivery arrangements within PHC facilities could be improved: time is lost on "waiting without work" on late mornings, too many interruptions disturb clinical attendances, and simple tasks by support staff lead to more time being allocated to clinical work by professionals.
– The compliance with various minimum components of a clinical encounter is irregular: poor attention to recorded clinical data, low frequency of physical examination of patients, poor communication with users, and—very worrying—poor attention to infection prevention and protection protocols. The poor compliance with some of these norms constrains the effectiveness of current initiatives to reduce maternal and child mortality.

These results can contribute to improving the estimation of needs for health professionals and the criteria for their distribution, at least for the main types of professionals in the primary care facilities.

This survey was approved by the IRBs of the Medical School of the Eduardo Mondlane University (UEM) and CDC-Atlanta and was formally authorized by the Ministry of Health of Mozambique.

ABBREVIATIONS

ART	antiretroviral treatment
CDC	U.S. Centers for Disease Control and Prevention
CSRI	Health Center Type I – Rural
DNRH	Direcçõo Nacional de Recursos Humanos
HF	health facility
HIV	human immunodeficiency virus
HRH	human resources for health
ICC	inter-cluster correlation
IEC	Information, education, communication
MCH	maternal and child health
MCHN	MCH nurse
MOH	Ministry of Health, Mozambique
OPD	outpatient department
PHC	primary health care
PLHIV	person or people living with HIV
PNDRH	National Development Plan for Human Resources for Health
RDT	Rapid diagnostic test
UEM	Universidade Eduardo Mondlane

I   CONTEXT

Staffing ratios for Mozambique's health professionals—.757 for 1,000 people—are below recommended ratios, such as the 2 to 3 for 1,000 recommended in 2006 by the World Health Organization (WHO 2006). Staff numbers have grown since mid-2000 due to strong investment from the Government of Mozambique and from development partners in training (the Accelerated Training Programme). The government is committed to improving the availability of human resources for health (HRH) across the entire public health network, and some partners have been particularly concerned about the need for professionals to care for the growing number of people living with HIV (PLHIV).

Despite the growth in HRH training in the last decade, the recent evaluation of the HRH Strategic Plan 2008-2015 showed that HRH distribution remained as unequal as it was before 2008 (MOH of Mozambique 2016). The same evaluation suggested that one of the reasons why this inequality was sustained was the lack of workload criteria for use in allocation decisions, along with the traditional criteria of ratio of professionals to population and of standard HRH teams to health facility (HF). In fact, the most recent attempt to evaluate productivity—or utilization of time—of health professionals (with data of national representativeness) was done in 2009-2010 (Cumbi et al. 2010). Other recent observations have been reported by officers from health partners, although with samples that do not represent the totality of the public health system and do not validate the anecdotal observations of visitors and supervisors, who say either that "health facilities are closed early" or "health professionals sacrifice themselves to attend to high numbers of patients, increasing the hours of service") (World Bank 2016).

Primary health care (PHC) services in Mozambique are provided in health centers—of which there are various designated types—and by a smaller range of professional cadres. The combination of the reduced range of services and a reduced range of cadres requires attention to planning the number of professionals necessary to supply this range of services, based on how much time each professional uses in service provision during their days of work and the average duration of each type of service. This planning exercise is important because 50% of health professionals are placed in primary level health units. In Mozambique, the demand for PHC has grown substantially, both because of the high pace of population growth and the increase in intensity of utilization, or number of contacts per capita (MOH of Mozambique 2014).

On the other hand, PHC is also the level of the national health system that attends the majority of patients with HIV and on antiretroviral treatment (ART). Between 2003 and 2016, the number of patients on ART grew dramatically from 1,600 to over 750,000 (MOH-CDC 2016). The response from the government and partners consists of (1) an Accelerated Training Programme, (2) delegation of clinical tasks to some types of mid-level professionals through in-service training, and (3) revision of graduate training curricula. It is not known whether the professionals are managing to attend this number of users with sufficient time to comply with clinical protocols, nor is it known how the recommendations to share clinical tasks are being put into practice.

In the global health literature, the search for knowledge on the utilization of time of health professionals is necessary to, first, inform both health systems management, such as the Workload Indicators of Staffing Need (WISN) application, and, second, to foresee the need to improve coverage with specific activities, such as caring for PLHIV (WHO 2010).[2]

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[2] WISN was published by WHO; see References section.

JUSTIFICATION AND RESEARCH QUESTIONS

This study seeks to respond to various questions related to better utilization of health professionals as well as maximization of recent investments in the increase in the number of professionals trained at the primary health care level by:

- Obtaining the necessary information for drafting acceptable workload criteria for the main types of PHC professionals.
- Quantifying the number of services with average duration (and potential threats to achieving minimum quality).
- Obtaining information on the percentage distribution of various types of PHC services among "multi-tasking" professionals available at that level of care.

This type of information is important for:

- HRH planning and evaluation, because it helps to define the average productivity of equivalent unit of professional/day.
- Efficient allocation of professionals, because it allows for weighting the number of professionals in standard teams according to the intensity of local demand for care.
- Better forecasting of HRH needs for growing numbers of services for HIV patients, because it will give information on the differentiation of staff performance when caring for HIV-positive patients.

II   OBJECTIVES AND HYPOTHESES

MAIN OBJECTIVE

The main objective is to characterize the utilization of time of the main categories of professionals involved in PHC provision, including factors that influence the utilization of their time. To achieve this, the following specific objectives should be met:

- Obtaining information about daily hours during which PHC professionals are present in health facilities, and the percentage of that time spent in direct service provision (contact with patients).
- Supplying information on use of time staff present in the HF, be it for work (non-clinical) or personal needs.
- Estimating the average (or median) duration of each unit of care for the various types of PHC services.
- Identifying the differences in average (or median) duration of each unit of care, depending on the type of professional provider and the HIV status of the service user.
- Supplying information about the factors that can influence the performance of the observed professionals, including such organizational aspects as tasks carried out by support staff, and the various levels of pressure related to the number of patients seen on specific days of the week.
- Supplying information on the percentage distribution of provision of the types of PHC services among PHC professionals.

Objectives 4 and 5 above can be expressed as hypotheses:

- The average (or median) duration of each service unit for each type of service is associated with the type of health unit, type of professional, patient's HIV status, and day of the week, as well as whether it is the first or a follow-up visit.

- The performance of the observed professionals—the number of services carried out per day—is associated with the presence of and the tasks carried out by the support staff, as well as the various levels of pressure related to the number of patients on specific days of the week.

III MMETHODS AND DATA SOURCES

GENERAL INFORMATION

This was a descriptive and observational study. The collectors observed the activities carried out by the selected health professionals during whole days of presence in health units. The collectors did not interfere with the activities of the professionals under observation.

The study focused on clinical professionals who provide care directly to users who seek health center services, including nurses, MCH nurses, clinical officers (*técnicos e agentes de medicina*), general practitioners (physicians), and laboratory and pharmacy professionals. A limited observation was carried out on workers who do "counseling" and "data typing."[3]

Health facilities and professionals were selected randomly. The types of data to be collected and the dimension and geographical coverage of the sample were estimated to obtain 95% statistical power, though within the limits of the budget available for the study.

Involvement of interested parties
The study team presented the proposal for carrying out the study to the Ministry of Health's National Directorate of Human Resources. The team also submitted summary versions of the protocol to the Provincial Health Directorates to seek their authorization for carrying out the study in selected health facilities within each province.

Methods of observation
The activity of the professionals—that is, utilization of time while present in health facilities, both for professional or personal aims—was observed in direct mode by the observer. For the clinical professionals, the method was continuous direct observation, whereby the collector followed the selected professional during the stay in the health unit and registered all the professional activities, apart from the time used for personal purposes or time not used for work. In the case of the laboratory and pharmacy professionals, the observation took place in alternate periods (work-sampling), also covering the whole day of the presence of the professional in the health unit.[4] [5] [6]

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[3] Neither the counseling staff nor the typists have defined careers, nor have they staff posts within the MOH. However, their presence is relatively frequent and their work highly recognized, particularly in areas with high HIV prevalence.

[4] The observation of clinical professionals included following up on their movements inside the HF to carry out work in other service points, outside their usual place of work (interruptions and calls).

[5] The "work sampling" method can be applied in the observation of professionals who have more repetitive tasks than clinical professionals, for example, those who must frequently occupy themselves with different types of users and services. This method was also used in the observation of counseling staff and typists.

[6] In the case of professionals working in "shifts" (for example, maternity and wards in larger HF), the "day of observation" ended between 16:30 and 17:00 because of collection team members returning to their accommodations.

It is worth noting that the data collectors were present at the health facilities before the arrival of the professionals and stayed until they left the facilities, in order to completely record the time of stay inside the health unit.

Each professional was observed over two consecutive days. The only exceptions were cases in which the professional had to be absent on the second day, or when the professionals worked in shifts and were absent on the second day to take the day off. The day of observation (first or second) was registered together with the data on work observation collected during each day.

Care was taken to minimize potential change in behavior of the professionals under observation (the Hawthorne effect) when the study's objective was communicated to them; emphasizing the anonymity of the data also helped avoid this problem.

The recording of the types of time utilization and the timing of the activities were carried out in real time using the application installed in tablets carried by each data collector.

Objects of observation

The study sought to relate the utilization of time, in particular the average duration of each type of patient care, to the quality of services provided. At each appointment, the types and the number of clinical procedures that were undertaken by the professional were also registered. Thus, the observation (and data registration) had a double objective: the professional (utilization of time) and the interaction between the professional and the user.

The presence of "support staff" was also registered at the place of work of the observed professionals. Some analysis of the potential effect of the presence (and activities) of support staff on the performance of the professionals will be presented in the final report.[7]

Sampling: health units

The sample was designed to represent (1) the types of PHC facilities that exist in urban and rural areas, reflecting their proportional weight within the PHC universe, (2) different levels of HIV prevalence, and (3) all the country's provinces. A decision was made in the design phase to not use health facilities with an absolute absence of professionals in any of the three major clinical cadres to avoid biasing the results with the expected heavier workloads in such health facilities.

The universe of districts was reduced to the 33 districts where the MOH and the CDC had decided in 2016 to start an accelerated program for testing and treatment for HIV patients ("test & start").[8] This sub-set of districts includes rural and urban areas of the country's provinces.

The initial estimation of the number of needed observations to obtain 95% statistical power suggested 33 health clinics, combining the various types. The 33 health clinics were selected randomly within the 33 districts. The final set of health facilities was altered to substitute some of the health facilities selected in the first round, when some of the major types of clinical professionals were absent. The final set of health facilities covered 16 districts in eight provinces as well as two urban districts in Maputo City.

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[7] "Support staff," as mentioned in this report, refers to ancillary or administrative staff whose location of work is close to places where patients are attended, and whose tasks focus on helping the clinical professionals to provide services to the patients.
[8] "Test & start" is the commonly used name of the program intended to increase testing and treatment for HIV patients in Mozambique.

The unexpected increase of the time spent on logistical planning, which limited the available budget for the data collection days, forced the reduction from 33 health facilities to 29, with the exclusion of four health facilities in the provinces of Inhambane, Manica, and Niassa.[9] Despite these reductions in the sample size, the representativeness of the sample regarding criteria 1 and 2, mentioned above, has been kept. Table 1 presents the distribution of health facilities per type and level of HIV prevalence.

Table 1: Distribution by typology of health unit and levels of HIV prevalence*

Types of facilities	# facilities
Rural II	10
Rural I	9
Urban C	3
Urban B	2
Urban A	5
# TOTAL	**29**

*Facilities of the types "Rural I" and "Urban A" are larger and have more staff and equipment, than facilities of the types Rural II, Urban B, and Urban C.

HIV (+)	Adjust. # facilities
< 5%	10
5 - 15%	10
> 15%	9

Sampling: the professionals

At each HF, prior visits by the study team had listed the numbers of professionals allocated to the work sector that was to be observed. For larger health facilities where more than one professional was involved in the same type of service, a list of the professionals was used to select one randomly.[10]

In one case where a professional did not want to participate in the study or be absent, random sampling was used again to select a substitute from within the same work sector. The fact of observing the selected or substitute professional was registered together with the data on observation of work collected each day.

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[9] Problems with the quality of the information collected in the first two days of observation limits the complete collection of final data on all services for 27 HFs. Data for laboratory, pharmacy, and physician appointments were collected for 29 HFs. The exclusion of Niassa, Manica, and one facility in the extreme north of Inhambane was due entirely to cost considerations.

[10] Random number tables were used for the selection of both the HFs and the professionals.

Laboratory and pharmacy professionals whose work was limited to very specific tasks were excluded. For example, some laboratory professionals in large urban facilities may only collect samples, while some pharmacy professionals are assigned to work in the warehouse and do not attend to patients.

Size of the sample

The minimum number of observations to guarantee 95% statistical power was calculated in different ways for the clinical activities and for the observations in laboratories and pharmacies.

For clinical activities, which were to be observed in continuous mode, the objective was to obtain reliable average values for the average duration of each service provision. The usual formula for continuous variables was used:

$$N = (1{,}96^2 * SD^2)/ d^2$$

The estimated minimum number of observations referring to each of the major types of services is shown in Table 2. Ambulatory services were subdivided by type of service and professionals, as shown in Table 3.

Table 2: Minimum number of clinical services to be observed

Activity	Duration	SD	d	N
Deliveries	120	40	5	**245.9**
Nursing inpatient care / patient / shift	20	7.5	1	**216.1**
Maternity inpatient care / patient / shift	15	7.5	1	**216.1**
Outpatient visits Triage / MCH ambulatory	7.5	5	0.5	**384.2**
Outpatient visits booked - clinician	15	7.5	1	**216.1**
Pharmacy / laboratory	5	3	0.5	**360.0**

SD: standard deviation; **d**: sampling error (accuracy); **N:** sample size

Table 3: Minimum number of ambulatory services to be observed, by type of services and providers

	# of outpatient visits
Triage: general medicine	384.2
Triage: HIV patient stable	384.2
Outpatient visits booked: clinician	216.1
Booked visit: HIV patient unstable	216.1
Booked visit: HIV patient initiation	216.1
MCH Healthy Child: immunization	384.2
MCH Child Health: sick children	384.2
TOTAL	**2,184.9**

The initial estimation of the number of professionals and health facilities to be observed to reach the number of observations in the tables above was based on the expected number of services, per day, for each type of service and professional, and in each type of HF.

Table 4 shows the expected division of types of services to be provided by the various types of professionals.

The formula for frequencies associated to the degree of expected task repetition was used for observations to register in the work-sampling mode in the laboratory and pharmacy, as well as in the observations of counseling personnel and typists.

The frequency of repetition (*P*) of the component tasks was defined within the 12.5% to 20% interval (between 5 to 8 component tasks). The sampling error (measurement precision: *E*) was set at 10%. The formula is:

$$N = (1.96^2 * (1-P))/(P * E^2)$$

Table 4: A matrix of PHC services and types of health professionals to be observed

Type of staff to be observed	Type of services to be observed
MCH Nurse	– Queue of vaccines and weighing – Healthy Child appointment – Child "at risk" appointment[11] – Antenatal appointment – Postnatal appointment – Family Planning appointment – Gynecology appointment – Assistance to delivery – Women admitted to maternity ward
Nurse	– Triage – Emergency care – Ambulatory nursing care – Admitted patients (general ward)

Medical officer	– Triage
	– Booked appointments – curative care:
	   o Child/adult
	   o Chronic diseases: HIV
	   o Patients with TB
	   o Gynecology appointment
	   o Call to emergency services
	   o Call to inpatients (general ward)

Physician	– Booked appointments – curative care:
	   o Child/adult
	   o Chronic diseases: HIV
	   o Patients with TB
	   o Gynecology appointment
	– Call to emergency services
	– Call to inpatients (general ward)

Laboratory technician	– Collection of specimens – Instrumental processing – Communication of results
Pharmacy technician	– Direct dispensation of medicines to patients (and information to patients) – Taking orders for pharmaceutical products from service points within the facility – Stock management
Lay counseling staff	– Organization of patient queue – Simple tasks of clinical support and assistance to health professionals – Information and counseling to patients/families

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[11] "Child at Risk": consultations for sick children, which in Mozambique usually means either HIV or malnutrition.

