

2021

# Community-based Care Quality Study Report



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## INTRODUCTION

### The community health worker program in Mozambique

Community involvement for promoting and providing health services is one of the principles that underpin the Mozambique Health Sector Strategic Plan (2014–2024) and the Investment Case.<sup>1 2</sup> Strengthening community-based health services is one of the key interventions to ensure access and utilization of available health services. The National Strategy guides its implementation for Health Promotion (2015–2019).

Community-based health services in Mozambique are primarily provided through the Agentes Polivalentes Elementares (APEs), embedded in the decentralized health structures. Existing since 1974, the Ministry of Health (MOH) revitalized its APE program in 2010 after setbacks encountered during the civil war (1976–1992).<sup>3</sup> The revitalized program, led by the Department of Health Promotion under the National Directorate of Public Health, sought to increase the coverage and the quality of services provided, aiming to train and deploy additional APEs across the country, with a primary role in health promotion and disease prevention (80 percent of their time) and a secondary role in curative services (20 percent of their time).<sup>4</sup> APEs were designated for training in a revised national five-month training package provided by the provincial supervisor and the district supervisor. Subsequently, APEs are attached to a health facility that is 8–25 km from their designated communities, serving a population of 500–2,000 individuals, with an average of 25 per district.<sup>5</sup> Refresher trainings are planned for every two years, with ad hoc trainings on major health threats to the countries organized.

APEs primarily utilize a door-to-door approach and interact with other community- and facility-based structures, including the health committees (comités de saúde) and co-management committees (comités de co-gestão). A facility-based supervisor oversees their work. Although APEs are officially considered volunteers, they receive a monthly stipend of 1,250 meticaís (approximately US\$20) and are provided with a bicycle, working kit, and monthly kit of medicines. The medicine kit (see Appendix C) includes basic medicines for first aid and common ailments such as diarrhea and acute respiratory infections. Since 2013, the kit is complemented by rapid diagnostic tests for malaria and four kinds of formulations of Atriméter-Lumefantrina as an antimalarial treatment. Contraceptives are provided separately through the pharmacy at the health facility. Although there are no minimum requirements for the APE's monthly work, the kit contains supplies for about 250 possible consultations.<sup>6</sup>

An APE's work and use of medicines are recorded through a monthly consultation report and stock management sheet. Across Mozambique, APEs are estimated to serve about 12 million people, roughly 40 percent of the country's population. In 2020, they carried out approximately 5 million consultations; conducted 2.6 million rapid diagnostic tests (RDTs), confirming approximately 1.8 million cases of malaria; and identified approximately 334,494 cases of diarrhea and 409,893 cases of pneumonia in children under five. APEs provided 1.6 million doses of the antimalaria medication "Coartem" and 30,991 of Artesunate in 2020. They also engaged in health promotion and disease prevention, conducting over 10 million house visits, including approximately 600,000 for women during pregnancy or postnatally, 478,000 visits for newborns, and 3.9 million visits for children under five. APEs provided a second dose of Vitamin A to 677,125 children and chlorhexidine to 48,994 newborns.<sup>7</sup>

As part of the Primary Healthcare Strengthening Program (PHCSP),<sup>8</sup> which supports the Investment Case, Disbursement-Linked Indicator 10 (DLI10) incentivizes both the increase in the APE workforce and

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<sup>1</sup> Plano Estratégico do Sector da Saúde, 2013.

<sup>2</sup> Investment case of the Republic of Mozambique, 2017. <https://www.globalfinancingfacility.org/investment-case-republic-mozambique>.

<sup>3</sup> Chilundo B. G., Cliff J. L., Mariano A. R., Rodríguez D. C., and George A. Relaunch of the official community health worker programme in Mozambique: is there a sustainable basis for iCCM policy?. *Health Policy Plan*. 2015; 30 Suppl 2 (Suppl 2):ii54–ii64. doi:10.1093/heapol/czv036.

<sup>4</sup> MISAU, Pontos Chave para a Implementação do Programa dos Agentes Polivalentes Elementares. 2010.

<sup>5</sup> MISAU, Pontos Chave para a Implementação do Programa dos Agentes Polivalentes Elementares. 2010.

<sup>6</sup> UEM, UNICEF, Avaliação do sistema de abastecimento de medicamentos para os Agentes Polivalentes Elementares em quatro distritos de Moçambique no período de Fevereiro de 2019 a Agosto de 2020. October 2020.

<sup>7</sup> Data for APEs' activities provided by UNICEF; population data from the World Bank WDI, 2019.

<sup>8</sup> The Primary Healthcare Strengthening Program is managed by the World Bank and cofinanced by the Global Financing Facility, Canada, the Netherlands, the UK Foreign and Common and Development Office (FCDO), and USAID.

improvements in the quality of their services. APEs are considered key agents to improve the utilization and quality of reproductive, maternal, child, and adolescent health and nutrition services in underserved areas. The support provided under the PHCSP is expected to increase the number of active APEs from 3,380 in 2017 to 8,800 by 2023, and 80 percent of APEs are expected to meet a minimum quality standard established.

### Review of selected community health worker programs

The recognition of community-based health workers (CBHW)<sup>9</sup> as vital to the improvement of primary health care by the Declaration of the Alma Ata in 1987 drove an increase in the interest in CBHW programs.<sup>10</sup> Initial programs faced the following difficulties: (1) inadequate training, remuneration, and incentives; (2) limited supervision; (3) deficient continuing education opportunities, inadequate supplies, and medicines; and (4) limited recognition of acceptance by other health workers.<sup>11</sup> These difficulties led to a decline in the interest in CBHW programs in the late 1980s. However, CBHW programs reemerged in the mid-1990s in low- and middle-income countries as a tool to address the demands of growing HIV and infectious diseases; inequalities in the access to health services, particularly in rural areas; and thanks to increased global advocacy, to reduce the burden on overstretched and understaffed health systems.<sup>12</sup>

Policies and approaches behind the different community health strategies vary considerably across low-income countries. Comparing these can be useful to inform changes in national CBHW strategies. As part of this study, the experiences from Ghana, Ethiopia, and Rwanda are considered and compared to those of Mozambique. The four Sub-Saharan countries have a comparably low Human Capital Index (0.36–0.45), high percentages of the rural population (43 percent–83 percent), and substandard maternal and child health indicators, including high fertility levels, maternal mortality, under-five mortality, and stunting. In addition, Mozambique is disproportionately more affected by the HIV/AIDS epidemic (see table 1 and table 2).

Table 1: Key Health Indicators: Mozambique, Ghana, Ethiopia, and Rwanda, World Bank Indicators

	Mozambique	Ghana	Ethiopia	Rwanda
<b>GDP per capita (current US\$) (2019)</b>	503	2,202	820	855
<b>Total population (million) (2019)</b>	30.36	30.41	112.07	12.62
<b>Rural population (%) (2019)</b>	63%	43%	79%	83%
<b>Human Capital Index (2020)</b>	0.36	0.45	0.38	0.38
<b>Total fertility rate (TFR) (2019)</b>	4.80	3.8	4.1	4.0
<b>mCPR % (15–49 years)<sup>13</sup></b>	25%	24%	41%	48%
<b>MMR (per 100,00 live births)<sup>14</sup></b>	589	334	557	297
<b>Under mortality rate (per 1,000 live births) (2019)</b>	74	46	51	34
<b>Stunting rate for children under 5 (%)<sup>15</sup></b>	42.3%	17.5%	36.8%	33.1%
<b>HIV prevalence rate (% population ages 15 to 49) (2019)</b>	12.4%	1.7%	0.9%	2.6%

Note: MMR = maternal mortality rate. mCPR = modern contraception prevalence rate

<sup>9</sup> CBHW is used as a broad term in scope including home-based care providers, community health workers, community-based treatment supporters, and traditional birth attendants.

<sup>10</sup> Liu A., Sullivan S., Khan M., Sachs S., and Singh P. 2011. Community health workers in global health: scale and scalability. *Mt Sinai J Med*, 78(3):419–435.

<sup>11</sup> Zulu J. M., Kinsman J., Michelo C., and Hurtig A. K. 2014. Integrating national community-based health worker programmes into health systems: a systematic review identifying lessons learned from low- and middle-income countries. *BMC Public Health*. September 22, 2014;14:987. doi:10.1186/1471-2458-14-987. PMID: 25245825; PMCID: PMC4192351.

<sup>12</sup> Glenton C., Colvin C. J., Carlsen B., Swartz A., Lewin S., Noyes J., and Rashidian A. 2013. Barriers and facilitators to the implementation of lay health worker programmes to improve access to maternal and child health: qualitative evidence synthesis. *Cochrane Database Syst Rev*, (10): Art. No.: CD010414. doi:10.1002/14651858.CD010414.pub2.

<sup>13</sup> Data for 2015 for Mozambique and Rwanda. Ghana 2018. Ethiopia 2019.

<sup>14</sup> Data from 2011 for Mozambique; 2015 for Rwanda; 2017 for Ghana; and 2016 for Ethiopia.

<sup>15</sup> Data from 2015 for Mozambique; 2017 for Ghana; 2019 for Ethiopia; and 2020 for Rwanda.