Typist	– Typing clinical data into computer applications
	– Preparation of reports and aggregated data
Preventive medicine professionals*	– Queue of vaccines and weighing

***This observation may take place only if this type of professional is conducting such services (they can be shared with MCH nurses).

The minimum number of observations must be placed between 1,537 (if five component tasks share 20% of time, each) and 2,689 (if eight component tasks share 12.5% of time, each), as shown in Table 5.

Table 5: Minimum number of "laboratory – pharmacy" services to be observed

E^2 (0.1)=	0.01	0.01	0.01
For an activity that uses % of time =	**13%**	**14%**	**20%**
N =	**2,689**	**2,305**	**1,537**

The number of observations necessary to comply with the suggestions of the formulae above was edited to respond to the reduction of the statistical power by the intra-cluster correlation (ICC).[12] The logistic preparation also includes the potential for refusal/impossibility of supplying information. The rate of losses was accepted up to 10%. The ICC was set at 0.1.

Care was also taken to check whether the size of the sample could have enough statistical power to confirm differences of pattern between two major stratifications: between small and large facilities, and between facilities in areas of high (> 12%) and low (< 5%) HIV prevalence.[13] The final number of desired observations is shown in Table 6.

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[12] The intra-cluster correlation demands a larger sample size. In this study, each set of data collected over each day, in each facility, constituted a "cluster."

[13] The expected variance in these strata was reduced to 20-25% in relation to the total sample variance to represent a greater homogeneity within the strata.

Table 6: Necessary number of observations to meet the sample's statistical power

	Total sample	Compare big-small facilities	Compare HIV: 3 levels of prevalence	Final choice
Ambulatory (MCH) services, MCH Nurses	1,535	1,877	2,115	2,115
Ambulatory services, nurses	999	1,505	1,657	1,657
Ambulatory services, Clinical Officers	989	2,591	1,711	2,591
Ambulatory services, physicians	1,014	1,034	994	1,034
Deliveries	340	340	280	340
Admitted mothers	643	643	374	643
Admissions	288	288	281	288
Laboratory	2,070	2,070	1,249	2,070
Pharmacy	5,742	5,742	2,373	5,742

NOTE: The number of expected observations for the laboratory and pharmacy in Table 6 is an estimation of the possible number of requested services for these two sectors, originating from the expected number of clinical appointments. The number of observations in the laboratory and pharmacy is particularly sensitive to the intra-cluster correlation effect because these types of observations were only possible in a limited number of HF's: when the number of clusters is small, more observations are needed to obtain the final statistical power.

Ensuring observation of sufficient numbers of specific services

Some types of observations are not possible in smaller HFs, particularly appointments by physicians, nursing care to inpatients, and laboratory work.

The trip itineraries of the teams of collectors enabled them to continue observing those types of services in larger HFs, while the other part of the team made observations in smaller HFs.

Variables

The data collection plan reflected the specific objectives and hypotheses of the study: (1) the description of utilization of time by professionals, (2) the tasks carried out while providing care to users, and (3) the characterization of points of service and the professionals under observation.

The data collected throughout each day of observation included:

– Characterization of the HF (according to the Ministry of Health typology).
– Characterization of the day of observation, such as first or second day of observation, day of the week.
– Characterization of the professional to be observed: cadre, level and year of training, selected and consented, time of arrival, time of start of activities.
– Characterization of point and type of service (see below), including the presence of support staff.
– Utilization of time of the professional before the start of caring for patients/users: start time of care for patients/users, list of activities and time count for each activity, possible interruptions. The observation followed a menu of specific activities for each service point.
– Care for patients/users: type of procedures carried out with each user/patient, duration of care, interruptions, calls for other types of services.
– Utilization of time by the professional after caring for patients/users: types of utilization of time (see below), interruptions.

– Characterization of each appointment: type of appointment; HIV status, first or follow-up appointment, "family" or "collective" appointment,[14] "complete" or "partial" appointment.[15]
– Final data on the support staff activities (specific per service point), statistics on number of users served registered in the HF for each service point, time when the professional leaves the facility.
– In work-sampling observations, the same data for the characterization of HFs, service point and professional, and utilization of time by the professional before the start of care for patients/users. The observation of care for patients/users was done in alternate 10-minute periods (laboratory X pharmacy, or counseling staff X typist), registering observed activities (specific lists for each service point): type and duration of activity, and interruptions (type and duration).

The structure of the data registration application followed the templates annexed to the research protocol covering all types of services listed in Table 7.

Quality of care and duration

Simplified lists of basic procedures for quality were defined for each type of service. The collectors recorded whether these procedures were carried out while they observed the professional caring for each user/patient (specific timing for each one of these procedures was not registered).

The intention was to compare the services carried out with different degrees of demand pressure and verify the coherence between the number of procedures and the average duration of these different types of services.[16] The lists of these basic procedures for quality are displayed in **Annex 2.**

Types of "utilization of time"

The utilization of time by professionals under observation throughout the day is divided into three categories:

– "Clinical – direct" work with patients/users.[17] [18]
– Non-clinical work, such as organization of work stations, contact with other professionals, meetings, registration of statistics, etc.
– Idle time, including breaks, other personal activities, and "time waiting without patients/users."[19]

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[14] These adaptations mean: (1) "family," frequently observed in appointments for HIV-positive patients, in which more than one patient (normally relatives of the principal patient) are present at the appointment; (2) "collective," when a procedure is carried out simultaneously for a group of patients/users – for example, weighing or vaccination of a group of children.

[15] The users can be completely cared for in one contact by the professional (who is being observed), or "more than one" contact is undertaken to finish the appointment. For example, this frequently happens when the user is sent to the laboratory and returns after a while with results for the clinician to analyze. In these cases, the duration of the "complete appointment" is the sum of the durations of the "partial" appointments.

[16] The statistical analysis of the frequencies with which these "basic procedures" were accomplished can also inform the quality of curative care and MCH on primary care. Nevertheless, this analysis is outside the scope of the objectives of the study and this preliminary report.

[17] "Clinical-direct" work refers to all tasks related to providing the needed service to the user, including diagnosis, treatment, and provision of information.

[18] In this report, the terms "patient," "user," and "client" are frequently used. "Patient" refers to a sick person who demands curative services from the facility. The more general terms "user" or "client" mean more broadly any person who demands preventive or curative services from the facility.

[19] "Time waiting without patients/users" means that the professional stays at her/his work station and does not interrupt the observation of patients, but the influx of patients (to her/his work station) has been interrupted.

Points and types of services

This listing was necessary to understand the usual workplaces of each type of professional and to standardize the procedures to be observed.

Table 7: Points and types of services to observe

Points of service	Types of service
Child Health	Queue of vaccines and weighing Healthy Child appointment Child "at risk" appointment
Maternal Health	Antenatal appointment Postnatal appointment Family Planning appointment Gynecology appointment "Call" to maternity
Outpatient curative care appointments	Triage Booked appointments – curative care: – Child/adult – Chronic diseases – HIV/TB – Gynecology appointment Call to emergency services Call to admitted patients (general ward) Call to maternity Care of ambulatory nursing
Maternity	Women in labor already inside the maternity ward Arrival of woman Third phase of delivery + newly born Nursing care for admitted women + newborns Newly born routine vigilance Discharge of mother/newly born Gynecology emergency Newly born outside maternity Newly born with complications
Hospital ward	Care to inpatients
Laboratory	Care to patients/users
Pharmacy	Care to patients/users
Counseling staff	Care to patients/users
Typist	Typist's tasks

Mitigation of the "Hawthorne effect"
The study envisaged that the presence of observers close to the professionals could alter their behavior, causing them to dedicate more time and attention to care for each patient. When the study teams requested consent from the professionals, they also asked them to "behave normally."[20]

To facilitate the statistical evaluation of the potential bias of the registration of observations, it was registered when the observations were undertaken: (1) on the first or second day of data collection, and (2) on a Monday or any other day of the week.[21]

METHODS OF OBSERVATION AND DATA COLLECTION

Observation throughout the day: different types of data
As stated above, the collectors were present in the HFs before the arrival of the professionals, and only left after the professionals had already left the HFs.[22]

Data collection can be divided into three phases, as shown in the display below:

Phase of day	Data to be collected
1　Start of day	− Characterization of service point and type of service (see below). − Characterization of the professional to be observed (and obtaining informed consent). − Utilization of time by the professional (for work or personal) before attending to patients/users (including time counting). − Verification of the presence of support staff.
2　Observation of clinical work	− Procedures carried out with each patient/user. − Interruptions and changes of appointment locations or type of services (calls) (including time counting).
3　End of day	− Utilization of time by the professional (for work or personal reasons) after attending to patients/users and before leaving the HF. − Recording the activities of the support staff and recording statistics on the number of services in the facility (for the day of the observation).

Mode of observation and registration
All data were collected in a tablet equipped with an application specifically designed for the study. The application included the following:

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[20] This request for "normal behavior" refers particularly to the utilization of time within the facility.
[21] It was presumed that (1) the professionals would be more at ease on the second day of observation, and (2) on Mondays, the biggest pressure from patients on the waiting list could accelerate the speed of the appointments resulting in the reduction of the average time for care to each user.
[22] A few exceptions, for the time when the observation finished, were the observations of professionals working in shifts of 12 hours or more. See footnote 6.

– A coded listing of the selected HFs for the sample.
– Automatic notation of the day of collection.
– A timer for counting time and registration of start and end of activities under observation.

During the period of caring for patients/users, the collectors were located in the consultation room of the professional under observation (or in the workplace of the laboratory staff, pharmacy technicians, counseling staff, or typists) and registered the activities and their duration in the tablet.

The application's architecture (shown on the screen) reflected the structure of the database. The most important aspects of links within the database were (1) the linkages of the collected data between the specific facility, specific day, and observed professional, and (2) the link between all records made during an appointment/episode of care (e.g., procedures, interruptions, type of appointment, duration) with the appointment identification number. Each collector had an identification number during the whole duration of the data collection, which was used to identify the data each sent daily to the server.

The application was tested before the start of data collection in the field, including the capacity to send the data to the server. The test was carried out by the collectors themselves in HFs in Maputo City, which were not selected for the study sample.

Transmission to the database
The collected data were transmitted daily via the internet to a server where they were stored. Data were sent at the end of the day. The application included a function to confirm to the collectors that the complete set of recorded data had been sent.

Daily, after the confirmation of data transmission by the collectors, questionable entries were verified directly by the supervisors with the collectors, before the complete daily data set at each HF was downloaded to the database in the server used for the study.

During transmission of the data to the server, the anonymity of all the information was protected by coding the names of the health facilities and collectors.

Quality control of the collected data
The structure of the application facilitated the recording of the observations, which (1) obliged the collector to comply with the three phases of the observation—arrival of the professional, provision of care, and end of day—and (2) presented standardized lists for selection, reducing arbitrariness and text drafting.

On the other hand, the fact that the collectors had recently graduated from the Faculty of Medicine made it easy for them to identify and record promptly the activities of the professionals as they cared for the users in the various service points.

The collectors had been trained on the study's objectives and justification of the selected variables and on the mode of data collection using the tablet. The collectors had also trained in both classroom-based and real-life conditions at facilities in Maputo City. The practical learning in real-life conditions was done with supervision from tutors and the lead investigator.

Apart from the daily verification mentioned in the previous section, ThinkWell carried out in situ auditing to teams in the Centre and North regions, during two whole days of observation for each team.[23]

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[23] The South team also received a visit from one staff member from CDC-Maputo.

Limitations on "continuous observation"

Some features of the type of observation made it difficult to fully undertake continuous and complete recording of activities. One example with the most impact on data analysis was the "time during which the activity of the professional has been observed," which was not always consistent with the "duration of the presence of the professional within the facility."

The following constraints are notable:

– The small interval between "arrival time of the professional" and "time for beginning of observation" was the time for negotiating the participation of the professional and obtaining informed consent.
– The intervals or breaks in the recording of the utilization of time by the professional were of two types:
  o Breaks made by the observer: a physiological break, or distractions and hesitations in classifying an activity (delaying recording and timing).
  o An unforeseen reduction in the recorded activities by professionals: In the case of alternate observation of laboratory and pharmacy professionals, if one of them was absent, then the other professional continued being observed for periods of 10 minutes, alternating with breaks of 10 minutes of non-observation.
– Cases when the application in the tablet crashed, which prompted re-initiation of the app.

Thus, in the Results section, for "percentage of time" used for "clinical work," "non-clinical work," and "time without work," the denominator for these percentages will be "the sum of all the times recorded" and not "the total time of presence of the professional within the facility."

Data protection

Regarding confidentiality and anonymity, data were protected through the coding of facilities and collectors during the daily transfers from the individual tablets to the server. Access to the database was restricted to the primary investigator, the database manager, one data auditor involved in the daily cycle of quality validation (during data collection only), and the statistician in charge of preparing the study results.

Protection from loss after uploading to the server housing the database was ensured by the same IT company that designed the data collection tool, using a second stand-by server with a copy of the database at a different physical location.

Calendar and collection organization

The data collection took place during the months of September and October 2017.[24] The provinces were grouped in three regions (South, Centre, and North), with a five-person team with a supervisor assigned to each region.

Each HF was visited during two days by a team of five collectors. The exceptions were the smaller HFs (usually Type II Rural health centers), where only two or three collectors were necessary. The same HFs had been visited previously by the supervisors who had also contacted the provincial and district health directorates to obtain credentials and confirm the service points and available professionals at each HF.

Prior knowledge of the characteristics of each HF allowed for drafting the data collection agenda for each one, with a view to monitoring the number of observations of the different types of services and professionals needed to respond to the statistical power of the sample. Two weeks from the end of data

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[24] Re-collection of some data in Maputo City took place during the week of November 6-10, 2017.

collection, the study's coordinators used the known sums of the different observations to suggest changes to the team's initial agenda and to refocus on the types of services where observations were still insufficient.

Ethical considerations

The selected professionals were only observed after they had signed the informed consent forms. These forms included information to users of the services, on the day of observation, about the presence of the collector in the consulting room.[25] The collectors informed the professionals under observation beforehand that they would not interfere with their activities.[26] The collectors also asked the professionals to maintain their normal working-day behavior.

The professionals were also assured that the identification data of the facilities and the professionals would be immediately coded, to be kept anonymous and confidential. The collected data were protected from identification by coding the names of the health facilities, professionals, and collectors.

The informed consent forms filled out by the professionals were stored in a safe, in the Maputo office of the institution where the lead investigator works.

IV   RESULTS

The sequence of the presentation of the results follows the specific objectives of the study and is divided into the following:

- Characterization of the sample and the observations undertaken.
- Utilization of time by the professionals while in the heath facility.
- Average duration of each unit of service provision.
- Average numbers of services provided during a day / shift at work.
- The relationship between the number of procedures and the duration of service provision.
- The specific observation of laboratory and pharmacy professionals.

CHARACTERIZATION OF THE SAMPLE AND THE OBSERVATIONS UNDERTAKEN

Tables R.1 – R.3, below, display:

- The number of days of observation of professionals, by type of facility.
- The numbers of days of observation of professionals from the various cadres, and numbers of days of observation.
- The numbers of services observed, by type.

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[25] The design of the application required that informed consent be completed before starting the recording of data on care work for patients/users. The application screen included a message summarizing the informed consent form to be read to each professional by each collector during the request for consent.