Table 2: Key Metrics of CBWH Programs: Ghana, Ethiopia, and Rwanda

	<b>Mozambique</b>	<b>Ghana</b>	<b>Ethiopia</b>	<b>Rwanda</b>
<b>Type of provider</b>	Elementary multipurpose agents (APEs) (salaried volunteers).	Community Health Officers (CHOs) (salaried).	Female Health Extension Workers (salaried).	MCH agents female/male tandem (salaried, performance-based).
<b>Coverage ratios</b>	1:500–2,000 individuals	Up to 3 CHO per 5,000 people.	1: 2,500 people	3:300 – 450 people
<b>Selection criteria</b>	Age > 18. Basic skills and arithmetic. Ability to read and write in Portuguese.	Trained community health nurse. Ages 18 to 30.	Grade 10. Age > 18.	Primary school completed. Ages 20 to 50.
<b>Training + roles</b>	5-month training. Refreshers planned for every 2 years. Routine activities include developing strong ties to their community, health promotion and education, family planning counseling, and prevention and treatment of common ailments.  Treat common ailments, including childhood illnesses: diarrhea, pneumonia, malaria, minor injuries, worms, and others.	2 years training for community nurse certificate + 2 weeks on-the-job training.  Integrated minimum service package of promotion and prevention.  Districts can customize training manuals and include additional services/roles with support from NGOs.	1 year, including 320 hours of practical experience.  Refresher every 2 years.  Integrated minimum service package including FP, MCH, nutrition, NB care, HIV and TB, Malaria and WASH.	15 days for MCH agents  27 days for “binôme.”  On-the-job training and periodic refreshers.  Differentiated roles:  MCH + deliveries;  Case management, pneumonia, diarrhea;  Common health promotion themes (TB DOTs, GBV screening, FP, immunization, hygiene).
<b>Community support</b>	Collaborate with health and community co-management committees comités de saúde and comités de cogestão.	Community health volunteers provided with basic training, bicycles, and social recognition.	“Model households” in defined networks of HH, with trained female member support extension workers (health development army).	Community Health Cooperative support outreach workers, oversee performance, entrusted with payments.  70% payment used for community projects.

Note: DOTs = directly observed treatments for (TB); FP = family planning ; GBV = gender-based violence; HH = household; MCH = maternal and child health ; NB = newborn; NGOs = nongovernmental organizations; TB = tuberculosis; WASH = water, sanitation, and hygiene.

### The case of Ghana<sup>16</sup>

<sup>16</sup> Community health systems catalogue, country profile: Ghana. USAID. 2017.

Ghana's model was based on an initial pilot where four service delivery models were tested, and the most successful model defined the structure of the national CBHW program. It consists of two cadres of community health workers, including salaried Community Health Officers (CHOs) and Community Health Volunteers (CHVs). CHOs live and work in a geographical area with 750 households or 5,000 people. They work closely with community leaders and other cadres of community health workers operated by nongovernmental organizations (NGOs). CHOs are trained for two years as community health nurses and provided with on-the-job training for two weeks on CHO functions. They are required to have at least one year's experience working in a health center and be 18 to 30 years old. Other skills such as planning, communication, and interpersonal skills are used as part of the selection criteria. CHOs deliver a predefined package of essential services, including health promotion and disease prevention, family planning, reproductive health, maternal and child health, immunization, and the treatment of diarrhea, malaria, acute respiratory infections, and childhood illness, among others. CHVs assist with household visits and are supervised by the CHOs. Paper-based forms for collecting data and a community register are kept, along with tally cards which are provided by the subdistrict health authorities, that are used to track the use of medicines and supplies.

### **The case of Ethiopia<sup>17</sup>**

Ethiopia's Health Extension Program uses a grassroots approach in which households with "model women" lead their families and surrounding households to implement and monitor health plans. Model women are supported by female community health extension workers (HEWs) who work closely with health posts and cover a network of up to 30 households led by model women. HEWs are recruited from their communities, and their one-year training includes practical experience and is recognized within the National Vocational Education and Training System. HEWs provide a package of services that include communicable and non-communicable diseases, maternal and child health (MCH) care, including sexual and reproductive health and rights (SHRS), malaria case management, immunization, and emergency response. Records of their work are kept in a family folder, including a series of health cards that track health and demographic information that feeds into the national health management system. Supplies are obtained using an official request procedure from the health facility. The Ethiopian model is government-led and financed. Health partners and NGOs support the implementation of this national program and provide technical and financial assistance upon request from the government and in alignment with the Health Sector Manual.

### **The case of Rwanda<sup>18</sup>**

The Rwanda model consists of two cadres of community health workers (CHWs): Agents de Santé Maternelle (ASMs, maternal health agents) and binômes (tandems). The village elects the two different cadres of health workers, who then receive training adapted to their different responsibilities. ASMs focus on maternal, neonatal, and child health services. In contrast, the two types of tandems (one male, one female) focus on integrated community case management for malaria, diarrhea, pneumonia, and monitoring of malnutrition and providing family planning. CHWs receive on-the-job training and periodic refreshers organized by the Ministry of Health. Their work is supported by community groups, including cooperatives, parents' groups, and water, sanitation, and hygiene (WASH) clubs. The three types of CHWs are remunerated through a community performance-based financing system, where 30 percent of the incentives are provided to the CHWs, and 70 percent are provided to the CHW cooperative that invests in income-generating activities. Data from their activities are collected through an electronic information system that is consolidated nationally by a dashboard. CHWs use mobile phones to report on specific pregnancies in real-time and collect data using reports and stock cards consolidated at the village level.

### **Determinants for positive integration of CHW programs into the national health system**

Compared to the three cases presented, the Mozambican CHWs are smaller in number, cover large populations, and are less supported by predefined/trained community-based representatives. In addition, the program depends heavily on external donor funding, with NGOs having separate agents for specific interventions or vertical programs. CHWs in other countries are either more qualified upon recruitment or receive more extended training. Performance-based allocation or a financial retribution

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<sup>17</sup> Community health systems catalogue, country profile: Ethiopia. USAID. 2017.

<sup>18</sup> Community health systems catalogue, country profile: Rwanda. USAID. 2017.

system that is more inclusive of community needs and efforts does not occur in Mozambique. In addition to these different metrics, a systematic review of 36 studies related to CBHW developed a conceptual framework to categorize the determinants that support a positive integration of CBHW programs into national health systems and provided the following conclusions.<sup>19</sup> Important findings and considerations include:

- **Careful planning and funding:** The gap in human resources for health in low- and middle-income countries is often one of the key factors that contribute to the integration of CHW into the health systems, as CBHWs have the potential of extending services to hard-to-reach areas and can play an important role in achieving demonstrable health benefits. The pathway to scale and integration has often been limited by planning and logistics management and insufficient and inconsistent program funding.
- **Ability to deliver good services:** Good services and improved health outcomes can enhance acceptability and adoption of CBHWs by the population and preference over other traditional and community-based actors. Quality of services is influenced by workload, training, supervision, and effective payment structures.
- **Perspectives to adopt the system:** Positive perceptions from politicians, communities, and health workers are key to integration. Lack of clarity regarding roles or hierarchy can create resistance from nurses or health personnel. Community perceptions are also important, and recruitment from local people has been shown to be positive. Still, considerations regarding gender and cultural norms are also important to consider as part of the recruitment criteria. For instance, mothers' utilization and acceptance of MCH and FP services have been associated with having women CHWs in Ethiopia and India, with whom women could share their personal stories.
- **Compatibility with existing systems:** Building a CHW program into existing data systems, payment structures, and hierarchies/communication lines facilitates the expansion and integration into the national health system and program compatibility with local practices, values, and regulations. It can also foster relationships with other health personnel and ease referral processes and general service delivery.

### Study objectives

This study is undertaken as part of the advisory services and analytics (ASA) that accompanies the implementation of the PHCSP. It builds on previous analytical work on APEs and discussions with the APE technical working group, which identified constraints in the program's functioning, including stockouts, supervision, and recruitment. This ASA seeks to assess the QoC provided by APEs to inform policymaking for the APE program from an evidence-based perspective. Specifically, the objectives of the study are to:

1. Assess the quality of primary health care services provided at the community level in Mozambique;
2. Establish a baseline for quality of care against which quality of care can be benchmarked and improved throughout the implementation of the PHCSP; and
3. Identify and assess contributing factors to successes and failures in the APE program across all provinces in Mozambique.

## METHODS

### Survey design

The study conducted a nationally representative, cross-sectional quality of care (QoC) survey of APEs and providers in primary health care facilities across Mozambique. It assesses not only the knowledge and competency of APEs but also the network of technical support (supervisors) and supplies available to them, using four survey instruments (see table 3):

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<sup>19</sup> Zulu, J. M., Kinsman, J., and Michelo, C., et al. 2014. Integrating national community-based health worker programmes into health systems: a systematic review identifying lessons learned from low- and middle-income countries. *BMC Public Health* 14, 987. <https://doi.org/10.1186/1471-2458-14-987>.

(1) *General questionnaire*: a simple introductory questionnaire for community health workers or *Agentes Polivalentes Elementares* (APEs) and supervisors (age, position, years in service, relevant training received, among others);

(2) *Medical vignettes*: hypothetical medical cases posed to the APEs and supervisors and a structured questionnaire used to record the specific history-taking questions and examinations reported and any articulated diagnoses and prescribed treatment, along with a complementary section regarding knowledge of, and engagement in, health promotion activities;

(3) *Direct observation checklists*: enumerator checks for the contents of an APE's drug kit and other supplies, and availability of functioning equipment including mobile phone application; and

(4) *Household and client surveys*: short questionnaires administered to clients by telephone, selected randomly from the APE's list of phone numbers for all rural members in their catchment area.

Table 3: Overview of Survey Instruments

(1) General questionnaire	<ul style="list-style-type: none"> <li>• Data on age, years of service, relevant training, etc.</li> <li>• Targeted APEs and APE supervisors.</li> </ul>
(2) Medical vignettes	<ul style="list-style-type: none"> <li>• Four case studies to evaluate whether APEs can: assess medical history, ask appropriate questions and conduct relevant exams, make a diagnosis and prescribe/administer adequate treatment.</li> <li>• Targeted APEs and APE supervisors.</li> <li>• This section also contains complementary questions aimed at assessing preventative services offered by APEs.</li> </ul>
(3) Direct observation checklists	<ul style="list-style-type: none"> <li>• Data on the content of APEs' medicine kit and work equipment.</li> <li>• The verification took place before the APE obtained a refill at the reference health facility.</li> </ul>
(4) Household and client survey	<ul style="list-style-type: none"> <li>• Short questionnaire to users of health services in the catchment area of the sampled APEs.</li> </ul>

## Sampling

The population of interest for this study is:

- APEs from all provinces in Mozambique;<sup>20</sup>
- Rural households, APE clients; and
- APE supervisors from an APE's reference health facilities.

The study sample included any individuals who satisfy the following conditions:

- APEs across the country, randomly selected from a list provided by the reference health facilities;
- Rural households, APE clients, randomly selected from a phone list provided by the APEs in the sample, over 18 years of age;
- APE supervisors working in the reference health facilities of the APEs in the sample; and
- Other health personnel in the reference health facilities.

The sampling frame was based on the health facilities to which the APEs are mapped. Health facilities were chosen using probability sampling, except for Cabo Delgado<sup>21</sup> and Inhambane, to capture the effect of the upSCALE program, which began in 2019 in these provinces.

The number of health facilities was inferred from the total number of APEs in each province, stratified as:

1. 1–3 APEs per health facility;
2. 4–6 APEs per health facility; and

<sup>20</sup> Maputo City is not included, as APEs in this province are not attached to a reference health facility; Cabo Delgado was subsequently excluded from the study due to safety concerns in data collection.

<sup>21</sup> Originally included in the sampling.

### 3. > 7 APEs per health facility.

All APEs attached to the selected health facilities were included in the sample. The final number of APEs interviewed was 1,377, roughly 24 percent of the total number of APEs in Mozambique at the time of the survey design. All APE supervisors who were available were interviewed for each health facility, and the final sample included 320 supervisors.

Finally, health users were randomly selected from the list provided by each APE. Three users over 18 years of age were selected for each APE. The final number of users surveyed was 2,404.

#### Data collection and analysis

Data was collected using the four survey instruments described in the “Survey design” section. After initial training in each region, data collection was carried out simultaneously in Mozambique’s three regions (North, Central, Southern). Each team was assigned a supervisor who oversaw the first week of data collection. A team leader was present throughout the data collection process, a field supervisor who performed quality control, five enumerators, and one driver. Data was collected between September and December of 2020.

Data collection was carried out using Computer-Assisted Personal Interviewing (CAPI) with a Census and Survey Processing System (CSPPro) for Android tablets. CSPPro is an open-source software that enables data collection, cleaning, management, and processing. Once surveys were filled out, they were downloaded to a central server. After this process was complete, questionnaires were reviewed for data validation or rejection by a supervising team based in Maputo City. A rejection of a survey would trigger either a correction or retake.

Data analysis includes producing descriptive statistics of demographic data for APEs, their supervisors, and rural households who use community health services, computing indicators for APEs’ knowledge and community engagement, availability of medicines and supplements, the frequency of training and supervision, and identifying potential factors driving APE performance through multivariate regression analysis.

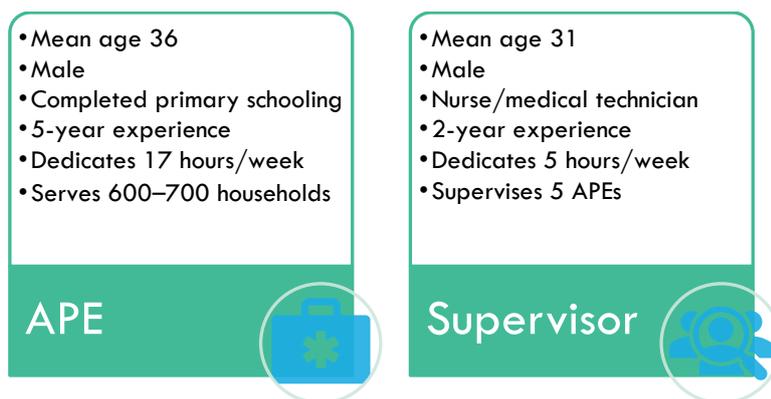
## RESULTS

### General characteristics

In 2020, the Community Health Workers program in Mozambique was comprised of an estimated 6,690 Agentes Polivalentes Elementares, or APEs, and 1,398 health workers who supervised them. Based on the responses to this study, one APE serves on average between 600 and 700 households, a higher load than that of other Sub-Saharan African countries with similar programs, such as Ghana (3:5,000 individuals), Ethiopia (1:2,500 individuals), or Rwanda (3:300–450 households).

Based on the nationally representative sample, a typical APE would be a man (60 percent of sampled APEs were male), in his mid-thirties, with an average of five years of experience as an APE and a primary school education. On average, APEs reported serving between 600 and 700 households and spending about 17 hours per week in this role. A typical supervisor would be a nurse or medical technician, male (69 percent) and in their early thirties, with two years of experience as an APE supervisor. Supervisors self-reported spending, on average, five hours per week on supervision (see Figure 1). Detailed descriptive statistics can be found in Appendix A.

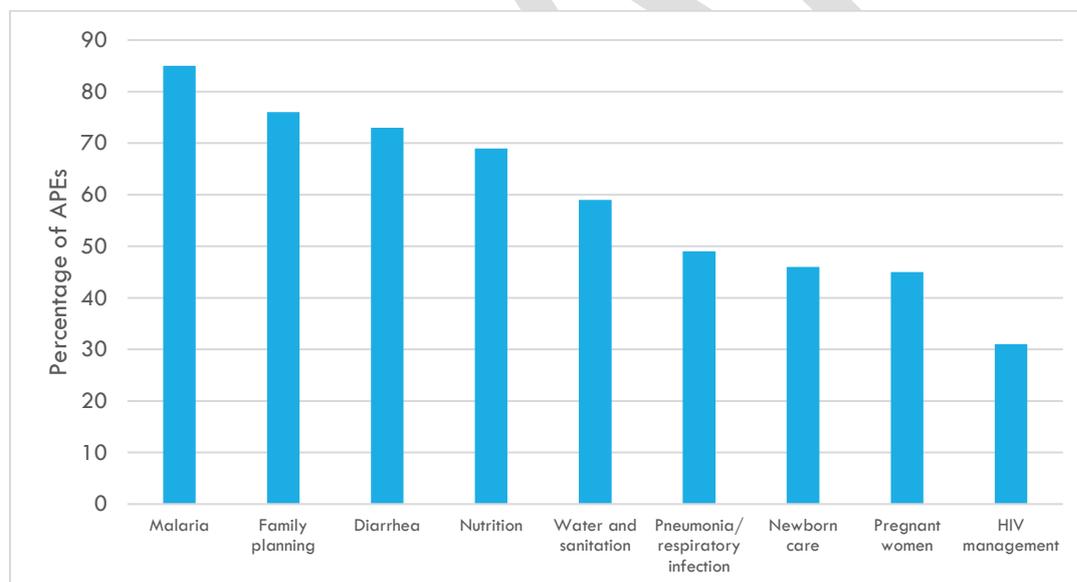
Figure 1: Profile of the Average APE and Supervisor



Source: Quality of Care (QoC) survey of APE, 2020. Authors’ own calculations.

Training is an important aspect of the community health workers’ program. In addition to their initial five-month training and ongoing supervision, APEs are expected to receive a refresher training every two years on relevant topics for community health. The last APE refresher was carried out in 2016, and a new training based on a revised curriculum planned for 2019 was subsequently postponed because of the COVID-19 restrictions. The survey revealed that 96 percent of APEs had received at least one such course, and, on average, APEs received refresher courses in five topics throughout their service. The most common subject for additional training was malaria, followed by family planning and diarrhea, as shown in Figure 2. Conversely, less than 50 percent of the APEs surveyed had received refresher courses on pneumonia and respiratory infection (49 percent), newborn care (46 percent), pregnant women (45 percent), and HIV management (31 percent).