[26] The collectors were young graduates of the Faculty of Medicine of UEM. Naturally, in the more peripheral facilities they were repeatedly asked to help professionals provide services to the day's users.

Table R.1: Characterization of the sample: numbers of observations, by type of facility[27]

Province / type of facility	Rur I	Rur II	Urb A	Urb B	Urb C	All types	% of total
Cabo Delgado	2	0	0	0	12	**14**	4.7%
Nampula	32	18	24	0	0	**74**	25.0%
Zambézia	45	22	0	0	0	**67**	22.6%
Tete	20	4	0	0	0	**24**	8.1%
Sofala	0	4	14	0	4	**22**	7.4%
Inhambane	10	13	0	0	0	**23**	7.8%
Gaza	12	10	0	12	0	**34**	11.5%
Maputo	0	0	0	0	12	**12**	4.1%
Maputo Cidade	0	0	20	6	0	**26**	8.8%
All provinces	**121**	**71**	**58**	**18**	**28**	**296**	
% on Total	40.9%	24.0%	19.6%	6.1%	9.5%		

Table R.2: Characterization of the sample: numbers and types of professionals

Type of professional/ level of training	Elementary	Basic	Medium	Senior-univ.	Other	All levels	% of total
Nursing	0	0	0	21	0	**21**	7.1%
MCH nursing	1	21	62	2	0	**86**	29.1%
Clinical Officer	0	5	27	2	0	**34**	11.5%
Physician	0	13	38	0	0	**51**	17.2%
Pharmacy	0	0	43	2	2	**47**	15.9%
Laboratory	0	3	38	2	0	**43**	14.5%
Preventive medicine	0	0	3	0	2	**5**	1.7%
Lay counselors	0	0	7	0	0	**7**	2.4%
Data typists	0	0	1	0	1	**2**	0.7%
All professionals	**1**	**42**	**219**	**29**	**5**	**296**	
% of total	0.3%	14.2%	74.0%	9.8%	1.7%		

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[27] In the following tables, acronyms are displayed for the types of facilities. "Rur I" stands for "health center of type Rural I," "Rur II" for "type Rural II," "Urb A" for "health center of type Urban A," "Urb B" for "type Urban B," and "Urb C" for "type Urban C."

Table R.3: Descriptive statistics: numbers of observed services

Type of service	# observations
Vaccinations & weighing queue	324
Healthy Child visit	443
Child at Risk visit	461
Antenatal visit	694
Postnatal visit	278
Family Planning visit	236
Gynecology visit	45
Assisted deliveries	61
Women & newborns in maternity ward *(a)*	89
Other types of care in maternity	205
Other ob-gyn emergencies	68
Triage	4,227
Booked visits – curative care:	856
– General booked OPD visits	204
– Chronic Diseases / HIV	652
Call clinician to ward	76
Call to emergency room	86
Ambulatory nursing care	36
Inpatient care general ward *(a)*	157
Patients attended in laboratory	995
Patients attended in pharmacy	2,652

(a): #'s of episodes of care to (1) women in maternity ward, (2) inpatients in general ward

THE UTILIZATION OF TIME BY THE PROFESSIONALS

Duration of the presence of the professionals in the facility (average number of hours)

On average, clinical / laboratory / pharmacy professionals stay in the facility for 7.5 hours daily. This average does not apply to the professionals who work in shifts and stayed longer during the days of observation.

Table R.4 displays the variation in the average duration of stay, by type of professional and type of facility.

Table R.4: Total time of presence in the facility, per day average

Type of professional / type of facility	Rur I	Rur II	Urb A	Urb B	Urb C	HIV ++ (b)	HIV -- (c)	All facilities
Physicians	07:56:15	07:32:41	06:53:22	06:18:26	07:49:49	07:00:38	07:50:34	**07:20:07**
MCH Nurses (a)	08:01:33	07:34:38	07:32:43	07:02:29	07:18:52	07:31:00	08:10:38	**07:41:41**
Nurses (a)	07:51:02	07:32:45	05:58:19	n/a	07:27:31	07:33:03	07:38:40	**07:38:49**
Clinical Officers	07:27:35	07:14:06	07:33:38	07:12:45	08:11:44	07:22:10	07:25:09	**07:27:48**
Pharmacy professionals	08:00:08	07:38:50	07:30:31	07:09:36	08:09:04	07:38:49	07:54:36	**07:46:18**
Laboratory professionals	08:03:08	07:30:42	07:25:16	07:14:15	08:24:29	07:36:32	07:54:28	**07:45:00**
All professionals	**07:50:53**	**07:24:56**	**07:23:24**	**07:03:19**	**07:48:01**	**07:27:26**	**07:44:30**	**07:36:07**

(a) Excludes staff working on shifts (usually > 12 hours / day) in maternity, general ward, and emergency services
(b) "HIV ++" = areas of high HIV prevalence (> 12%);
(c) "HIV--" = areas of low HIV prevalence (< 5%)

Table R.4 also compares the average stay for the same types of professionals between facilities with high (> 12%) and low (< 5%) HIV prevalence.[28]

Table R.5 displays the variation in the average stay, according to day of the week (Monday vs. other days).

Table R.5: Variation in "total time of presence," according to "day of the week"

Type of professional / type of facility		Rur I	Rur II	Urb A	Urb B	Urb C	
MCH Nurses	Monday	8:50:08	7:19:35	n/a	n/a	7:29:43	**7:56:04**
	Other day	7:56:31	7:36:41	7:32:43	7:02:29	7:16:09	**7:40:13**
Nurses	Monday	9:15:51	6:58:05	n/a	n/a	n/a	**8:29:56**
	Other day	7:39:44	7:35:25	5:58:19	n/a	7:27:31	**7:33:52**
Clinical Officers	Monday	8:38:10	7:44:26	n/a	n/a	7:22:49	**8:04:23**
	Other day	7:15:49	7:05:49	7:33:38	7:12:45	8:21:31	**7:21:59**

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[28] In the context of this section, "high" and "low" prevalence for HIV is simply a way to characterize two groups of facilities serving populations with selected levels of that variable.

It should be noted that professionals at Rural Type I health centers stay longer in the facilities on Mondays, probably because they have to attend larger queues of clients.

Table R.6 displays the average time when the last patient presented at the facility for the various types of services and compares HFs in rural and urban areas.

Table R.6: Time of attendance to last client

Type of service	Rur I	Rur II	Urb A	Urb B	Urb C	All facilities (a)
Child Health	13:10:45	12:44:10	13:21:41	n/a	12:29:52	**13:01:44**
Maternal / Women's Health	12:56:01	13:30:56	13:27:48	n/a	12:47:04	**13:13:44**
Outpatient visits	13:17:16	13:30:19	13:26:16	14:20:02	13:40:08	**13:30:38**
Triage	13:26:29	13:56:21	12:51:30	14:44:37	13:31:35	**13:40:55**
Booked consults	12:12:26	11:13:49	13:40:46	n/a	n/a	**12:30:54**
Chronic disease / HIV	12:46:57	12:47:43	13:39:42	13:27:40	12:51:38	**13:01:44**

It should be noted that:

- The last client/patient attended between 12:30-13:30, suggesting a long period without clinical work, until the time that professionals left the facility (during the days of observation).
- The time of attendance of the last patient is early for "booked consults" and later for Triage.[29]

Time dedicated to "direct contact with patients," by day

Table R.7 displays the variation in the average number of hours used daily for direct contact / clinical work, by type of professional and facility.

Table R.7: Time spent on "direct patient contact," per day (number of hours)

Type of professional / type of facility	Rur I	Rur II	Urb A	Urb B	Urb C	HIV++	HIV--	All facilities
Physicians	2:31:52	1:00:21	3:17:03	3:19:55	4:32:11	2:57:18	2:06:31	**2:56:24**
MCH Nurses	2:46:07	3:17:32	3:34:42	3:24:28	3:10:19	2:55:39	2:53:34	**3:08:33**
Nurses	2:36:32	3:29:32	2:51:28	n/a	4:57:14	3:37:36	2:42:41	**3:07:04**
Clinical Officers	3:15:26	3:49:24	4:18:45	5:17:14	4:31:21	4:39:05	2:52:46	**3:52:59**
Pharmacy professionals	1:29:01	2:51:13	1:54:45	3:14:45	2:19:14	2:11:58	1:21:29	**1:59:27**
Laboratory professionals	1:49:40	1:45:27	1:42:07	1:12:29	0:54:29	1:26:16	2:08:15	**1:42:20**
All professionals	**2:22:50**	**3:10:06**	**2:43:15**	**3:15:26**	**3:10:34**	**2:39:51**	**2:28:37**	**2:45:53**

Table R.7 also compares the same time for "direct contact / clinical work" for the same types of professionals, between facilities located within high (> 12%) and low (< 5%) HIV prevalence areas.

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[29] In Mozambique, the vast majority of patients presenting at PHC facilities for curative care are attended in the triage, without booking.

It should be noted that clinical officers devote a longer time to clinical work than other professionals. In addition, in areas of high HIV prevalence, physicians, nurses, and clinical officers devote more time to clinical work than the same professionals in facilities situated in areas with lower HIV prevalence.

Time dedicated to "direct contact with patients" expressed as "% of the daily time of presence in the facility"

NOTE: For this parameter, the denominator is NOT the difference between "time of arrival" and "time of leaving" the facility, but instead "the sum of all chronometered observations, between the arrival and leave of the professional."

The number of hours used for direct contact / clinical work were compared to the total time of presence within the facility.

Table R.7-A displays the variation of this average percentage of presence time used for direct contact / clinical work, by type of professional and facility. The table also compares the same average percentage of "presence time" used for direct contact / clinical work, for the same types of professionals, between facilities located within areas with high (> 12%) and low (< 5%) prevalence for HIV.

Table R.7-A: Time spent on "direct patient contact," per day (% total observed time)

Type of professional / type of facility	Rur I	Rur II	Urb A	Urb B	Urb C	HIV++	HIV--	All facilities
Physicians	33%	14%	50%	54%	60%	44%	28%	**42%**
MCH Nurses	37%	45%	50%	51%	46%	42%	37%	**43%**
Nurses	35%	48%	51%	n/a	69%	51%	37%	**43%**
Clinical Officers	46%	57%	60%	76%	59%	65%	41%	**55%**
Pharmacy professionals	22%	53%	30%	59%	31%	36%	20%	**31%**
Laboratory professionals	27%	30%	27%	22%	11%	23%	31%	**26%**
All professionals	**33%**	**47%**	**41%**	**53%**	**44%**	**41%**	**35%**	**40%**

It should be noted that clinical officers spend the highest percentage of their time in clinical work, while laboratory and pharmacy professionals display the lowest percentage.

Time dedicated to "non-clinical work," by day (average number of hours/day)

Table R.8 displays the variation in the average number of hours used daily for "non-clinical work," by type of professional and facility.

Table R.8: Time spent on "non-clinical work," per day (number of hours)

Type of professional / type of facility	Rur I	Rur II	Urb A	Urb B	Urb C	HIV++	HIV--	All facilities
Physicians	3:55:36	4:01:29	1:26:58	1:33:47	2:03:40	2:09:17	3:33:08	**2:35:22**
MCH Nurses	2:28:44	2:44:55	2:52:29	2:23:51	1:54:51	2:45:23	2:45:34	**2:34:05**
Nurses	2:22:26	2:05:32	2:09:08	n/a	1:32:21	2:06:25	2:29:50	**2:12:08**
Clinical Officers	1:24:23	1:45:36	1:13:28	1:03:09	0:34:57	1:38:22	1:24:42	**1:21:02**
Pharmacy professionals	3:26:23	2:19:19	3:18:39	1:34:42	3:13:25	3:07:33	3:03:25	**3:06:49**
Laboratory professionals	1:55:14	1:30:40	1:55:48	1:54:50	0:52:10	1:52:17	1:53:56	**1:49:02**
All professionals	**2:27:00**	**2:16:00**	**2:25:45**	**1:55:19**	**2:04:09**	**2:27:30**	**2:20:03**	**2:20:02**

Time dedicated to "non-clinical work, "expressed as "% of the daily time of presence in the facility"
Table R.8-A displays the variation of this average percentage of presence time used for non-clinical work, by type of professional and facility.

Table R.8-A: Time spent on "non-clinical work," per day (% total observed time)

Type of professional / type of facility	Rur I	Rur II	Urb A	Urb B	Urb C	HIV++	HIV--	All facilities
Physicians	52%	56%	22%	25%	27%	32%	47%	**37%**
MCH Nurses	33%	38%	40%	36%	28%	39%	35%	**35%**
Nurses	32%	29%	39%	n/a	21%	30%	34%	**30%**
Clinical Officers	20%	26%	17%	15%	8%	23%	20%	**19%**
Pharmacy professionals	50%	43%	52%	29%	44%	52%	45%	**48%**
Laboratory professionals	28%	26%	31%	35%	11%	30%	28%	**28%**
All professionals	**34%**	**34%**	**36%**	**31%**	**28%**	**37%**	**33%**	**34%**

It should be noted that laboratory and pharmacy professionals spend the highest percentage of time in non-clinical work. In fact, they spend more time on work that is "non-clinical" than "clinical" (i.e., direct work with patients).

Time not used in "any kind of work," by day (average number of hours / day)
Table R.9 displays the variation in the average number of hours spent daily on "not any kind of work," by type of professional and facility.

Table R.9: Time spent on "no-work," per day (number of hours)

Type of professional / type of facility	Rur I	Rur II	Urb A	Urb B	Urb C	HIV++	HIV--	All facilities
Physicians	1:06:51	2:13:14	1:52:47	1:14:22	0:57:19	1:34:58	1:53:00	**1:30:29**
MCH Nurses	2:10:12	1:12:46	0:45:48	0:52:15	1:52:10	1:19:45	2:07:57	**1:32:54**
Nurses	2:29:21	1:38:16	0:34:30	n/a	0:42:11	1:23:44	2:09:23	**1:58:38**
Clinical Officers	2:27:36	1:08:19	1:42:08	0:39:19	2:37:05	0:48:50	2:43:15	**1:50:39**
Pharmacy professionals	1:58:25	1:06:14	1:06:05	0:41:16	1:49:44	1:00:05	2:23:00	**1:29:56**
Laboratory professionals	3:08:56	2:30:18	2:41:34	2:23:24	6:14:09	2:53:24	2:45:44	**3:01:08**
All professionals	**2:17:17**	**1:23:00**	**1:31:34**	**1:00:42**	**2:03:13**	**1:29:43**	**2:20:56**	**1:49:19**

It should be noted that time spent without work averages between 1.5 to 2 hours for the various types of professionals. There is less time without work in areas of high HIV prevalence, while the loss is higher in large rural health centers (CSRI).

Time not used for "any kind of work" expressed as "% of the daily time of presence in the facility"
Table R.9-A displays the variation of the average percentage of presence time not used for any kind of work, by type of professional and facility.

Table R.9-A: Time spent on "no-work," per day (% total observed time)

Type of professional / type of facility	Rur I	Rur II	Urb A	Urb B	Urb C	HIV++	HIV--	All facilities
Physicians	15%	31%	28%	20%	13%	24%	25%	**21%**
MCH Nurses	29%	17%	11%	13%	27%	19%	27%	**21%**
Nurses	33%	23%	10%	n/a	10%	20%	29%	**27%**
Clinical Officers	35%	17%	24%	9%	34%	11%	39%	**26%**
Pharmacy professionals	29%	21%	17%	12%	25%	17%	35%	**23%**
Laboratory professionals	46%	43%	43%	43%	78%	47%	41%	**46%**
All professionals	**32%**	**21%**	**23%**	**16%**	**28%**	**23%**	**33%**	**26%**

It should be noted that the percent of time spent without work is higher for laboratory and pharmacy professionals.