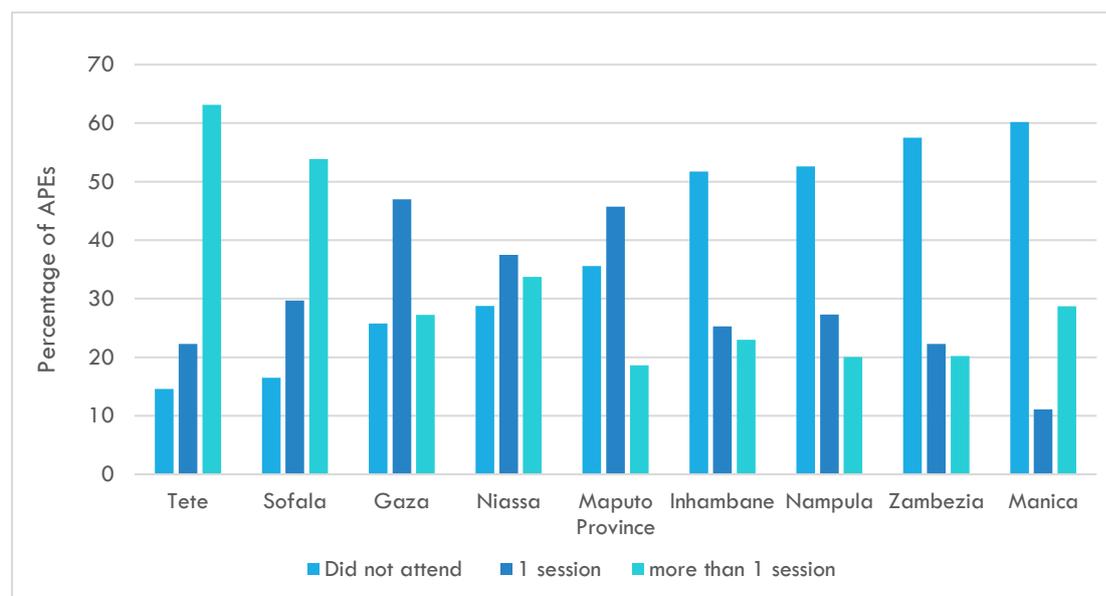
Figure 2: Percentage of APEs Who Reported Having Received Refresher Courses after Initial Training



Source: Quality of Care (QoC) survey of APE, 2020. Authors’ own calculations.

While APEs did not specify when they last received the refresher courses, they reported attending on average one training session over the previous three months (Figure 3). More than half of APEs in Nampula, Zambezia, Manica, and Inhambane had not received any training over the previous three months. The result is likely to include refresher trainings that were rolled out with the support of partners on malaria (2018/2019) and nutrition (2019/2020)

Figure 3: Percentage of APEs Who Attended a Training Session over the Previous Three Months



Source: Quality of Care (QoC) survey of APE, 2020. Authors' own calculations.

Another essential feature of the community health program is supervision by health personnel. The physical verification of APEs' and supervisors' reports was conducted. APEs' records revealed that they had received on average one supervision visit over the previous three months, but 28 percent did not receive any. Twenty-nine percent of APEs received one supervision visit per month. In Inhambane, 65 percent of APEs hadn't registered any supervision sessions over the previous three months. The verification of supervisors' registers showed similar deficiencies. While most APE supervisors had updated records of the monthly activities performed by their APEs, less than 50 percent had evidence of their supervision of APEs' work in the community, and only 57 percent had evaluated APEs' clinical competencies (see Table 3).

Table 3: Verification of APE Supervisors' Checklists

APE supervisors' checklists	Number	Percent
Summary sheet of monthly activities of APEs is available	270	84
Summary sheet of monthly APE activities is completed for the past three months	243	76
Verification list for APE supervision in the community is available	188	59
Verification list for APE supervision in the community is completed for each of the APEs over the past three months	152	48
Evaluation of APE's clinical competencies is completed for each APE over the past three months	182	57

## Quality of care

### Clinical vignettes

The use of clinical vignettes to assess the quality of care is well documented in developed and developing countries alike.<sup>22</sup> Clinical vignettes facilitate standardized comparisons and offer a pragmatic method for assessing provider care quality. They have been validated against the "gold standard" of unannounced standardized patients, with the advantage of being more cost-effective. In fact, they have been shown to be more accurate than medical records examinations.<sup>23</sup> Limitations to their use in developing countries include potential misalignments with inputs provided in actual consultations.<sup>24</sup> Four

<sup>22</sup> See, for example: Peabody, John W., and Anli Liu. 2007. "A cross-national comparison of the quality of clinical care using vignettes." *Health Policy and Planning* 22.5: 294–302.

<sup>23</sup> Peabody, John W., et al. 2004. "Measuring the quality of physician practice by using clinical vignettes: a prospective validation study." *Annals of internal medicine* 141.10: 771–780.

<sup>24</sup> Leonard, Kenneth L., and Melkiory C. Masatu. 2005. "The use of direct clinician observation and vignettes for health services quality evaluation in developing countries." *Social science & medicine* 61.9: 1944–1951.

cases of common ailments were presented to the APEs as clinical vignettes, and basic symptoms and patient characteristics, such as age and gender, were described. In two of the cases, APEs were instructed to ask questions that would help them identify the ailment. Additional information was provided to the APEs (irrespective of the questions asked), and APEs were then requested to describe the diagnosis for the symptoms provided. Subsequently, APEs were asked what the appropriate treatment would be.

The cases described a scenario of diarrhea and pneumonia in children, a case of malaria in children, one describing potential signs of danger during pregnancy, and one of malaria in adults (see Figure 4). The third case was subsequently excluded from the study as it was deemed too complex and was not clearly understood by a sufficient number of interviewees.

Figure 4: Cases Described to APEs in Clinical Vignettes



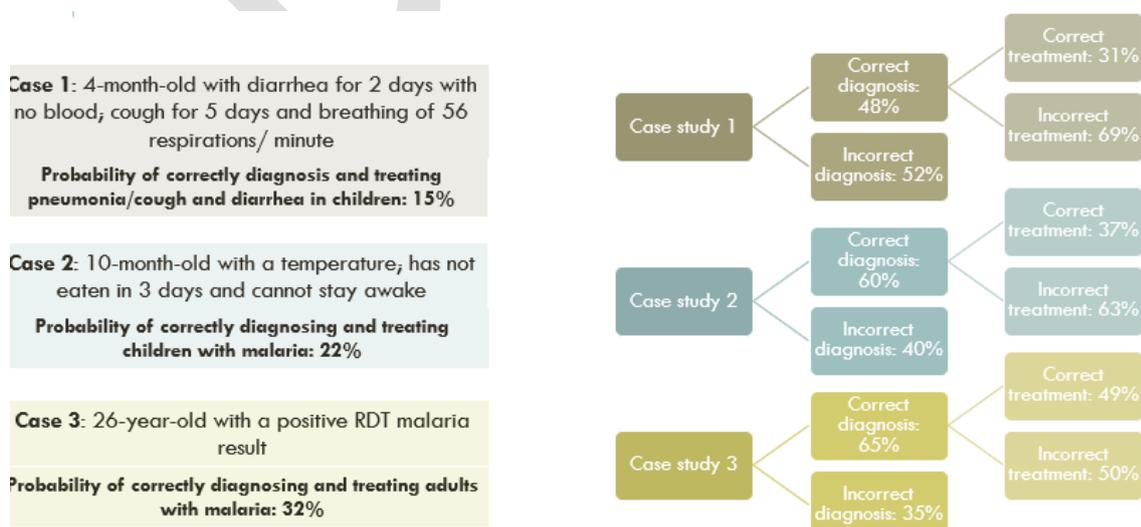
Source: Quality of Care (QoC) survey of APE, 2020.

For the purposes of this analysis, an APE was classified as having diagnosed the common ailment correctly if, in addition to providing an accurate diagnosis, they did not also identify an incorrect diagnosis (multiple answers were allowed). A treatment was considered accurate when APEs mentioned any correct treatment actions (and no incorrect actions) after correctly diagnosing the case. Figure 5 depicts the share of APEs who correctly identified and recommended the appropriate treatment for each case.

Among the clinical cases, APEs performed worse in identifying signs of danger in pregnancy (19 percent of APEs correctly diagnosed this case), followed by respiratory infection and diarrhea in children (48 percent). The probability of a correct diagnosis for pneumonia and diarrhea in children was highest in Gaza (87 percent) and lowest in Zambezia (24 percent). Less than 5 in 20 children in Zambezia would be correctly identified as having a condition consistent with experiencing cough, rapid breathing, and diarrhea.

The share of APEs who correctly identified malaria in children was above 50 percent in all provinces, except in Zambezia, where it was only 36 percent (see Figure 5). An adult with malaria and a positive rapid diagnostic test (RDT) result had approximately a 65 percent chance of being accurately diagnosed, but that chance rose to 100 percent in Maputo Province.