Average duration of a unit of delivery of care – Maternal Health
Table R.10 displays the average duration of an antenatal consultation and its variation according to:

– Whether the consultation was a first one or a follow-up.
– Whether the observation took place during the first or second day.
– Whether the observation took place on a Monday or on another day of the week.

- The HIV status of the client.

Table R.10: Average duration of consultation: Maternal Health / antenatal

Antenatal consult	1st visit	Follow-up visits	All consults
Day 1	0:08:34	0:05:05	**0:08:08**
Day 2	0:07:52	0:03:03	**0:07:05**
User HIV+	0:15:01	0:10:49	**0:14:44**
User HIV-	0:06:58	0:03:26	**0:06:25**
Monday	0:08:29	0:03:53	**0:06:11**
Other days	0:08:13	0:03:59	**0:07:45**
All consults	**0:08:14**	**0:03:57**	**0:07:37**

It should be noted that (1) the reduction in the average duration, on the second day of observation, (2) longer duration for HIV+ users, and (3) longer duration for first visits.

Table R.10-A displays the average duration of a family planning consultation and its variation according to:

- Whether it's a first consultation or a follow-up.
- Whether the observation took place during the first or second day.
- The HIV status of the client.

Table R.10-A: Average duration of consultation: Maternal Health / Family Planning

Family Planning consult	1st visit	Follow-up visits	All consults
Day 1	0:04:29	0:02:24	**0:03:57**
Day 2	0:04:44	0:02:26	**0:03:42**
User HIV+	0:05:01	n/a	**0:05:01**
User HIV-	0:04:33	0:02:25	**0:03:47**
All consults	**0:04:34**	**0:02:25**	**0:03:51**

Table R.10-B displays the average duration of a postnatal consultation, and a gynecology consultation and its variation according to whether it is a first consultation or a follow-up.

Table R.10-B: Average duration of consultation: Maternal Health / postnatal

Type of service	1st visit	Follow-up visits	All consults
Postnatal visits	0:04:51	0:03:23	**0:04:47**
Gynecology	n/a	n/a	**0:05:14**

Postnatal visit	1st visit	Follow-up visits	All consults
User HIV+	0:07:31	0:22:42	**0:08:03**
User HIV-	0:04:33	0:01:37	**0:04:25**

It should be noted that, again, consultations for HIV+ users are of longer duration.

Average duration of a unit of delivery of care – Child Health

Table R.11 displays the average duration of consultation for healthy child / vaccination and growth monitoring and its variation according to:

– Collective attendance.
– Whether it took place on the first or second day of observation.

Table R.11: Average duration of services: vaccination and weighing queue / healthy child

Vaccination and weighing queue	Collective visit	All consults
Day 1	0:08:00	**0:02:02**
Day 2	0:04:31	**0:01:56**
All consults	**0:07:47**	**0:02:00**

Healthy Child	Collective visit	All consults
Day 1	0:10:51	**0:01:53**
Day 2	0:04:13	**0:01:15**
All consults	**0:10:27**	**0:01:33**

It should be noted that:

– The duration of the consultation decreases on the second day of observation.
– The visits take longer when they are collective.

Table R.11-A displays the average duration of a consultation for children at risk and its variation according to:

– Family attendance.
– Whether the consultation took place during the first or second day of observation.

Table R.11-A: Average duration of services: Children at Risk

Children at Risk visit	Family visit	All consults
Day 1	0:11:58	**0:08:57**
Day 2	0:09:30	**0:07:58**
All consults	**0:10:27**	**0:08:24**

It should be noted that:

– The consultation for children at risk takes much longer than consultations for healthy children or vaccinations.
– The duration is even longer when the consultation is for the family.
– The duration decreases slightly on the second day of observation.

Average duration of a unit of delivery of care – outpatient curative care

Table R.12 displays the average duration of a consultation triage, booked consults, consults for HIV/chronic care, and variations according to:

– The type of professional who undertakes the consult.
Whether the consult took place during the first or second day of observation.

Table R.12: Average duration of services: outpatient visits / curative care

Type of consult	Day of observation	Nurses	Clinical Officers	Physicians	All professionals
Triage	Day 1	0:03:18	0:03:11	0:00:54	**0:03:13**
	Day 2	0:03:08	0:02:46	0:05:51	**0:02:51**
Booked consult	Day 1	n/a	0:06:29	0:08:28	**0:07:49**
	Day 2	0:04:12	0:06:57	0:05:10	**0:06:14**
Chronic Disease / HIV - TB	Day 1	0:10:27	0:08:44	0:08:23	**0:08:45**
	Day 2	0:12:09	0:08:57	0:07:51	**0:08:56**
Gynecology	Day 1 + 2	0:13:40	0:07:45	0:07:17	**0:05:14**
Type of consult	**HIV status**	Nurses	Clinical Officers	Physicians	**All professionals**
Triage	User HIV+	0:08:07	0:07:45	0:02:14	**0:08:00**
	User HIV-	0:03:07	0:02:48	0:03:49	**0:02:53**
All consults		**0:03:13**	**0:02:58**	**0:03:39**	**0:03:02**

Type of consult	Week - Day	Nurses	Clinical Officers	Physicians	All professionals
Triage	Monday	0:02:27	0:02:25	0:02:14	**0:02:39**
	Other days	0:03:13	0:03:05	0:03:49	**0:03:05**
Chronic disease / HIV - TB	Monday	n/a	0:07:47	0:07:01	**0:07:15**
	Other days	0:10:57	0:09:00	0:08:42	**0:09:14**

Table R.12 also displays the average duration of triage consultations performed by nurses or clinical officers (*técnicos de medicina*) and variations according to the HIV status of the client.

Table R.12 also displays the average duration of triage consultations or consultations for HIV/chronic care performed by nurses or clinical officers according to the "day of the week" when the consultation was performed.

It should be noted that:
- "Triage," "booked consults," and "chronic disease / HIV" consults show progressively longer average durations.
- Triage takes approximately 2.5 times longer in for HIV patients.
- Consultations are shorter on Mondays, for all types of professionals (reflecting the pressure from higher numbers of patients).

Average duration of a unit of delivery of care – inpatient care (general ward)

Table R.13 displays the average duration of an episode of care to bedridden patients, and variations according to the type of professional who performs it.

It should be noted that (1) nursing care includes nurses who are part the ward team and nurses who are called episodically, and (2) attendance by clinical officers and physicians includes episodic calls and ward rounds.

Readers should also be reminded that each bedridden patient can benefit from ">1" episode of care during each work shift by each of these professionals.

Table R.13: Average duration of services: general ward - inpatient care (and attended delivery)

	Nurses	*Officers*	*Physicians*
Average duration of "unit of care" to bedridden patient	0:04:33	0:05:07	0:08:37

Table R.13-A displays the average duration of a unit of delivery of care attending deliveries.

The average amount of time invested by an MCH nurse into assisting one delivery was approximately 30-31 minutes. This average duration includes the slots of time used by the MCH nurse since the arrival of the woman, attendance before delivery, and care for the expulsion period (mother and newborn).

Table R.13-A: Average duration of attending a delivery

	MCH Nurses	
Average time for attending to "woman on arrival"	0:05:32	
Average time for care to women already in maternity ward	0:04:32	
Average time for "third period of labor"	0:19:15	
Average time to attend to a delivery	**0:29:19**	**a)**
	0:30:58	**b)**

a) *Sum of the average duration of the three types of care*
b) *Total time (three components) / number of deliveries*

It should be noted that the denominator of the formula for this average is the number of events of "third period of labor – expulsion of the fetus." It has been assumed that:

– Women keep arriving at the maternity ward, during the day and night.
– MCH nurses continue to attend the women who are already within the maternity ward, until they reach the "third period of labor" and give birth.
– During the hours that the collectors made their observations, the MCH nurses attended "new arrivals" and "women already admitted" whose deliveries occurred after the observation period had ended.

It should also be noted that the average duration of delivery attendance (i.e., the total amount of time that MCH nurses invest in caring for each woman inside the maternity ward until she gives birth) may be an underestimation, because: (1) the frequency of the "third period of labor" seems to be higher during the day than during the night, and therefore (2) if the denominator for the average is the "number of events" of "third period of labor" and such number is higher during the day, then the "time recorded for observed activities" is divided by a number of births that is higher than the average for 24 hours.

It should be noted that the amount of time that MCH nurses devote to caring for women waiting for delivery is limited. Table 14-A shows that MCH nurses allocated to the maternity ward undertake more MCH consultations than activities aimed at preparing and assisting women to give birth.

Average number of services to patients / users performed for each type of professional, during a day / shift at work

This section of the "Results" displays the set of daily activities of the various types of professionals at each point of service. Clinical professionals in particular—nurses, MCH nurses, clinical officers, and physicians—perform various types of services during the day, either in the outpatient sector, or attending to calls to other points of service within the facility.

The following tables only cover the services to patients / users and do not display the numbers of non-clinical activities.

Table R.14 displays the numbers of various types of services performed daily by MCH nurses, when they are located in the ambulatory MCH section. Table R.14 also displays the variation in the total number of attendances by the maternal and child health nurse (MCHN) (ambulatory), according to the type of facility, whether it is the first or second day of observation, and whether it is a Monday, or another day of the week.

Table R.14: Average number of services by MCH Nurses, ambulatory MCH

		# Healthy Child	# Child at Risk	# Women Health	# Other consults	Calls to maternity ward	Total
MCH Nurse assigned to ambulatory MCH		7.5	6.4	10.7	10.9	0.4	**35.8**
		21%	18%	30%	30%	1%	

		Rur I	Rur II	Urb A	Urb B	Urb C	Total
MCH Nurse assigned to ambulatory MCH	Day 1	32.4	35.1	58.8	29.0	28.8	**38.1**
	Day 2	25.9	28.4	58.3	24.0	24.6	**33.4**
	Monday	n/a	40.0	n/a	n/a	39.5	**39.8**
	Another day	29.6	30.8	58.6	26.5	22.7	**35.5**
	All days	**29.6**	**31.8**	**58.6**	**26.5**	**26.4**	

It should be noted that for the MCH nurses observed:

- Approximately 30% of their activity was related to "other consults" (non MCH-related), which may reflect the absence of other cadres in smaller rural facilities.
- Their workload is higher in large Urban facilities (Type A).
- They have a higher workload on Mondays.
- They attended to lower numbers of clients on the second day of observation.

Table R.14-A displays the numbers of various types of services performed, by MCH nurses, during the period under observation, when they are located in the maternity ward.[30]

Table R.14-A: Average number of services by MCH Nurses assigned to the maternity ward

		# Deliveries (a)	# Gynecology emergencies	#Cons. Child Health	#Cons. women health	#Other activities in maternity	#Other consults	Total
MCH Nurse assigned to maternity ward		5.1	2.1	2.9	4.0	1.7	16.6	**32.4**
		16%	7%	9%	12%	5%	51%	

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[30] MCH Nurses stationed in the maternity may perform ambulatory types of services, either because that is the way work is organized in the facility or because they have free time and decide to help their colleagues. In some cases, these MCH consultations may be provided within the physical space of the maternity building.

It should be noted that:

– MCH nurses assigned to maternities (usually in large Rural facilities Type I) seem to allocate a reduced amount of time to activities within Maternity and avail of time for various other ambulatory activities. This should be read in connection with Table 13-A, which displays the short time devoted to assist to women for birth.
– This ambulatory activity encompasses "other types of consults" besides MCH.

Table R.15 displays the numbers of various types of services performed daily by nurses when they are located in the ambulatory care/outpatient department (OPD) sector.

Table R.15: Average number of services by nurses assigned to ambulatory OPD

	# child visits	# Women Health	# Triage	# booked Cons / Chron. Dis. / HIV	# ambulatory nursing care	# calls emer. room	# calls ward	*Total*
Nurse assigned to OPD consults	0.2	0.0	56.1	3.5	0.8	0.4	0.0	**61.1**
	0.3%	0.0%	91.9%	5.7%	1.3%	0.6%	0.0%	

		Rur I	*Rur II*	*Urb A*	*Urb B*	*Urb C*	*Total*
Nurse assigned to OPD consults	Day 1	56.5	54.4	n/a	n/a	98.0	**59.2**
	Day 2	97.3	43.8	n/a	n/a	74.0	**62.9**
	All days	**81.0**	**49.5**	n/a	n/a	**86.0**	

Table R.15 also displays the variation in the total number of attendances by nurses, according to (1) the type of facility, and (2) whether it was the first or second day of observation.

It should be noted that nurses assigned to OPD:

– Undertake a higher number of services than the MCH nurses, although they devote a similar number of hours (daily) to clinical work (Table R.7).
– Their main activity is triage.

The nurses stationed in the general ward team performed, on average, during the period under observation, 15.8 attendances of bedridden patients and 8.1 attendances in ambulatory care.

	# care to in-patients	# OPD consults	*Total*
Nurse assigned to General Ward	15.8	15.8	**23.9**
	66.0%	34.0%	

Table R.16 displays the numbers of various types of services performed daily by clinical officers (*técnicos e agentes de medicina*), and the variation in the "total number of attendances," by:

– The type of facility.
– Whether it was the first or second day of observation.
– Whether they took place on a Monday, or another day of the week.

Table R.16: Average number of services by Clinical Officers

	# Child visits	# Women Health	# Triage	# booked Cons / Chron. Dis. / HIV	# calls emer. room	# calls ward	Calls to Maternity	*Total*
Clinical Officers	1.7	0.0	52.2	7.9	0.4	0.5	0.2	**63.2**
	2.7%	0.1%	82.6%	12.5%	0.6%	0.8%	0.3%	

		Rur I	*Rur II*	*Urb A*	*Urb B*	*Urb C*	*Total*
Clinical Officers	Day - 1	57.1	64.0	78.5	53.3	58.7	**60.3**
	Day - 2	57.3	70.9	92.5	49.7	83.7	**66.2**
	Mondays	61.0	107.3	n/a	n/a	73.0	**82.6**
	Other days	56.6	56.5	85.5	51.5	70.8	**60.1**
	ALL days	57.2	67.4	85.5	51.5	71.2	

It should be noted that clinical officers:

– Have a higher workload than nurses (and MCH nurses) and they spend more hours daily on direct clinical work than do the other two types of professionals (Table R.7).
– Their main activity is the triage.
– Their workload can be extremely heavy in small Rural facilities - Type II (on Mondays), and in large Urban facilities (Type A).

Table R.17 displays the numbers of various types of services performed daily by physicians.

Table R.17: Average number of services by physicians

	# child visits	# Women Health	# Triage	# booked Cons / Chron. Dis. / HIV	# calls emer. room	# calls ward	Calls to maternity	*Total*
Physicians	0.0	0.2	0.4	17.3	0.4	2.3	1.1	**22.0**
	0.0%	1.1%	2.0%	79.0%	2.0%	10.6%	5.2%	

It should be noted that physicians' main activities are the "booked consults / chronic disease – HIV" and that they have a smaller daily clinical workload than the other cadres.

Table R.18 displays the numbers of various types of services performed daily by laboratory and pharmacy professionals, as they are recorded in the statistics books of each sector.[31]

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[31] When comparing the numbers in Table R.18 with those in Tables R.20 and R.21, it must be noted that the latter two tables display the observations recorded by the data collectors during approximately 50% of the working day of these professionals, as observed during alternate 10-minute slots.

Table R.18: Average number of services by laboratory and pharmacy professionals

	Rur I	*Rur II*	*Urb A*	*Urb B*	*Urb C*	*Total*
# Attendances to patients, laboratory *(a)*	59.4	59.1	48.2	8.5	16.6	**51.3**
# Clinical attendance, pharmacy *(b)*	101.9	129.6	89.7	29.6	214.7	**109.5**

(a): includes collecting samples, attending patients, preparing and undertaking instrumental processing
(b): includes dispensing medicines to patients and responding to requisitions from within the facility

It should be noted that the number of patients attended in the pharmacy is larger than in the laboratory. However, Table R.21 also shows that "dispensing drugs" is the major task of the pharmacy staff, and this task is dealt with very quickly.