Figure 5: Percentage of APEs Who Correctly Identified and Treated Case Scenarios

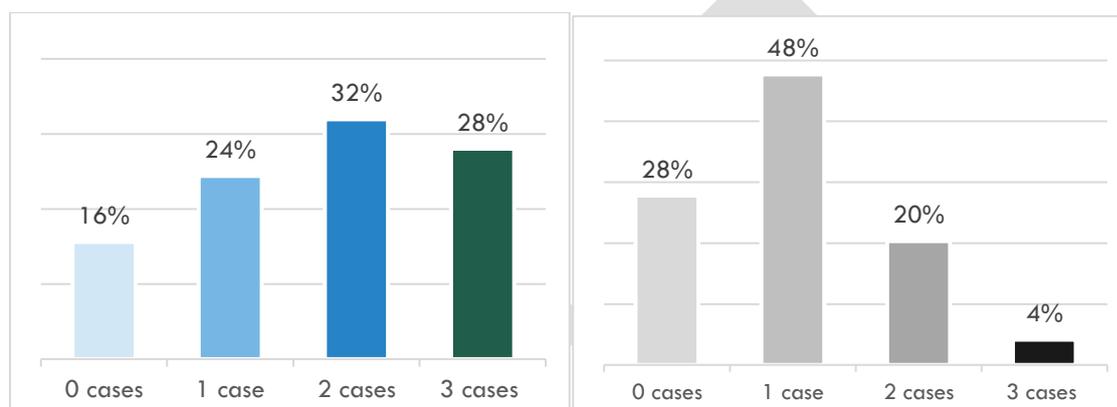


The results are considerably worse when it comes to APEs' ability to prescribe an appropriate treatment or course of action to the cases described. This result is in part due to the fact that APEs who were not able to correctly identify the clinical case were excluded from the second step of this analysis. Nevertheless, even among those APEs who correctly identified the clinical case, less than 50 percent identified the appropriate actions to take.<sup>25</sup>

In order to establish a baseline measure for APE knowledge, the number of correct diagnoses and treatments were counted for each APE. Case 3 in Figure 4 (pregnant woman with headache and stomach pain) was dropped from this metric due to concerns over lack of clarity in the case description and the lack of a clear diagnosis, which would be out of the scope of APEs' training and not a fair assessment of their knowledge.

Overall, 28 percent of APEs were able to identify all three cases correctly, and only 4 percent recommended appropriate treatment for all three cases (see Figure 6). On average, APEs correctly identified 1.7 cases and prescribed an appropriate course of action for one case.

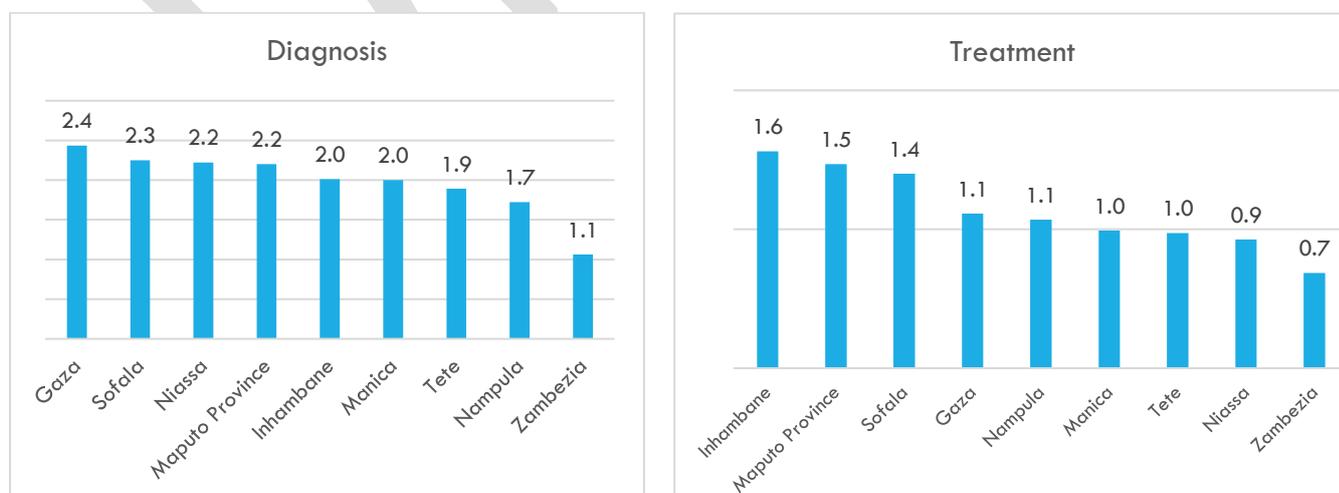
Figure 6: Percentage of APEs Who Correctly Diagnosed Case (left) and Recommended Appropriate Treatment (right)



Source: Quality of Care (QoC) survey of APE, 2020. Authors' own calculations.

Significant differences were observed among provinces regarding APEs' ability to identify clinical cases correctly (Figure 7). In Maputo Province and Gaza, all APEs were able to correctly identify at least one of the three clinical cases presented, with Niassa (99 percent) and Sofala (98 percent) showing similar performances. Conversely, 31 percent of APEs in Zambezia and 24 percent in Tete could not correctly identify a single case.

Figure 7: Average Number of Cases APEs Correctly Diagnosed and Treated by Province



Source: Quality of Care (QoC) survey of APE, 2020. Authors' own calculations.

<sup>25</sup> Detailed statistics on each question in the vignettes can be found in Appendix B.

## Health prevention and promotion

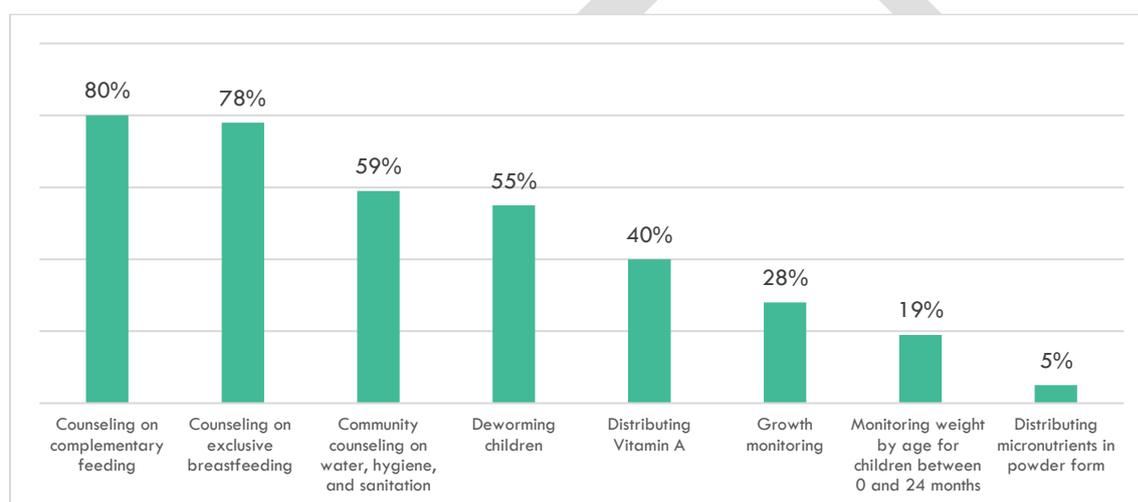
A central role of APEs is to engage in community health promotion and preventative health care. A complementary section of the medical vignettes tested APEs' knowledge and engagement with the community, primarily concerning nutrition services and family planning.

### Nutrition

APEs were asked to list all nutrition services they provided. Ninety-six percent of APEs provided at least one service, the most common being counseling on complementary feeding (80 percent) and exclusive breastfeeding (78 percent) (see Figure 8). APEs also revealed a satisfactory knowledge in these domains, with 88 percent correctly identifying the optimal duration of exclusive breastfeeding and 77 percent recognizing the correct approximate age range to begin complementary feeding.

Other essential nutrition services were less prevalent, such as the distribution of Vitamin A and micronutrients in powder form (MNPs) and growth and weight monitoring of children. This could be partly due to issues hindering the procurement of scales and MNPs at the national level and a limited supply of vitamins in the APE kit (only 48 percent of APEs had Vitamin A+E in their drug kits at the time of verification.) APEs demonstrated poor knowledge regarding the ideal frequency of deworming (only 56 percent responded correctly), and only 55 percent reported offering deworming services.

Figure 8: Percentage of APEs Who Offered Nutrition Services



Source: Quality of Care (QoC) survey of APE, 2020. Authors' own calculations.

### Family planning

Knowledge and practices related to family planning provisions indicated that substantial improvements are needed. While most APEs reported offering family planning methods (89 percent said they offered oral contraceptives [OCs], and 82 percent claimed to provide male condoms), the physical verification process of items in the kit showed a persistent lack of family planning methods. At the same time, 7 percent of APEs claimed to provide implants, which is not a method that is provided through community-based services. Additionally, 84 percent of APEs could not name any traditional methods of contraception, and a question regarding the differences between two commonly distributed OCs revealed that most APEs could not meaningfully differentiate them.

## Medicines and supplements

The physical verification of medicines and supplies was conducted with roughly half of the APEs in the sample (790). During this process, the enumerator asked the APE to open their drug kit and verified its contents, including the availability of key supplies, their quantity of each item, and their expiration date.

This assessment revealed critical shortages in key supplies, such as family planning methods, antibiotics, and analgesics, as shown in table 4. At the time of verification, less than 50 percent of APEs had each of the three main methods of contraception, and only 10 percent had all three, posing severe limitations to women's informed choice and uptake of their desired family planning and challenging the protection from sexually transmitted infections (STIs) that double-method use can provide. Similarly, the verification process revealed very low rates of antibiotics and analgesics, as well as low availability of important micronutrients. Availability was highest for rehydration salts (74 percent of surveyed APEs) and antimalaria treatment, where about 50 percent of APEs had some formulation of Coartem available.



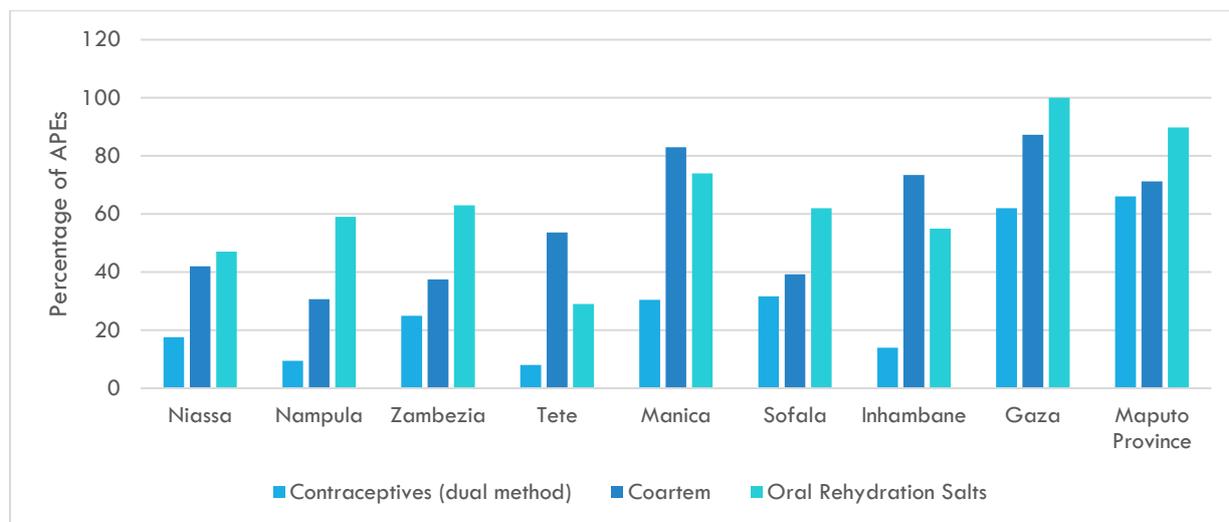
Table 4: Percentage of APEs with a Stock of Key Medicines and Supplements

	Percent of APEs	95 Percent Confidence Interval
<b>Family planning methods</b>		
Oral contraceptives: Microgynon or Microlut	39	34–41
Injectables 104 mg/0.65 ml	29	26–32
Male condoms	35	32–39
<b>Malaria diagnosis/treatment</b>		
Rapid diagnostic test	62	58–65
Any combination of Artemeter+Lumefantrina (Coartem)	55	51–58
Artesunate 200 mg	17	14–20
Artesunate 50 mg	12	10–14
<b>Micronutrients</b>		
Iron 90 m+folic acid 1 mg	57	53–60
Vitamin A+E	48	45–52
Zinc 20 mg	44	40–47
<b>Rehydration salts</b>		
Oral rehydration salts (ORS)	74	71–77
<b>Antibiotics, analgesics, and other</b>		
Amoxicillin 125 mg	14	12–16
Amoxicillin 250 mg	16	14–19
Tetracycline 1%	37	34–41
Paracetamol 500 mg	44	41–48
Paracetamol 250 mg	34	31–38
Mebendazole 500 mg	44	40–47
Cetrimide 15%/Chlorhexidine di-glunato 1.5% 500 ml	27	24–30
Chlorhexidine gen 7.1%	3	2–5

The availability of medicines also differed among provinces (see Figure 9). For example, in Maputo Province, 66 percent of APEs had at least one method of female contraceptives (OC or injectables) in addition to male condoms. However, in Tete and Nampula, less than 10 percent did. Tete had the lowest availability of family planning methods. Availability of oral rehydration salts (ORS) was generally high, except in Niassa and Tete, where less than 50 percent of APEs had ORS. In four provinces—

Niassa, Nampula, Zambezia, and Sofala—less than 50 percent of APEs had any formulation of “Coartem.”

Figure 9: Share of APEs Who Had Three Categories of Medicines at the Time of Verification



Source: Quality of Care (QoC) survey of APE, 2020. Authors’ own calculations.

Stockouts and medicine shortages have also been found in other recent studies, which have pointed to the need to address the different epidemiological needs of each province—given that the kit is standardized irrespective of the burden of disease/population demands of each province. Concerns related to the availability of medicines are also linked to the capacity of APEs to diagnose and treat patients correctly.<sup>26</sup>

A study currently underway by University Eduardo Mondlane (UEM) and the United Nations Children’s Fund (UNICEF) includes 94 APEs across four districts in Mozambique (Mossuril in Nampula, Angonia in the Central Region, Jangamo and Moamba in Inhambane, and Maputo Province, respectively). APEs were found to collect a new kit once every three months in three out of the four districts (except for Inhambane), which was also confirmed in the present study. However, the UEM/UNICEF study revealed difficulties from the APEs in understanding and filling out the stock management forms to be used. Throughout the visits, it was measured that paracetamol (250 g and 500 g) and amoxicillin were the most used medicines in the APE kit.

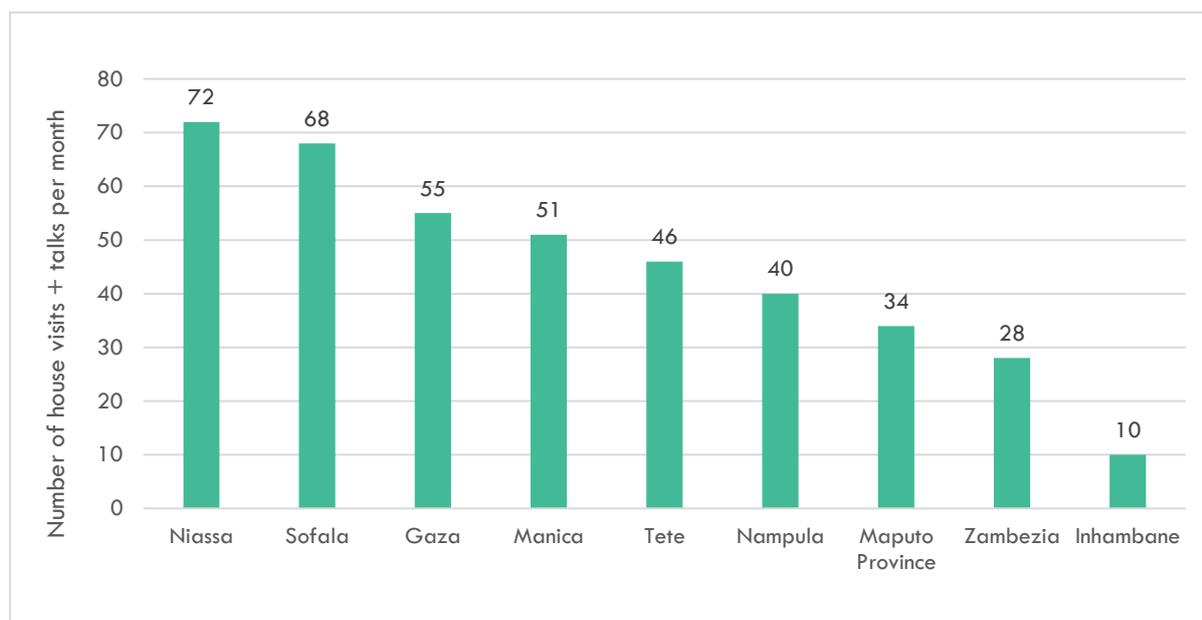
### Community engagement

During the physical verification visit, APEs were also asked to show their registers of community engagement, consultations, and supervision received. 358 APEs (26 percent) did not have available reports. Answers were collected from the remaining 1,019 APEs.

Community engagement includes APE visits to households, to foster promotive and preventative health or follow up on a treatment, as well as community health talks. On average, APEs had conducted 34 house visits over the previous month and given 27 talks over the previous three months (Figure 10). About 6 percent of APEs had not logged any community talks or household visits over the stated period. APEs logged, on average, 61 consultations over the previous months, for an average of 2 consultations per day.

<sup>26</sup> UEM, UNICEF. October 2020.

Figure 10: Composite of Community Engagement of APEs by Province



Source: Quality of Care (QoC) survey of APE, 2020. Authors’ own calculations.