An indirect indicator of the quality of services: the number of procedures and the average duration
Table R.19 displays both the average number of procedures and the average duration for the various types of services – consultations. It can be forecast that types of consultations that demand higher numbers of procedures will also be those with the longer duration.

Table R.19: Quality of the consultations: number of procedures and duration

	Average # components	*Average duration*
Healthy Child consult	3.1	0:01:33
Child at Risk consult	5.7	0:08:24
Child vaccination / weighing	3.7	0:02:00
Antenatal visit	6.8	0:07:37
Postnatal visit	5.1	0:04:47
Family Planning consult	4.5	0:03:51
Gynecology consult	3.9	0:05:14
Triage	4.6	0:03:02
Booked consult	5.2	0:07:10
Chronic Disease / HIV Consult	7.1	0:08:50

It should be noted that there seems to be an association between the higher number of procedures undertaken during the booked consults, chronic disease, Child at Risk, and antenatal consultations, with their longer duration, when contrasted with healthy child and vaccination consultations, which are dealt with quickly and include procedures. It is worrying to note the short duration and fewer procedures for family planning consultations.

Laboratory and pharmacy
The reader should note that the professionals in these two sectors were not observed in a continuous mode but on alternate periods of 10 minutes each, during their presence in the facility. As these

professionals were observed from their time of arrival to time of departure, it is presumed that they have performed tasks with approximately the same frequency and duration as tasks that were recorded during the periods of direct observation.

Table R.20 displays the frequency and the average duration of the activities performed by the laboratory professionals, during the periods of observation (10-minute slots, alternated).

Table R.20: Frequency of undertaking component tasks – laboratory

	# times the task is undertaken	% task observed over # total of observations *(a)*	Average duration
Reception to patients	343	11.1%	0:00:47
Sample collection	363	11.7%	0:01:07
Preparing materials for processing	230	7.4%	0:01:15
Instrumental processing	289	9.3%	0:02:52
Providing information to patients / accompanying relatives	190	6.1%	0:00:55
Communication with other staff	290	9.4%	0:01:12
Moving between work sites in facility for sample collection / collecting orders	9	0.3%	0:04:05
Noting – filling data, stats, supply requests	346	11.2%	0:16:15
Cleaning, sorting, maintenance	44	1.4%	0:02:59

(a) Another 33% of observations for "no work"

The tasks most frequently observed among laboratory professionals were those directly related to attending patients.

Table R.21 displays the frequency and the average duration of the activities performed by the pharmacy professionals during the periods of observation (10-minute slots, alternated).

Table R.21: Frequency of undertaking component tasks – pharmacy

	# times the task is undertaken	% task observed over # total of observations *(a)*	Average duration
Dispensing medicines to patients	2616	42%	0:01:03
Providing information to patients / relatives	780	12%	0:00:32
Preparing medicines for orders from within the facility	36	1%	0:02:32
Moving within the facility to collect orders / pick prescriptions	30	0%	0:02:23
Bringing medicines from the warehouse to the dispensing counter	68	1%	0:01:38
Daily organization of shelves	241	4%	0:03:02
Communication with other staff	724	12%	0:01:00
Noting: filing data, stats, supply requests	538	9%	0:01:42
Cleaning, sorting, maintenance	102	2%	0:01:22

(a) Another 35% of observations for "no work"

It should be noted that the tasks most frequently observed among pharmacy professionals were those directly related to attending patients: dispensing medicines and providing information. The duration of these tasks seems short, particularly informing HIV-positive patients properly. However, Table 3 suggests that 80% of patients attended in the pharmacy come from triage, approximately 80% of the consultations.

ANALYSIS OF FACTORS INFLUENCING THE PRODUCTIVITY OF PROFESSIONALS

The preceding section—"Utilization of time by the professionals"—presents data about the utilization of time (clinical work, non-clinical work, and time without work) and the number of users attended per day (which must be combined with the average duration of each type of service). This group of data can be referred to as "productivity." This section includes information about the factors that can influence the productivity of the professionals.

The data collected for the study were analyzed to respond to the following specific objectives:

– Whether the presence and variety of tasks of the support staff influence the distribution of professionals' time among clinical work, mon-clinical work, and time without work.
– Whether the presence and variety of tasks of the support staff influence the number of users attended by each professional.
– The characterization of "non-clinical work" in (a) organization of the workplace, (b) consultation with co-workers, (c) health information, (d) meetings, (e) statistics and record-keeping, (f) training.

– The characterization of "time without work," including (a) waiting without work, (b) personal issues (non-entitlements), (c) entitlement breaks.
– The frequency of interruptions, expressed as (a) daily number of work interruptions, (b) probability of interrupting an attendance.

Logical framework for the analysis

The support staff

Traditionally, the Mozambican National Health Service usually has had a limited number of professionals, and it has delegated simple tasks to less qualified staff or non-qualified workers. Some of those "simple" tasks are actually tasks that must be done by the clinical professionals if support staff is absent, including checking the date of the appointment, transmitting information about compliance with prescribed medicines, and weighing or measuring blood pressure.

Thus, the presence of (and realization and tasks by) the support staff can allow the clinical staff to concentrate on the attendance of patients: consequently, the clinical staff could waste less time doing non-clinical tasks and deliver their services to more patients.

Interruptions

The occurrence of interruptions during the rendering of clinical care can reduce the quality of care rendered.[32] Too many interruptions can artificially extend the length of appointments with the clinician and also increase patients' waiting time. In addition, some types of interruptions (for example, organization of the workplace) suggest deficiencies in the health center's internal organization that force the professional to suspend service delivery.

Another set of tables with descriptive statistics about this section is in Annex 8.

Presence of support staff and use of time by the clinical professionals

Support staff were available in 92% of the observed work stations. But in 65% of the cases, support staff executed too few tasks to alleviate the work of the clinical professionals.

The following statistics are of interest (Table R.22):

– The presence of support staff improves the utilization of the time of the clinical officers, who can invest more time in clinical work and attend to more patients.
– The uptake of more tasks by the support staff improves the utilization of physicians' time.

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[32] In the literature about quality in health care, interruptions during the attendance of patients are cited as affecting the continuity of information and observation linkage in the professional's brain. This is why, after each interruption, the professional loses time trying to remember the information already collected earlier in the appointment.

Table R.22: Presence of support staff and utilization of time by clinical professionals

Clinical Officers	With support staff	Without support staff
Time spent on clinical work	4:08:36	2:29:03
Time spent on non-clinical work	1:08:15	2:29:48
Time without work	1:42:25	2:34:54
Number of patients / day	52	46

Physicians	> 50% of tasks	<50% of tasks
Time spent on clinical work	3:15:53	2:48:36
Time spent on non-clinical work	1:29:57	3:01:33

However, "time without work" may increase when support staff carry out a high number of clinical support tasks; this may confound other factors that influence the use of clinical staff time.[33]

The characterization of "time without work"

There are interesting differences among the professional cadres in how time without work is spent (Table R.23):

- Physicians and nurses spend a large portion of time dealing with "personal issues."
- MCH nurses and clinical officers spend a large portion of time "waiting without work."

Table R.23: Characterization of "time without work" among the different types of clinical professionals [34]

	Physicians	MCH Nurses	Nurses	
Personal matters	1:02:24	0:34:54	1:01:41	0:33:38
Regular breaks	0:06:25	0:08:53	0:12:46	0:16:42
Waiting without work	0:21:40	0:49:08	0:43:29	0:59:41
Unexplained absence	0:00:00	0:00:00	0:00:42	0:00:38
Total time without work	1:30:29	1:32:54	1:58:38	1:50:39
Personal matters, as % of time with no work	69%	38%	52%	30%
Waiting without work, as % of time with no work	24%	53%	37%	54%

Annex 3 displays the variations in "time without work" across the types of health centers where the various types of professionals were observed.

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[33] When dealing with causality, in Biostatistics, the term "confounding" is used to describe situations where two variables (independent – causal) have simultaneous influence on a third variable (dependent – effect).

[34] The values in Table R.23 represent "the average quantity of time spent in one type of activity" during "**one day**" of professional observation. For example, the nurses spend 43.29 minutes "waiting without work" during **one day**. It cannot be interpreted as "*Each time* that one nurse waits without work, that waiting time lasts for 43.29 minutes."

The specific case of "time waiting without work"

The time spent while "waiting without work" deserves special attention, particularly among clinical professionals, who are not responsible for the "waste" of their time caused by poor organization of service delivery.

The frequency of these "time losses" was analyzed in two periods of day: "before" and "after" 11:00am. This division was suggested by the observation in the health facilities covered by the study that at the end of the morning, the professionals do not leave the health facility, but there are large intervals between the clients. That contrasts with the great crowd of clients who receive services in the beginning of the day, which contributes to the short average duration.

Table R.24 shows that:

‒ The episodes of "waiting without work" occurred mainly in the period "after 11:00am," and more time was wasted during this period.
‒ The waste of more time with unproductive waiting after 11:00am is also motivated by the large average duration of the episodes of "waiting without work" after 11:00am.

These results underline the importance of improving the organization of various service delivery sectors within the health facilities in order to obtain better quality and more efficiency with the available human resources.

Table R.24: "Waiting without work": high frequency and duration after 11:00am

	After 11am		Average duration of "waiting without work"	
	% of # episodes of "waiting without work"	% of time spent waiting	Before 11	After 11
Physicians	66%	71%	0:13:20	0:16:56
MCH Nurses	83%	92%	0:09:59	0:23:54
Nurses	84%	94%	0:07:04	0:22:51
Clinical Officers	75%	91%	0:09:29	0:30:40

The characterization of time on "non-clinical work"

The types of activities included in "non-clinical work" are described below. The following were studied separately: (a) the four types of clinical professionals (observed in "continuous mode"), and (b) the laboratory and pharmacy professionals (observed in the "work-sampling" mode).

Physicians, nurses, clinical officers, and MCH nurses

Table R.25 summarizes the time spent in the main activities that do not belong to "direct service delivery to users." Tables R.26 and R.27 display details about the variation in these types of time loss in different types of HFs. It is worth noting that:

- Physicians spend a considerable amount of time on "consulting with other professionals" and "meetings."
- This type of physicians' activity consumes more time in rural facilities.
- Nurses spend a considerable amount of time on "statistics and reports."[35]
- MCHN spend considerable time in the "organization of the workplace" and "statistics and reports" (always between 0.5 and 1 hour, in different types of HFs).
- The observed level of time spent by MCHN on "organization of the workplace" may have been influenced by service delivery in maternity wards; Table R.26 shows that this type of activity consumes more time in HFs with maternity homes (Rural HC I and II and Urban HC A).

Clinical officers are the ones who spend less time on "statistics and reports."

Table R.25: Characterization of "non-clinical work," among different types of clinical professionals

In all types of health facilities	*Physicians*	*Nurses*	*Clinical Officers*	*MCH Nurses*
Organization of the work space	0:22:45	0:29:52	0:34:53	0:52:09
Consultation with other professionals	0:34:09	0:16:32	0:16:05	0:17:14
Health education	0:01:08	0:02:51	0:01:12	0:01:38
Meetings (inside/outside the HF)	0:47:37	0:06:13	0:10:53	0:11:58
Statistical reporting	0:28:37	0:40:14	0:08:14	0:42:01
Teaching (professor/student)	0:09:03	n.a.	n.a.	0:01:35
Other	0:12:03	0:14:34	0:09:49	0:15:33
Total	2:35:22	1:50:16	1:21:07	2:22:09

Table R.26: Detail about the "non-clinical work": time spent in the "organization of the workplace," in different types of health centers

	Rur I	*Rur II*	*Urb A*	*Urb B*	*Urb C*
Physicians	0:20:47	0:19:50	0:27:15	0:14:14	0:23:05
Nurses	0:13:47	0:31:32	n.a.	n.a.	0:59:17
Clinical Officers	0:34:30	0:42:20	0:24:17	0:36:20	0:25:38
MCH Nurses	0:52:42	0:57:02	1:05:15	0:37:44	0:27:06

Table R.27: Detail about the "non-clinical work": time spent in "statistics and reports," in different types of health centers

	Rur I	*Rur II*	*Urb A*	*Urb B*	*Urb C*
Physicians	0:26:17	1:44:41	0:07:28	n.a.	1:14:01
Nurses	1:01:57	0:34:36	n.a.	n.a.	0:22:30
Clinical Officers	0:07:28	0:12:54	0:15:07	0:02:30	0:01:43
MCH Nurses	0:26:35	1:01:55	0:40:05	0:42:31	0:32:07

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[35] It is noted that professionals spend another part of their time on tasks related to recording clinical information, which is included in the "tasks-components" of each activity and is counted under "time on clinical work." See the following section about "Quality."

Laboratory and pharmacy professionals

Table R.28 shows that pharmacy professionals spend more time in "non-clinical work" than their colleagues in laboratories.[36]

Table R.28: Characterization of "non-clinical work," among laboratory and pharmacy professionals

	Laboratory	*Pharmacy*
Consultation with other professionals	0:19:40	0:31:26
Movements within the health facility to deliver products and collect samples	0:01:42	0:02:59
Organization of the work space	0:08:39	0:22:46
Statistical reporting	0:34:33	0:42:51
Cleaning, classification, maintenance	0:07:07	0:05:10
Daily tidying up of stocks and shelves	n.a.	0:36:25
Total time on non-clinical work	1:49:02	3:06:49

Table R.29 displays details about the variation in the time spent in "Consultation with Other Professionals" and "Statistics and Reports," in different types of HFs. These activities take more time from laboratory and pharmacy professionals in the larger health facilities.

Table R.29: Details about the "non-clinical work" for laboratory and pharmacy professionals: variation according to the type of health center

Consultations with other professionals	*Rur I*	*Rur II*	*Urb A*	*Urb B*	*Urb C*
Laboratory	0:23:32	0:09:29	0:21:27	0:09:25	0:11:28
Pharmacy	0:42:23	0:12:38	0:35:37	0:05:20	0:15:24

Statistical reporting	*Rur I*	*Rur II*	*Urb A*	*Urb B*	*Urb C*
Laboratory	0:49:04	0:20:16	0:23:28	0:26:41	0:24:53
Pharmacy	0:59:45	0:14:24	0:39:14	0:08:36	0:49:21

Interruptions: frequency and characterization

The average frequency of interruptions, per day of work, is displayed in Table R.30. The most frequent causes of interruptions across the four types of professionals are:

– The organization of the workplace, including the seeking of materials and organization of the queue of user.;
– Consultation among professionals.
– Personal issues.

On average, the activity of each professional is interrupted between 30 to 40 times per day of work.

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[36] Pharmacy technicians in the must manage the local stocks (and their tidiness), as well as the formalities of requisitions and receiving supplies of medicines.

Table R.30: Most frequent causes of work interruption

In one day of work	Physicians	MCH Nurses	Nurses	Clinical Officers
Urgent call to attend a patient in another service point	0.05	0.06	0.06	0.06
Helping other professionals with clinical work	2.29	3.05	2.21	2.37
Consultations with other professionals (including at the phone)	8.52	8.51	7.06	4.39
Teaching (professor/student)	1.33	0.94	0.09	0.00
Collective health education	0.05	0.08	0.12	0.04
Meetings (inside/outside the HF)	1.24	0.28	0.21	0.22
Organization of the work space	6.71	13.51	10.38	8.02
Waiting without work	1.38	2.28	2.15	2.35
Personal matters	6.67	8.13	7.79	9.33
Unexplained absence	0.00	0.00	0.03	0.06
Other	2.19	4.43	2.56	2.82
Total # of interruptions / day of work	30.43	41.27	32.65	29.67

Table R.31 shows the probability of interrupting an appointment.

The probability for interruption is higher in physicians' appointments, probably because the interruptions happen during the lower daily number of appointments for physicians compared to other clinical professionals. The probability of the occurrence of the various types of interruptions during the activity of the physicians follows the same sequence as the frequency shown in Table R.30, above:

– It is not surprising that "consultation with other professionals" becomes the most frequent cause of interruption of the physicians' activity, since they are the "technical reference" within a HF.
– On the other hand, the interruptions for "organizing the workplace" are worrying because they suggest a less efficient utilization of the time of this scarce professional.

Table R.31 also suggests that:

– An interruption can occur in almost every service rendered by a nurse.
– Half of the services rendered by clinical officers and MCH nurses may be interrupted.
– Each medical appointment is interrupted, on average, 1.5 times.

Table R.31: Probability of interruptions of an appointment, for each type of professional

During one consultation	Physicians	MCH Nurses	Nurses	Clinical Officers
Urgent call to attend a patient in another service point	0.2%	0.1%	0.2%	0.1%
Helping other professionals with clinical work	11%	4%	6%	5%
Consultations with other professionals (including at the phone)	41%	10%	21%	9%
Teaching (professor/student)	6%	1%	0%	0%
Collective health education	0.2%	0.1%	0.3%	0.1%
Meetings (inside/outside the HF)	6%	0%	1%	0%
Organization of the work space	32%	16%	31%	16%
Waiting without work	7%	3%	6%	5%
Personal matters	32%	9%	23%	18%
Unexplained absence	0.0%	0.0%	0.1%	0.1%
Other	10%	5%	8%	6%
Probability of interruption in one consultation	145%	48%	96%	58%

As for the laboratory and pharmacy professionals (Table R.32):

– The daily frequency of interruptions is higher among the laboratory professionals.
– Laboratory professionals display a higher frequency of interruptions for "consultation with other professionals" and "organizing the workplace."
– The interruptions due to "other / personal" motives are the most frequent in the two groups of professionals.

Table R.32: Most frequent motives for interruptions of the work of laboratory and pharmacy professionals

In one day of work	Pharmacy technician	Laboratory technician
Consultation with other professionals	6.0	3.6
Helping other professionals with clinical work	1.5	1.2
Urgent call to attend a patient in another ward	0.2	0.4
Organization of the work space	9.2	3.7
Collective health education	0.1	0.1
Teaching (professor/student)	0.1	0.1
Meetings (inside/outside the HF)	0.6	0.5
Professional preparing to leave	0.4	3.2
End of the day	0.6	1.3
Other / personal matters	12.4	8.6
Total # of interruptions / day of work	31.1	22.6

QUALITY OF SERVICES: FREQUENCY INDICATOR FOR MINIMUM COMPONENTS

Logical framework for the analysis

The quality of health care can be measured by indicators for resources, processes, and results. In the case of the Time and Motion Study, collectors gathered data for process indicators.

During the observation and time-measuring of the clinical activities of the professionals, the tasks that the professionals carried out while attending to each user were recorded. For each type of "appointment," simple lists containing "minimum procedures" were defined for the rendering of each type of service. Some minimum components are "absolute": for example, the undertaking of a "physical examination" is indispensable in any appointment. In other cases, the "component" is an indication; it is expected that in an antenatal appointment a higher frequency of "dispensing of medicines and products" (for example, nutritional supplements and prophylactic medication) will be observed, if compared with an outpatient curative appointment.

The following types of services were chosen to exemplify the fulfillment of those "lists of minimum procedures":

- Maternity home: on arrival of an expectant mother.[37]
- Triage and booked outpatient curative appointments.
- Antenatal appointment.
- Healthy child visit.
- Appointments for children at risk.

Another set of tables with descriptive statistics about this section is in Annex 8.

The results regarding this text section were stratified by:

- Type of health center and presence or absence of a laboratory: those facilities "without a laboratory" are usually the small facilities located at the periphery of the National Health Service.[38]
- Type of professional.

Maternity home: arrival of an expectant mother

Table R.33 shows that some minimum components are carried out with low frequency:

- The opening and registration of a partograph.[39]
- Obstetric examination, in the small peripheral health centers.
- Instructions to the support staff, who, in many cases, ensure the continuity of the monitoring and support to the expectant mother.

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[37] The moment of the arrival of the "expectant mother" was chosen to express the accuracy in the screening of obstetric complications in expectant mothers, who usually arrive late at the HF.

[38] The criterion of the "presence of a laboratory" simplifies the distinction of the frequency of tasks related to the laboratory: When "there is no laboratory," in a small peripheral health center, there are fewer prescriptions, and more rapid diagnostic tests are undertaken by the clinical professionals. Some laboratory tests are minimum components of certain types of services.

[39] The frequency of "0" of this component in peripheral small Health Centers must be interpreted cautiously; fewer than 10 childbirths were observed in this type of Health Center.

– Preparation of MCH nurses for infection protection, which is a concern as obstetric examinations are undertaken so frequently.

Table R.33: Frequency of realization of minimum components of attention at the arrival of an expectant mother at a maternity home

	All health facilities	*Large health facilities*	*Small health facilities (no lab)*
Support to the expectant mother (walking, hygiene, information, etc.)	26%	31%	18%
Collecting specimens for laboratory	3%	4%	0%
Communication with expectant mother & family	82%	88%	82%
Nursing care / medication / reanimation / vital signs / transfusion	33%	19%	73%
Instructions to support staff	10%	12%	9%
Clinical / obstetrical observation	90%	96%	82%
Partograph: new / consulting / updating	51%	69%	0%
Preparation of materials for delivery	0.0%	0.0%	0.0%
Preparation of the MCH Nurse (gown, gloves, etc.)	77%	88%	55%

Triage

Table R.34 shows that some minimum components are carried out with low frequency:

– Physical examination.
– Instructions to the user.
– Infection prevention.

It should also be noted that the low frequency of prescribing medicine does not match the common image that a quick appointment at the triage is accompanied, almost every time, by a prescription.

Table R.34: Frequency of the undertaking of minimum components at triage

	Clinical Officers	*Nurses*
Clinical record: new / consulting / referral note	38%	34%
Clinical history and symptoms (conversation with the patient)	82%	87%
Physical examination	23%	25%
Check laboratory test results / X rays	25%	24%
Laboratory tests / X rays: prescription for laboratory / referral to hospital	10%	8%
Laboratory tests: local RDT / specimen collection for the lab	19%	21%
Prescription of medicines	69%	52%
Handing out medicines /other products	12%	27%
Consultations with other professionals	2%	2%
Instructions to patient or relative (at the end of consult)	71%	73%
Data recording (books, computer); scheduling next appointment	82%	86%
Prevention of infections (hands, gloves, etc.)	1%	2%

Booked medical appointments, including for chronic patients / HIV / TB

Table R.35 shows notable differences between triage and the booked appointment, although it also shows that some minimum components are carried out with low frequency, even by physicians:

– Physical examination.
– Recording notes from the appointment.
– Instructions to the user.
– Infection prevention.

The fulfillment of the minimum procedures can be particularly low among clinical officers. For example, the physical examination was carried out in only 27% of the appointments.[40]

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[40] Table A.11, in Annex 3, compares the frequency of the realization of these minimum components by the medical technicians, at the triage and at the booked appointments. It is notable that there are few differences: there is more care only with the reading of the information that is already recorded in a clinical file, more frequency of medicine prescription, and instructions to the user (at the end of the appointment).

Table R.35: Frequency of the undertaking of minimum components at the booked appointments

	Physicians	*Clinical Officers*	*Nurses*
Clinical record: new / consulting / referral note	89%	77%	82%
Clinical history and symptoms (conversation with the patient)	91%	91%	92%
Physical examination	67%	27%	41%
Check laboratory test results / X rays	12%	6%	12%
Laboratory tests / X rays: prescription for laboratory / referral to hospital	30%	13%	26%
Laboratory tests: local RDT / specimen collection for the lab	2%	6%	15%
Prescription of medicines	73%	85%	66%
Handing out medicines /other products	12%	9%	38%
Consultations with other professionals	2%	5%	5%
Instructions to patient – relative (at the end of consultation)	85%	81%	95%
Data recording (books, computer); scheduling next appointment	83%	83%	93%
Prevention of infection (hands, gloves, etc.)	12%	1%	0%

Antenatal appointment

Table R.36 shows that some minimum components are carried out with low frequency:

– Check the clinical file or antenatal file.
– Physical examination.
– Weighing.
– Recording of notes from the appointment.
– Instructions to the user.
– Infection prevention.

Table R.36: Frequency of undertaking of minimum components at the antenatal appointments

	All health facilities	Large health facilities	Small health facilities (no lab)
Clinical record: new / consulting / referral note	71%	64%	85%
Clinical history and symptoms (conversation with the patient)	92%	92%	91%
Physical examination	79%	78%	77%
Checking results from laboratory tests / X-rays	10%	9%	10%
Counseling for HV testing	10%	4%	22%
HIV lab test: RDT by MCH Nurse + other lab tests: specimen collection by MCH Nurse	32%	26%	41%
HIV lab test: RDT by MCH Nurse	11%	8%	16%
Other laboratory test: collection of sample by the MCH Nurse	10%	11%	8%
HIV laboratory test: prescription for the laboratory	9%	10%	7%
Other laboratory tests: prescription for sample collection in the laboratory	8%	9%	6%
Weight measurement	41%	42%	30%
Height measurement	18%	12%	24%
Prescription of medicines	16%	15%	15%
Handing out medicines / other products	67%	65%	69%
Instructions to patient or relative (at the end of consult)	83%	85%	77%
Data recording (books, computer); scheduling next appointment	72%	68%	77%
Prevention of infections (hands, gloves, etc.)	11%	13%	6%

Healthy child visits

Table R.37 shows that some minimum components are carried out with low frequency:

- Checking the file / growth card.
- History of the child / communication with the mother.
- Screening of intercurrent diseases.
- Vaccines.
- Control of weight and height.
- Instructions to the user's mother.
- Infection prevention.

The discrepancy is noted between the recording of data (more than 90% of appointments) and the checking of those very same records when the child returns for an appointment (60%).

Child at risk visits

Table R.38 shows that the appointments for children at risk involve more components than the appointments for healthy children, but some minimum components are carried out with low frequency:

- Control of weight and height.
- Physical examination and evaluation of nutritional status.
- Instructions to the user's mother.
- Infection prevention.
- Specific communication with the user's mother about HIV.

Table R.37: Frequency of realization of minimum components at the Healthy Child appointments

	All health facilities	Large health facilities	Small health facilities (no lab) (a)
User record book: Child Health book (weight, height, vaccines)	60%	60%	100%
Weight and height measurement	56%	57%	0%
History (talking to mother – guardian): child growth	22%	21%	83%
Physical examination / nutritional status / screening other issues	8%	8%	50%
Vaccines: preparation; delivery	2%	2%	0%
Prescription of medicines / supplements	5%	5%	0%
Handing out medicines / other products	6%	5%	33%
Instructions to mother – guardian + IEC (at the end of visit): schedule next appointment	52%	52%	83%
Record of observations (book, computer, vaccination card)	94%	94%	67%
Prevention of infections (hands, gloves, etc.)	0%	0%	0%

(a) A very small number of health facilities of this type was observed.

Table R.38: Frequency of undertaking of minimum components in the appointments for Children at Risk

	All health facilities	Large health facilities	Small health facilities (no lab)
User record book: Child Health book (weight, height, vaccines)	86%	84%	88%
Weight and height measurement	23%	16%	32%
History (talking to mother – guardian): child growth, nutrition, disease	76%	71%	82%
History (talking to mother – guardian): mother's health (HIV / TB)	51%	44%	61%
Physical examination / nutritional status	34%	22%	50%
HIV+ mother: counseling + child tests (local RDT / prescription for lab)	18%	14%	27%
Malaria test (local RDT / prescription for lab)	6%	6%	6%
Vaccines: preparation; delivery	1%	2%	0%
Prescription of medicines / other products	74%	70%	79%
Instructions to mother – guardian + IEC (at the end of visit): schedule next appointment	72%	67%	81%
Prevention of infection (hands, gloves, etc.)	11%	11%	12%

V COMMENTS AND DISCUSSION

SAMPLE CHARACTERISTICS

The numbers and variety of data collected represent the types of facilities, working days (the pressure from queueing users and the behavior of the professionals), types of professionals, and types of services and users.

THE UTILIZATION OF TIME OF PRESENCE IN FACILITIES

The results show that a considerable portion of the time when professionals are present within the facilities is not used for any kind of work, including "time waiting without patients."

The results also show that the time dedicated to direct clinical work with clients varies between three and four hours for the clinical professionals, and approximately 1.75 hours for the laboratory and pharmacy professionals. This amount of time for equivalent professionals per day should be carefully considered when estimating the numbers of professionals needed to meet the growing demand for services in the public health system, at least for the short term.

It is also worth noting that the interval between the time of attendance of the last patient and the time when professionals leave the facilities is significant; it is probable that the professionals stayed in the facility because of the presence of the data collectors. Under normal circumstances, it is not reasonable

to expect that the professionals stay within the facility for so long if there are no more patients to attend.

THE PERFORMANCE OF THE PROFESSIONALS WHILE ATTENDING THE PATIENTS: TIME INVESTED AND COMPLIANCE WITHIN MINIMUM QUALITY PROTOCOLS

The results show that the professionals of the various cadres try to simultaneously manage (1) the pressure caused by the number of patients to attend to, and (2) the need to correctly attend patients with more complex problems. In other words, performance does not depend on the type of professional but is related to the types of services to be rendered. Examples include the following:

- In the services with long patient queues, the professionals (nurses, MCH nurses, clinical officers) undertake rapid services, with fewer procedures. Examples are the Triage, the vaccination / weighing queue, and the healthy child consultation.
- The consultations for chronic diseases / HIV and for children at risk take longer, with more procedures undertaken. It should be noted that consultations for children at risk normally involve children with HIV and their relatives. Table R.19 is quite eloquent in that regard.

It can be inferred that professionals comply with protocols when the type of patient demands it. Motivation interventions might be able to extend such behavior to attending other types of services considered less complex and demanding.

THE INFLUENCE OF HIV STATUS ON DURATION OF ATTENDANCE TO PATIENTS

Following on the previous section, it can be noted that consultations at the service points that are specifically organized for HIV-positive patients have a longer duration, and professionals undertake more procedures with the patients.

A complementary finding is that, according to Tables R.10, R.10-A, and R.12, HIV-positive users attended in antenatal, family planning, and triage consultations have longer consultations than other users (non-HIV) at the same types of consultations.

Data within Table R.11-A on the child-at-risk consultation show that the mother (and/or other relatives of the HIV-positive child) frequently come together to the consultation, which has been designated "family." These consultations also have a higher average duration.

Over and above the longer duration of consults for HIV-positive patients, it should be also noted that nurses and clinical officers allocate more hours to direct work with patients in areas of high HIV prevalence and, conversely, spend less time without work; see tables 7 and 9.

COMPARING LARGE AND SMALL FACILITIES, URBAN AND RURAL

Health professionals, particularly nurses and clinical officers, devote more hours to direct patient care in small facilities. The exception is the MCH nurses in Urban HC Type A, who allocate more time and attend more patients.

Clinical officers attend more patients in Urban HC Type A but do so in less time than when working on Urban HC Type C (small).

The pressure to attend patients also varies, according to type of facility:

- MCH nurses attend more patients in Urban HC Type A.
- Triage is equipped with nurses in Rural HC I, and clinical officers in Urban HC Type A, who have large numbers of consultations. In small Urban HC Type C facilities, triage can be staffed by either nurses or clinical officers, putting high workloads on both of these types of professionals.