### User satisfaction

User satisfaction is also an important component of an analysis of the success of a community health program. The user survey interviewed 2,404 rural users over the phone regarding their experiences with APEs, attendance of APEs’ community health talks, and overall satisfaction with the service provided. Surveyed users skewed male (67 percent), with an average age of 38. One-half reported agriculture or fishing as their primary occupation, and the median monthly income was Mt 640–1,600. The average household size of the surveyed users was seven people, which included four children.

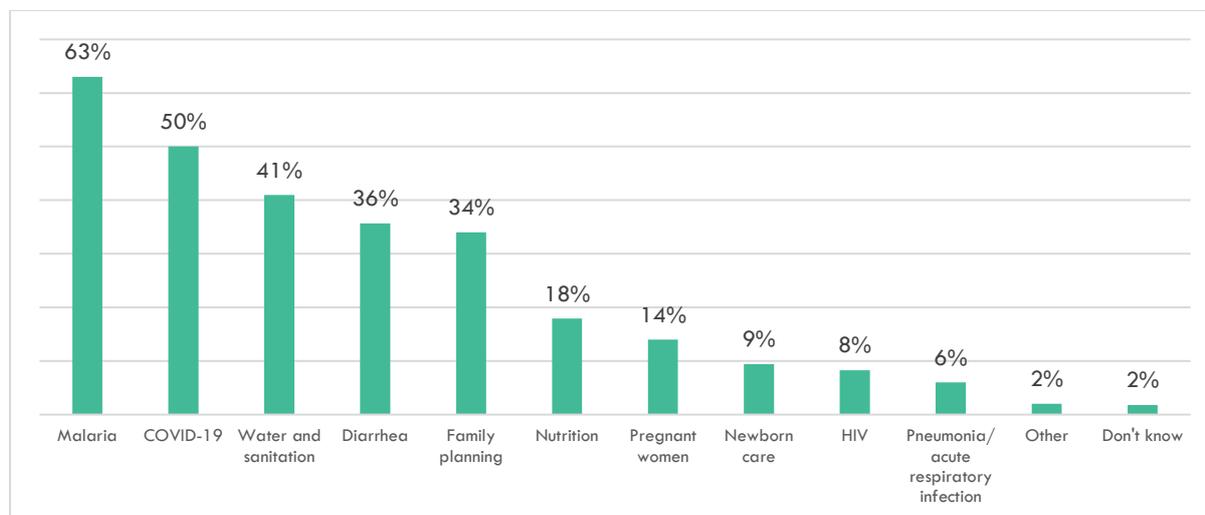
Individuals were selected among lists provided by the APEs, which introduces a selection bias in the sample. Nevertheless, results suggest that rural communities rely on APEs to a large extent. When asked where they or someone in their household went the last time they felt sick, close to 80 percent said to an APE, while only 14 percent went to a health center and 5 percent to a hospital.

Eighty-seven percent of users reported that their APE provided regular health talks, mainly on a weekly basis. Seventy-five percent of users reported attending the APE talks and went to an average of four talks over the past year. The most mentioned topic for the talks (Figure 11) was malaria (reported by 63 percent of users), followed by COVID-19 (50 percent) and water and sanitation (41 percent). The subjects of the APEs’ talks are primarily aligned with the topics in which APEs appear to be receiving the most training (85 percent received a refresher course on malaria versus 31 percent on HIV management). However, less than 50 percent of users reported that their last APE’s talk had included discussions of family planning, an important part of the APEs’ work.

A large share of users also reported being satisfied with the care received by APEs. Most users were satisfied with APEs on several domains, namely APE availability and engagement and availability of medicines. The evidence gathered in the study does not fully support these perceptions, especially regarding the availability of medicines and supplements. It is important to note that over 50 percent of the survey respondents were male with an average age of 38. At the same time, family planning was one of the weakest areas for APEs, both in terms of availability of family planning methods, APE engagement (community talks), and knowledge. Moreover, the reliability of patient satisfaction with the quality of service is not established. A systematic review of 195 studies in developed countries found

little evidence of the reliability of patient satisfaction data.<sup>27</sup> Other studies conducted in developing countries found similar biases in user responses on the quality of care.<sup>28</sup>

Figure 11: Topics Discussed by APE in the Last Talk (as reported by community members)



Note: Percentage of respondents who reported their APE discussed each topic in last talk. Multiple options were allowed. Source: Quality of Care (QoC) survey of APE, 2020. Authors' own calculations.

## Factors influencing APE performance

### Variable selection and model

The framework of the analysis was informed by previous studies, which evaluated the impact and cost-effectiveness of APEs in Mozambique, as well as the factors that contributed to the success of the program. Receiving feedback and training from health authorities was found to increase APE motivation. Bowser et al. (2015) documented that adding APE salaries led to an efficiency gain of 56 percent in cost per output in the long run.<sup>29</sup> Supervision is another key factor for the success of community health worker (CHW) programs. Ndimba et al. (2015) found misalignments between policy and practice regarding skills, training, and supervision of APEs.<sup>30</sup> For the purpose of this exercise, APE performance was defined as the ability of an APE to identify some of the most common clinical cases they encounter in their community health work. Essentially, the three hypothetical cases presented to the APEs were consistent with cases of malaria in children, malaria in adults, and diarrhea/respiratory infection in children. To be considered successful in identifying such cases, an APE had to diagnose at least two out of the three cases correctly. Hence, a dummy variable was created as the dependent variable, which takes on a value of 1 if an APE could correctly identify at least two of the three cases and a value of 0 otherwise.

Based on a review of the relevant literature and the variables available in the data, several variables were identified a priori as impacting APE performance (see table 5). Given the binary nature of the dependent variable, a logistic regression model was chosen to analyze potential predictors of APE

<sup>27</sup> J. Sitzia. 1999. How valid and reliable are patient satisfaction data? An analysis of 195 studies, *International Journal for Quality in Health Care*, Volume 11, Issue 4, August 1999, pages 319–328, <https://doi.org/10.1093/intqhc/11.4.319>.

<sup>28</sup> See, for example: Glick, Peter. 2009. "How reliable are surveys of client satisfaction with healthcare services? Evidence from matched facility and household data in Madagascar." *Social science & medicine* 68.2: 368–379.

<sup>29</sup> Bowser, D., Okunogbe, A., Oliveras, E., Subramanian, L., and Morrill, T. 2015. A cost-effectiveness analysis of community health workers in Mozambique. *Journal of primary care & community health*, 6(4), 227–232.

<sup>30</sup> Ndimba, S. D., Sidat, M., Ormel, H., Kok, M. C., and Taegtmeier, M. 2015. Supervision of community health workers in Mozambique: a qualitative study of factors influencing motivation and programme implementation. *Human resources for health*, 13(1), 1–10.

performance. Unlike linear regressions, logistic regressions do not assume normality and homoscedasticity. However, key assumptions still apply, namely linearity, independence of observations, and little to no collinearity among independent variables. Logistic regressions also require a relatively large sample size, which should increase when more independent variables are included in the model.

Table 5: Independent Variables Thought to Impact QoC Given by APEs

APE individual factors	Community factors
<ul style="list-style-type: none"> <li>• Age</li> <li>• Sex</li> <li>• Education</li> <li>• Years as an APE</li> <li>• Frequency of supervision (monthly supervision visits)</li> <li>• Ratio of supervisors to APEs</li> <li>• Training</li> <li>• Workload</li> <li>• Training in upSCALE</li> </ul>	<ul style="list-style-type: none"> <li>• Location (province)</li> <li>• Distance from reference health facility (time traveled to and from facility)</li> </ul>

Different linearity tests were performed for continuous variables, including visual examination of each variable plotted against their log odds, as well as the Box-Tidwell test. The Box-Tidwell test for linearity revealed a potential issue of nonlinearity with the APEs' caseloads (number of patients seen by APE per month), and, as a result, the variable was removed. Explanatory variables were found to be independent and did not exhibit significant collinearity.

The gender of an APE did not show a significant correlation with the dependent variable. Surprisingly, the frequency of training was also not significantly correlated with an APE's performance, whether it was measured as the number of "refresher" courses the APE received or the number of times the APE received training over the previous three months. Hence, these two variables were excluded from the multivariate regression. No issues of collinearity among the independent variables were detected.<sup>31</sup> A two-level model nesting APEs within provinces was employed.

## Results

Univariate regressions were run with each variable. Age was regressed both as a continuous and categorical variable by constructing age brackets. In the univariate regressions, all variables had a positive effect on APE success, with different degrees of magnitude and significance. An older APE (over 35) had considerably greater odds of success, suggesting that experience builds knowledge. However, the number of years as an APE had quite a small effect. In the univariate regression, each additional year of experience led to an 8 percent greater chance of correctly diagnosing the clinical cases. Education had the greatest impact.

Multivariate regressions included all the variables. Different specifications were considered for the multivariate logistic regression (table 6). In Model 1, the lower number of observations results from missing data in one variable—the number of supervision visits per month—due to many APEs not having their registers available for verifications. In Model 2, missing data points were predicted through multiple imputation. Multiple imputation is a general approach to deal with missing data, which allows for the uncertainty about the missing data by creating several different plausible imputed data sets and appropriately combining results obtained from each of them. It used a highly correlated variable to predict the missing values, which in this case were the number of supervision visits APEs reported to have received (as opposed to the verified registers of the number of supervision visits they actually received).