No pattern has been shown for higher versus lower workload between urban and rural facilities; it depends on which type of professional is assigned to undertake the triage, who are the professionals with the highest workloads.

LABORATORY AND PHARMACY

Table R.20 shows a low frequency for the activity "sample collection" by the laboratory professionals. The information gathered by the collectors suggests that this is a work management tactic used by the laboratory professionals, who cannot abandon their equipment while the processing of specimens is ongoing to come to the front counter and attend new patients with prescriptions. However, it is worrying that it has been observed that this sample collection is then delegated to students and even ancillary personnel.

Regarding the pharmacy sector, the duration of the activity "dispensing medicines to the patients" is quite low. However, this may be a time management tactic too, since the pharmacy professionals attend to, on average, a higher daily number of patients, and finish attending patients quite late, in comparison with the other professionals in the facility.

It should be noted that the professionals in these two sectors are those who spend the larger portions of their time (1) on non-clinical work (39-40%), and (2) without work (33-35%).

RESULTS OF THE STUDY AND THE PROPOSALS FOR HRH PLANNING

This study was intended to provide information to improve planning and distribution of health professionals at the PHC level. A major concern has been to control the Hawthorne effect on the professionals being observed, that is, to avoid potential changes in behavior due to the presence of the data collectors.

It is certainly possible that the presence of the collectors may have influenced the data collected. However, it should be noted that the performance of the observed professionals, on the second day of observation, showed a lower duration of the consultations, compared with the "first day of observation." This suggests that the observed professionals felt quite at ease with the presence of the collectors and behaved "as usual." Therefore, the data from the "second day of observation" provides a more precise representation of the current performance of these types of professionals in PHC facilities.

The professionals observed in the triage and health child / vaccination services attended to their clients in a very rushed manner, despite the presence of the collectors, suggesting that the pressure from the high number of patients queuing outside was stronger than concerns about being observed.

Some of the results are useful to describe current performance, although this performance is characterized by short duration of visits and poor compliance with protocols (and reduced periods of time used for direct care to patients). Such values should be considered in formulae intended for the distribution of health professionals according to workload, in the short term.

Other results can be more useful for medium-term planning. For example, it can be noted that a greater level of attention (and time) is devoted by professionals to the consultations for children at risk and for

chronic diseases / HIV. These data suggest the average duration for attending such patients with reasonable quality; such figures should be used for medium- to long-term HRH planning.

The low amount of time invested in assisted delivery and inpatient care deserves attention. The number of observations of these two types was limited in this study. This issue deserves a larger sample to help update the factorial that should be used when expressing the equivalent service units commonly used in the process of planning within the Ministry of Heath; it seems that the 12 units assigned to 1 "assisted delivery," as well as the 9 units assigned to 1 "occupied-bed-day," should be adjusted downward for attendances at the PHC level.[41]

The data also suggest that the HRH planning should foresee how an improved organization (and division) of work within the PHC facilities may increase the "% of presence time devoted to clinical work" in order to allow the professionals to attend their clients with greater care and more time.

On a final note, the difference in the duration of consultations for all HIV-positive users suggests that the numbers of professionals needed for high-prevalence areas should be proportionally allocated. In these areas, it is also anticipated that the specific types of consultations for these patients—Child at Risk and chronic disease / HIV—will become proportionally more numerous, stressing again the higher number of professionals needed because of the longer average duration of these specific services.

FACTORS THAT INFLUENCE THE PRODUCTIVITY OF PROFESSIONALS

The detailed analysis of the data collected by the study suggests some statements that can be generalized to the health professionals and to the organization of service delivery at the primary health care facilities:

- The presence of support staff enables the more efficient use of the professionals' time for clinical activities.
- The "time without work" has two major components: the "time waiting without work" and the time spent on "personal issues." The time loss to personal issues, in the case of physicians, is a loss with high financial value, due to the high expenses committed to these professionals in relation to medium-level professionals.
- The time loss to "waiting without work" reflects the discontinuous functioning of the health centers: the majority of these "time waiting" take place after 11:00am. The organization and management of the health centers, particularly the larger ones, could result in more efficient utilization of the professionals and better service quality (which is undertaken within short duration in the first part of the morning).
- The utilization of the time of the professionals in "non-clinical work" reflects common daily tasks for the professionals in health centers: consulting among professionals, meetings, organization of the workplaces, and such tasks as filing data and reports. There are differences among the types of professionals: (a) the physicians, particularly in rural health centers, spend a lot of time in meetings, in addition to necessary consultations with other professionals, (b) nurses and MCH nurses spend more time organizing their respective work-stations and filing data and reports, and (c) pharmacy

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[41] The current definitions for "equivalent service units" at the MOH in Mozambique take into account that assisting a delivery takes 12 times longer than the average duration of an outpatient visit (theoretically, 10 minutes). As a consequence, assisting a delivery should take 120 minutes of staff work-time. A second assumption is that care to an inpatient / day takes 9 times the average duration of an outpatient visit.

professionals spend more time than their laboratory colleagues in various tasks not linked to direct service delivery to patients, with that type of utilization of time more pronounced in larger health centers.

‒ Finally, the activity of the clinical professionals is frequently interrupted, particularly for physicians. The types of interruptions that are more frequent are the ones linked to work (consultation with other professionals and the organization of the workplace), followed by the "personal issues." The activity of laboratory professionals is more frequently interrupted than their pharmacy colleagues.

QUALITY OF THE RENDERED SERVICES: WHAT THE STUDY DATA SUGGEST

The low frequency observed for some minimum components of the services is worrisome because it impacts the quality of services received by the users, as well as the security of those professionals. The disregard for infection protection and prevention measures during service delivery is of particular concern because of high HIV prevalence, with some risk of infection transmission.

The low frequency of conducting physical examinations compromises the quality of the majority of the triage appointments, as well as the impossibility of screening complications in the antenatal and child health appointments.

The manifestations of carelessness during healthy child appointments compromise the strategies and programs that seek to reduce infant mortality. For example, children's health (or disease) backgrounds are rarely discussed with the mother, and the low frequency of physical examinations reduces the chances of screening for disease and malnutrition. This extreme case of low-efficacy child visits—with an average duration of 1.5 minutes—also shows disrespect for the mothers, who invest time and money to travel significant distances and wait for long periods to obtain the service.

The quality of the reception to expectant mothers at the maternity homes is also a concern because partographs may be carelessly prepared and maintained.

There seem to be different levels of perception about the utility of clinical records within defined types of professionals, for example, MCH nurses:

‒ At the healthy child visits, records are taken at almost every visit, but those records are not checked when the child comes back for the next visit.

‒ The same MCH nurse pays much more attention to checking previously recorded data when the pregnant women comes back for the next Antenatal appointment.

Finally, the frequency of communication with the user at the end of the appointment is very irregular. This can compromise, for instance, the compliance with instructions for intake of medicines, or improvement in infant nutrition.

VI LIMITATIONS OF THE STUDY

The main limitations of the study, when contrasted with the stated objectives and hypothesis, are:

‒ The loss for the record of information on short breaks in the utilization of time by the professionals, as has been mentioned in "Methodology – Limitations on "Continuous Observation." However, these

losses for the record rarely occurred during the observation of direct clinical work. It has been assumed that the distribution of time lost for the record between "non-clinical work" and "time without work" is evenly spread throughout the day (including periods of "time lost for the record").

- The limited number of observations for maternity and inpatient care was notable; care for admitted patients is rare in small rural facilities, and the daily number of deliveries is also low, even in the maternities of large rural health centers.
- The observation of laboratory professionals was constrained by similar limitations: many small rural facilities do not have a laboratory, and there were power cuts as well as stockouts of laboratory reagents in the visited facilities during the fieldwork. This limited the number of attendances to patients that could have been observed.
- Very few observations were done on counselors and data typists. This was a result of a decision to allocate the time of the teams of five collectors to pursue the minimum numbers of observations for the other services and professionals. The teams could only rarely afford to allocate one of their members to observe these two types of workers.

ANNEXURE

Annex 1: Names of data collectors

Annex 2: Lists – simplified – of "basic procedures for quality" for each type of service (Excel file)

Annex 3: Confidentiality statements by data collectors and managers (PDF file, attached)

Annex 4: Declaration of conflict of interest of the PI, Jorge Cabral

Annex 5: Data collection instruments, with link to the file with the content of application (see next page)

Annex 6: Biodata for the data collection supervisors

Annex 7: Data on counselors and data typists

Annex 8: Details on productivity and quality

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Link to the data collection tool:

The link to the T-MS data collection tool is for external sharing; it expires on 31 October 2019.

https://collaborativedev.egnyte.com/dl/fe1vaipHyw/Time_and_motion_data_collection_app.apk_

Users will need to use the following credentials:
username: admin

password: admin

ANNEX 1: NOMINAL LIST OF DATA COLLECTORS

- Angelica Tomas David Sotomane
- Anisio Novela
- Carlos da Silva Alberto
- Carlos Daniel Cumbe
- Carmen Ermelinda Fernandes Marcelino
- Elzie J. de C. Mavume
- Faruk Nobre da C. Murucha
- Heleuterio da Conceicao Nicolau Madogolele
- Joao Portela Macuba Junior
- Jorge Humberto Goncalves Marmeleiro
- Lara Cristina Elias de Melo
- Madalena Carmen Imede
- Milton Meneses Manhica
- Pedro Jose Antonio
- Percina da Graca B. Machava
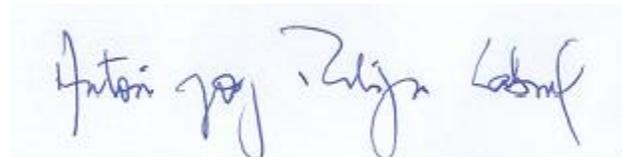- Rafaela I. R. Chambela

ANNEX 4: DECLARATION ON CONFLICTS OF INTEREST

DECLARATION ON CONFLICTS OF INTEREST

I, ANTÓNIO JORGE RODRIGUES CABRAL, as principal investigator in the proposed "Time and Motion study for Primary Health Care in Mozambique," declare that neither myself nor the institution that I work for—ThinkWell—has any individual or institutional interests in the current activities of the National Health System or the Ministry of Health of Mozambique. Neither do we have any interests in the potential utilization of the results of the proposed study.

Maputo, August 24, 2016

………………………………………..

ANNEX 6: BIODATA FOR THE DATA COLLECTION SUPERVISORS

SAVAIVA MENDES DA BARCA MUNGUAMBE, born in 1988, is a medical graduate of the Faculty of Medicine of the Eduardo Mondlane University (2013). He is currently head of the Medical Assistance Department for the Municipality of Maputo. He worked as a district health director for the Nlhamankulu Municipal District (2014-2016) and as a general practitioner in the health centers of Polana Cimento (2013-2014) and Bagamoio Health Center (2013-2014). He has professional experience with planning, management, and evaluation of health programs at the levels of the health center, district, and province in the Municipality of Maputo and has been accumulating experience in the areas of clinical research and health systems, especially in the areas of HIV / AIDS, family planning, drug management, and health personnel.

TAVARES LOPES MADEDE is a Mozambican citizen trained in general medicine who holds a Master of Public Health specializing in development and management of human resources for health. He has eight years of experience in teaching in the fields of community health and biostatistics and more than 12 years of experience in basic and applied research in different social and clinical areas. He has been accumulating experience in multiple activities, such as evaluation, research coordination and implementation, training, and technical assistance for health programs in Mozambique. Over the past seven years he has also been dedicated to research in non-communicable diseases and human resources for health areas, and for the past four years he has managed a distance learning masters' program in public health. He is a trainer of trainers in Leadership, Management, and Governance for health systems strengthening in Africa, and from 2012 to 2016 he was the focal point and coordinator of this training program for African Portuguese- speaking countries.

ANNEX 7: THE UTILIZATION OF TIME BY COUNSELORS AND DATA TYPISTS

Lay counselors and data typists are types of staff working in health facilities that do not yet fit into any formal classification in Mozambique's public health system. They are usually recruited – and their costs are borne – by partner institutions. Nonetheless, their presence is critical for the success of HIV control, since (a) the counselors enhance the potential to screen for HIV as well as enroll patients on ART, and (b) data typists help to improve clinical data recording, which is the basis for monitoring patient status, as well as monitoring and evaluation for the HIV control program overall.

Logistical constraints limited the opportunities for the data collecting teams to observe the activities of counselors and data typists. Therefore, only a limited set of data is available for analysis.

These two types of workers were observed through "work sampling," in facilities where either one or both of the two types of workers were present and active on the days of observation of the other clinical and laboratory-pharmacy professionals.

Table 7.1: Numbers of counselors and data typists observed, by type of facility and province

	Rur I	*Urb B/C*	*Total*
Counselors	3	2	5
Data typists	3	4	7
	Zambézia	**Gaza**	**Maputo**
Counselors	1	4	0
Data typists	1	4	2

These two types of workers stayed in the facilities for approximately seven hours daily, and the time for observation of their activity covered approximately five hours and 40 minutes. The ways in which they used their time was quite different, as displayed in the table below.

It is interesting to note that counselors have a flow of clients through the morning that mimics that of the clinical professionals: periods of "waiting without work" are common after 11:00am, which may contribute in large part to their "time without work."

Table 7.2: The utilization of daily time, by counselors and data typists observed

	Chronometered time			
	Total time stay facility	**Direct work with patients**	**Other work**	**No work**
Counselors	7:01:15	2:06:46	1:10:03	2:06:08
Data typists	7:19:44	0:00:00	5:33:28	0:12:37
Counselors: Wait without work	**Before 11:00**	**After 11:00**		
Frequency, per day	1.2	10		
Duration	0:06:20	0:09:28		

Tables 7.3 and 7.4 below display the types of tasks that these two types of workers perform during the day. Notably, data typists spend most of their day recording clinical data on computers.

Table 7.3: Counselors: frequency of tasks

Counselors	Total # observations	Frequency / day	Average duration
Counseling to user / family	37	14.8	0:05:43
HIV status (ask; orient; suggest testing)	9	3.6	0:03:45
RDT malaria, HIV	17	6.8	0:03:07
Orient, post-consult (lab, pharmacy)	5	2	0:04:32
Prepare equipment, furniture, forms	5	2	0:02:29
Eliminate used materials	1	0.4	0:00:12
Manage clinical files; verify dates and defaulters	8	3.2	0:04:08
Transport items within the facility	2	0.8	0:05:17
Get instructions from clinical staff, manager	3	1.2	0:02:24
Wait, no work	28	11.2	0:09:07
Other	11	4.4	0:02:19

Table 7.4: Data typists: frequency of tasks

Data typists	Total # observations	Frequency / day	Average duration
Responding to queries from clinical staff	22	6.3	0:01:07
Preparing reports and aggregated data	3	0.9	0:03:45
Typing clinical data into computer	126	36.0	0:05:27
Other computer work	37	10.6	0:02:54
Wait, no work	1	0.3	0:09:57

ANNEX 8: INFORMATION DETAILS ON PRODUCTIVITY AND QUALITY

A. FACTORS THAT INFLUENCE THE PRODUCTIVITY OF HEALTH PROFESSIONALS

Support staff: presence / absence

Table A.1: Utilization of time, within the health facility

Time spent on clinical work	WITH support staff	NO support staff	# Sites WITH support staff	# Sites with NO support staff
Physicians	2:56:24	n/a	21	0
MCH Nurses	3:08:29	3:09:24	79	7
Nurses	3:07:33	2:51:28	33	1
Clinical Officers	4:08:36	2:29:03	43	8

Time spent on non-clinical work	WITH support staff	NO support staff
Physicians	2:35:22	n/a
MCH Nurses	2:33:48	2:37:08
Nurses	2:12:14	2:09:08
Clinical Officers	1:08:15	2:29:48

Time spent without work	WITH support staff	NO support staff
Physicians	1:31:02	n/a
MCH Nurses	1:32:02	1:43:10
Nurses	2:01:11	0:34:30
Clinical Officers	1:42:25	2:34:54

Table A.2: Utilization of time, within the health facility – task intensity, by support staff

Time spent on clinical work	Tasks by sup. staff >50%	Tasks by sup. staff <50%	# sites, tasks by sup. staff >50%	# sites, tasks by sup. staff <50%
Physicians	3:15:53	2:48:36	6	15
MCH Nurses	3:05:51	3:09:56	29	57
Nurses	2:13:42	3:49:13	15	19
Clinical Officers	3:56:36	3:51:10	17	34

Time spent on non-clinical work	Tasks by sup. staff >50%	Tasks by sup. staff <50%
Physicians	1:29:57	3:01:33
MCH Nurses	2:43:24	2:29:20
Nurses	2:42:44	1:47:59
Clinical Officers	0:52:41	1:35:13

Time spent without work	Tasks by sup. staff >50%	Tasks by sup. staff <50%
Physicians	2:16:15	1:12:57
MCH Nurses	1:39:22	1:29:39
Nurses	2:45:59	1:21:15
Clinical Officers	2:06:07	1:42:55

Table A.3: Number of patients attended, per day

	WITH supp. staff	NO supp. staff
Physicians	34	n/a
MCH Nurses	31	28
Nurses	42	71
Clinical Officers	52	46

Time spent on "non-clinical work": details

Table A.4: Outpatient visits (curative care)

Outpatient visits	Physicians	Nurses	Clinical Officers
Organizing the workstation	0:22:45	0:29:52	0:34:53
Consulting with other professionals	0:34:09	0:16:32	0:16:05
Health education (to users)	0:01:08	0:02:51	0:01:12
Meetings (in / out HF)	0:47:37	0:06:13	0:10:53
Filing statistics; reports	0:28:37	0:40:14	0:08:14
Training (trainer / trainee)	0:09:03	n.a.	n.a.
Other	0:12:03	0:14:34	0:09:49
Total time on non-clinical work	2:35:22	1:50:16	1:21:07

Physicians	Rur I	Rur II	Urb A	Urb B	Urb C	All HFs
Organizing the workstation	0:20:47	0:19:50	0:27:15	0:14:14	0:23:05	0:22:45
Consulting with other professionals	0:46:18	0:37:16	0:19:58	0:57:50	0:21:36	0:34:09
Health education (to users)	0:00:00	0:11:20	0:00:08	0:00:00	0:00:00	0:01:08
Meetings (in / out HF)	1:31:38	1:08:22	0:22:48	0:19:41	n.a.	0:47:37
Filing statistics; reports	0:26:17	1:44:41	0:07:28	n.a.	1:14:01	0:28:37
Training (trainer / trainee)	0:22:23	n.a.	0:04:09	n.a.	n.a.	0:09:03
Other	0:28:12	0:00:00	0:05:12	0:02:02	0:04:58	0:12:03
Total time on non-clinical work	3:55:36	4:01:29	1:26:58	1:33:47	2:03:40	2:35:22

Nurses	Rur I	Rur II	Urb A	Urb B	Urb C	All HFs
Organizing the workstation	0:13:47	0:31:32	n.a.	n.a.	0:59:17	0:29:52
Consulting with other professionals	0:04:35	0:22:20	n.a.	n.a.	0:08:48	0:16:32
Health education (to users)	n.a.	0:04:07	n.a.	n.a.	0:01:46	0:02:51
Meetings (in / out HF)	n.a.	0:09:33	n.a.	n.a.	n.a.	0:06:13
Filing statistics; reports	1:01:57	0:34:36	n.a.	n.a.	0:22:30	0:40:14
Training (trainer / trainee)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Other	0:02:54	0:21:17	n.a.	n.a.	n.a.	0:14:34
Total time on non-clinical work	1:23:12	2:03:26	n.a.	n.a.	1:32:20	1:50:16

Clinical Officers	Rur I	Rur II	Urb A	Urb B	Urb C	All HF's
Organizing the workstation	0:34:30	0:42:20	0:24:17	0:36:20	0:25:38	0:34:53
Consulting with other professionals	0:22:29	0:11:42	0:17:51	0:13:44	0:06:23	0:16:05
Health education (to users)	0:01:51	0:01:45	n.a.	n.a.	n.a.	0:01:12
Meetings (in / out HF)	0:17:11	0:08:06	0:14:32	0:05:29	n.a.	0:10:53
Filing statistics; reports	0:07:28	0:12:54	0:15:07	0:02:30	0:01:43	0:08:14
Training (trainer / trainee)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Other	0:04:06	0:26:49	0:01:41	0:05:06	0:01:12	0:09:49
Total time on non-clinical work	1:27:35	1:43:36	1:13:28	1:03:09	0:34:56	1:21:07

Table A.5: Mother and Child Health

MCH Nurses	*Rur I*	*Rur II*	*Urb A*	*Urb B*	*Urb C*	*All HFs*
Organizing the workstation	0:52:42	0:57:02	1:05:15	0:37:44	0:27:06	0:52:09
Consulting with other professionals	0:11:00	0:16:37	0:24:07	0:11:37	0:21:38	0:17:14
Health education (to users)	0:00:30	0:03:06	n.a.	n.a.	0:03:17	0:01:38
Meetings (in / out HF)	0:18:29	0:04:55	0:03:59	0:25:58	0:22:06	0:11:58
Filing statistics; reports	0:26:35	1:01:55	0:40:05	0:42:31	0:32:07	0:42:01
Training (trainer / trainee)	0:03:14	0:00:23	0:02:40	n.a.	n.a.	0:01:35
Other	0:24:59	0:13:30	0:07:47	0:26:01	0:10:56	0:15:33
Total time on non-clinical work	2:17:29	2:37:27	2:23:53	2:23:51	1:57:10	2:22:09

Table A.6: Laboratory and pharmacy

Laboratory professionals	*Rur I*	*Rur II*	*Urb A*	*Urb B*	*Urb C*	*All HFs*
Consulting with other professionals	0:23:32	0:09:29	0:21:27	0:09:25	0:11:28	0:19:40
Moving around the HF to deliver products / collect specimens	0:03:01	0:02:19	0:00:07	0:00:00	0:00:00	0:01:42
Organizing the workstation	0:11:15	0:12:18	0:03:01	0:20:59	0:00:00	0:08:39
Filing statistics; reports	0:49:04	0:20:16	0:23:28	0:26:41	0:24:53	0:34:33
Health education (collective, to users)	n.a.	0:03:35	0:00:14	n.a.	n.a.	0:00:34
Training (trainer / trainee)	0:00:18	n.a.	n.a.	n.a.	n.a.	0:00:08
Meetings (in / out HF)	n.a.	n.a.	0:14:55	n.a.	n.a.	0:04:52
Cleaning, sorting, classifying	0:08:00	n.a.	0:09:17	0:09:18	0:02:49	0:07:07
End of the day	0:11:11	0:21:10	0:02:02	0:00:30	n.a.	0:08:35
Other	0:08:54	0:21:33	0:41:17	0:47:56	0:13:00	0:23:13
Total time on non-clinical work	1:55:14	1:30:40	1:55:48	1:54:50	0:52:10	1:49:02

Pharmacy professionals	*Rur I*	*Rur II*	*Urb A*	*Urb B*	*Urb C*	*All HFs*
Consulting with other professionals	0:42:23	0:12:38	0:35:37	0:05:20	0:15:24	0:31:26
Moving around the HF to deliver products / collect specimens	0:02:21	0:01:41	0:05:52	0:00:00	0:00:00	0:02:59
Organizing the work-station	0:33:59	0:28:16	0:10:11	0:07:49	0:10:09	0:22:46
Daily sorting of stocks and shelves	0:18:55	0:43:29	0:56:58	0:31:33	0:35:56	0:36:25
Filing statistics; reports	0:59:45	0:14:24	0:39:14	0:08:36	0:49:21	0:42:51
Information to patients	0:13:52	0:10:10	0:18:36	n.a.	0:34:47	0:15:51
Health education (collective, to users)	0:03:19	n.a.	n.a.	n.a.	n.a.	0:01:20
Training (trainer / trainee)	0:00:20	n.a.	n.a.	n.a.	n.a.	0:00:08
Meetings (in / out HF)	0:11:01	n.a.	0:00:42	n.a.	n.a.	0:04:40
Cleaning, sorting, classifying	0:05:45	0:00:15	0:02:38	n.a.	0:23:38	0:05:10
End of the day	0:02:59	n.a.	0:02:54	0:01:29	0:04:37	0:02:31
Other	0:11:45	0:28:26	0:25:58	0:39:56	0:19:32	0:20:41
Total time on non-clinical work	3:26:23	2:19:19	3:18:39	1:34:42	3:13:25	3:06:49

Table A.7: Time without work: details

Physicians	Rur I	Rur II	Urb A	Urb B	Urb C
Entitlement breaks (tea; lunch)	0:09:32	n.a.	0:03:59	n.a.	0:17:58
Waiting / no work	0:03:15	1:50:51	0:06:16	0:44:20	0:35:51
Unexplained absence	n.a.	n.a.	n.a.	n.a.	n.a.
Personal matters (phone, talking with colleagues)	**0:54:03**	**0:22:23**	**1:42:31**	**0:30:02**	**0:03:30**
Total time without work	1:06:51	2:13:14	1:52:47	1:14:22	0:57:19

MCH Nurses	Rur I	Rur II	Urb A	Urb B	Urb C
Entitlement breaks (tea; lunch)	0:14:03	0:04:59	0:03:57	n.a.	0:12:13
Waiting / no work	1:08:03	0:34:52	0:14:36	0:46:42	1:23:24
Unexplained absence	n.a.	n.a.	n.a.	n.a.	n.a.
Personal matters (phone, talking with colleagues)	**0:44:55**	**0:32:20**	**0:27:15**	**0:05:33**	**0:16:32**
Total time without work	2:10:12	1:12:46	0:45:48	0:52:15	1:52:10

Nurses	Rur I	Rur II	Urb A	Urb B	Urb C
Entitlement breaks (tea; lunch)	0:18:30	0:04:27	n.a.	n.a.	0:28:32
Waiting / no work	0:48:01	0:47:18	n.a.	n.a.	n.a.
Unexplained absence	n.a.	0:01:43	n.a.	n.a.	n.a.
Personal matters (phone, talking with colleagues)	**1:17:02**	**0:38:02**	**0:34:30**	**0:00:00**	**0:13:39**
Total time without work	2:29:21	1:38:16	0:34:30	n.a.	0:42:11

Clinical Officers	Rur I	Rur II	Urb A	Urb B	Urb C
Entitlement breaks (tea; lunch)	0:20:54	0:11:37	0:11:45	0:17:00	0:16:49
Waiting / no work	1:26:29	0:27:50	0:06:53	0:09:16	2:05:51
Unexplained absence	0:01:09	n.a.	n.a.	0:00:38	0:00:42
Personal matters (phone, talking with colleagues)	**0:39:04**	**0:28:42**	**1:07:30**	**0:12:25**	**0:13:42**
Total time without work	2:27:36	1:08:19	1:42:08	0:39:19	2:37:05

	Pharmacy professionals	Laboratory professionals
Non-entitlement breaks & other personal affairs	0:42:25	0:37:23
Unexplained absence	0:16:13	0:33:19
Entitlement breaks (tea; lunch)	0:03:18	0:00:02
Waiting; no work; personal affairs	0:02:51	0:00:06
Absent in other location within the facility	0:00:12	n.a.
Professional leaves the facility	0:02:23	0:28:25
Total time without work	1:29:56	3:01:08

Table A.8: Interruptions: details

Time spent on personal matters	Rur I	Rur II	Urb A	Urb B	Urb C
Physicians	0:54:03	0:22:23	1:42:31	0:30:02	0:03:30
MCH Nurses	0:44:55	0:32:20	0:27:15	0:05:33	0:16:32
Nurses	1:17:02	0:38:02	0:34:30	0:00:00	0:13:39
Clinical Officers	0:39:04	0:28:42	1:07:30	0:12:25	0:13:42

Time spent on waiting without work	Rur I	Rur II	Urb A	Urb B	Urb C
Physicians	0:03:15	1:50:51	0:06:16	0:44:20	0:35:51
MCH Nurses	1:08:03	0:34:52	0:14:36	0:46:42	1:23:24
Nurses	0:48:01	0:47:18	n.a.	n.a.	n.a.
Clinical Officers	1:26:29	0:27:50	0:06:53	0:09:16	2:05:51

Table A.9: Waiting without work: before and after 11:00am

Waiting without work	Before 11:00am	After 11:00am	Total
Physicians	10	19	29
MCH Nurses	33	163	196
Nurses	12	61	73
Clinical Officers	30	90	120

Waiting without work	Before 11:00am	After 11:00am
Physicians	34%	66%
MCH Nurses	17%	83%
Nurses	16%	84%
Clinical Officers	25%	75%

Total time lost for this interruption, during the study <11:00>	Before 11:00am	After 11:00am	Total
Physicians	2:13:16	5:21:43	7:34:59
MCH Nurses	5:29:43	64:55:18	70:25:01
Nurses	1:24:43	23:13:33	24:38:16
Clinical Officers	4:44:15	45:59:41	50:43:56

% time lost for this interruption, during the study <11:00>	Before 11:00am	After 11:00am
Physicians	29%	71%
MCH Nurses	8%	92%
Nurses	6%	94%
Clinical Officers	9%	91%

Average duration of interruption by "Waiting without work"	Before 11:00am	After 11:00am	Total
Physicians	0:13:20	0:16:56	0:15:41
MCH Nurses	0:09:59	0:23:54	0:21:33
Nurses	0:07:04	0:22:51	0:20:15
Clinical Officers	0:09:29	0:30:40	0:25:22

B. QUALITY: FREQUENCY FOR UNDERTAKING MINIMUM COMPONENTS OF SERVICES

Table A.10: Details on minimum components – antenatal appointments

	Average ALL facilities	Larger facilities	Small facilities (no lab)
Clinical file: new, consult	71%	64%	85%
Symptoms and patient history	92%	92%	91%
Physical exam	79%	78%	77%
Check lab tests & XR results	10%	9%	10%
HIV testing counseling	10%	4%	22%
HIV testing: RDT by MCHN + Other lab tests: specimen collection by MCHN	32%	26%	41%
HIV testing: RDT by MCHN	11%	8%	16%
Other laboratory tests: specimen collection by MCH Nurse	10%	11%	8%
Other laboratory tests: prescription for lab	9%	10%	7%
HIV testing: prescription to laboratory	8%	9%	6%
Weighing	41%	42%	30%
Measurement of height	18%	12%	24%
Prescription of medicines	16%	15%	15%
Dispensing medicines & other products	67%	65%	69%
Instructions to patient / relative (end of consult)	83%	85%	77%
Clinical records; set new consult	72%	68%	77%
Infection prevention (hands, gloves, etc.)	11%	13%	6%

Table A.11: Clinical officers – Comparing the frequency of minimum components between triage and booked appointment

	Triage	*Booked appointment*
Clinical file: new, consult; referral note	38%	77%
Symptoms and patient history	82%	91%
Physical exam	23%	27%
Check lab test & X-ray results	25%	6%
Lab test & XR: prescribe / refer to hospital	10%	13%
Lab Test: local RDT/ Specimen collection	19%	6%
Prescription of medicines	69%	85%
Dispensing medicines & other products	12%	9%
Consulting with other professionals	2%	5%
Instructions to patient / relative (end of consult)	71%	81%
Clinical records; set new consult	82%	83%