After controlling for other variables, APEs' years of experience as an APE, their training in upSCALE, and distance traveled to the nearest health facility lose significance. Education has the largest effect; having

<sup>31</sup> Two variables, the age of an APE and the years of experience, had a correlation coefficient of 0.5. However, the literature suggests that correlation coefficients up to 0.7 are acceptable among independent variables.

completed primary education made an APE between 1.8 and 3.0 times more likely to diagnose at least two of the three cases.

The number of supervision visits also revealed a significant effect. Each additional supervision visit per month could make an APE between 13 and 17 percent more likely to perform well. In contrast, being assigned to a supervisor with a higher load of APEs made APEs less likely to succeed in Model 2, which shows that an increase of one APE per supervisor could lead to a 3 percent drop in the likelihood of achieving the positive outcome.

Table 6: Regression Analysis Results

APE success=1 if APE correctly diagnosed at least 2 out of 3 cases						
	Univariate regressions		Model 1		Model 2	
	Odds ratio	p-value	Odds ratio	p-value	Odds ratio	p-value
Age	<b>1.02***</b>	0	1.01	0.392	<b>1.02*</b>	0.050
19–25 (ref)	1	—				
26–30	1.22	0.262				
31–35	1.26	0.208				
36–45	<b>1.49*</b>	0.031				
46–55	<b>1.83**</b>	0.004				
56–74	<b>2.28**</b>	0.003				
Education						
Some primary (ref)	1	—	1	.	1	—
Primary	<b>2.47***</b>	0	<b>1.79*</b>	0.054	<b>3.05***</b>	0
Basic	<b>2.76***</b>	0	<b>2.47**</b>	0.007	<b>4.78***</b>	0
Middle general	<b>2.61***</b>	0	<b>2.75**</b>	0.007	<b>4.15***</b>	0
Technical	1	—	0 (empty)		0 (omitted)	
Middle	<b>2.95**</b>	0.004	0 (empty)		1.87	0.158
Years as an APE	<b>1.08**</b>	0	1.02	0.128	1.02	0.204
Supervision visits per month	<b>1.13*</b>	0.019	<b>1.17*</b>	0.011	<b>1.14*</b>	0.034
APEs to supervisor ratio	<b>0.94***</b>	0	0.99	0.350	<b>0.97*</b>	0.083
Trained in upSCALE	<b>1.02*</b>	0.018	1.01	0.159	1.01	0.593
Distance to facility	<b>0.92*</b>	0.012	1.01	0.547	0.99	0.186
Cons			0.79	0.695		
Cons (province)			2.627		2.167	
Number			935		1,280	

Note: Model 2 uses multiple imputation to replace missing data in one of the variables (supervision visits per month).  
 \* =  $p < 0.05$ ; \*\* =  $p < 0.01$ ; \*\*\* =  $p < 0.001$ .

## CONCLUSIONS

This cross-sectional quality of care (QoC) survey reveals critical deficiencies in the community-based services that are currently provided in Mozambique. Despite the relatively large areas and share of the population covered by APEs, the study found that they appeared actively engaged with the community through regular door-to-door visits and talks. Members of the community suffering from ailments largely resort to APEs before seeking care at a health facility, perhaps pointing to how they are perceived as trusted and accessible points of care at the community level.

However, APEs' knowledge was found to be extremely deficient. The ability to identify basic and common illnesses appeared inadequate, with less than one in three APEs able to correctly diagnose cases of pneumonia and malaria in children and adults. Significant differences were observed among provinces in this regard and appeared worse in the Central provinces of Zambezia and Tete. APEs' knowledge and dissemination of health promotion information related to contraception and nutrition are also limited.

Weaknesses in APEs' knowledge are compounded by systemic constraints in the supply chain of APE kits. Shortages limit the contribution that APEs can make to integrated community case management for key infections in Mozambique, such as malaria, given that less than 50 percent of APEs had any formulation of Coartem at the time of verification in the provinces of Niassa, Nampula, and Zambezia—three

provinces with the highest parasite prevalence. The low availability of contraceptives also impairs APEs' role in addressing the existing unmet need for contraception in rural settings of Mozambique. Women's sexual and reproductive health choices are limited, as only 10 percent of APEs had all three main methods of contraception (oral contraceptives [OCs], injectables, and male condoms). The fragilities in the program are not dissimilar from previous findings, which have highlighted shortages in medicines and variable implementation success.<sup>32, 33</sup> The availability of medicines also differed among provinces, with southern provinces such as Maputo Province and Gaza having a better stock of critical medicines than Northern or Central provinces.

Factors influencing APE performance were examined through regression analysis. Findings suggested that an APE's level of education, followed by the strength of their supervision, contributes most to their knowledge, which is measured as the ability to correctly diagnose at least two of the three cases presented in the clinical vignettes. The study found that although all APEs have undergone initial training, refreshers have been delayed and have not benefited all equally, but, interestingly, APEs' trainings were not significantly correlated with their ability to diagnose common ailments.

Study findings could be used to improve the APE program through a combination of short- and long-term strategies. In the short term, it would be important to analyze in further detail the issues behind the supply chain that hinder the availability of medicines of APEs. Similarly, strengthening APE supervision, both in terms of frequency as well as the standardization of the supervision, appears paramount to the program's success. This could be combined with on-the-job training to focus on common ailments that APEs ought to be able to identify and treat correctly and ensure the accuracy of the messages disseminated during health promotion activities. In the long term, recruitment criteria should consider the level of education of candidates, and the severe gaps in basic knowledge would also suggest that a revision of the curriculum and approach to training are needed.

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<sup>32</sup> Baltazar G. M., Chilundo, Julie L. Cliff, Alda R. E. Mariano, Daniela C. Rodríguez, and Asha George. 2015. Relaunch of the official community health worker programme in Mozambique: is there a sustainable basis for iCCM policy?, *Health Policy and Planning*, Volume 30, Issue suppl\_2, December 2015, pages ii54–ii64.

<sup>33</sup> UEM, UNICEF, Avaliação do sistema de abastecimento de medicamentos para os Agentes Polivalentes Elementares em quatro distritos de Moçambique no período de Fevereiro de 2019 a Agosto de 2020. October 2020.

## Appendix A: Descriptive statistics of APEs and supervisors

### Descriptive statistics of APEs

	Number	Percent	Mean	95 Percent Confidence Interval CI	Standard deviation
Age	1,377		36		10.7
Gender	1,377				
Male	832	60		58–63	
Female	545	40		42–37	
Median level of schooling	1,377		Primary		
Years as an APE <sup>34</sup>	1,375		4.6		5.5
Households under care	1,371		658		869
Average weekly hours worked in this role	1,376		17		10.08
Trainings in 3-month period	1,372		1		3.5

### Descriptive statistics of APE supervisors

	Number	Percent	Mean	95 Percent Confidence Interval	Standard deviation
Age	320		31		6.6
Gender	320				
Male	220	69		63–74	
Female	100	31		37–26	
Position/job title					
Nurse	94	29			
Health technician	90	28			
Director	57	18			
Clinical Director	12	4			
Public health doctor	10	3			
General doctor	2	1			
Health specialist	1	.3			
Other	54	17			
Years as an APE supervisor	320		2.4		2.7
APEs under supervision	320		5		3.6
Weekly hours worked in this role	320		5		4.7

<sup>34</sup> At the time of data collection (2020).

## Appendix B: Detailed responses to medical vignettes (in Portuguese)

### CASE 1: “Abel” (4-month-old boy with cough and diarrhea)

Questions (diagnosis)	APEs	
	Number	Percent
1.1.1 Duração da tosse	980	72
1.1.2 Pergunta se a criança teve febre	677	49
1.1.3 Pergunta se tinha algum sangue nas fezes da criança	338	25
1.1.4 Pergunta se a criança vomitou	399	29
1.1.5 Pergunta se criança teve convulsões	169	12
1.1.6 Conta as respirações da criança	266	19
1.1.7 Executa o teste rápido de sangue para a malária em crianças	475	35
1.1.8 Pergunta sobre a duração da diarreia da criança	683	50
1.1.9 Pergunta sobre a duração da febre da criança	402	29
1.1.10 Pergunta/verifica se criança consegue beber/ amamentar	280	20
1.1.11 Pergunta/verifica se a criança está com muito sono / inconsciente	121	9
1.1.12 Pergunta se a criança teve qualquer outro problema	324	24
1.1.13 Verifica se o peito da criança tem tiragem subcostal	134	10
1.2.1 Identifica a criança como tendo respiração rápida/pneumonia	496	37
1.2.2 Identifica a criança como tendo malária	233	17
1.2.3 Identifica a criança como tendo sinal de perigo / sintoma referência para referência ou doença grave (qualquer)	338	25
1.2.4 Identifica a criança como tendo diarreia	444	33
1.2.5 Prescreve antibióticos; amoxicilina	400	30
1.2.6 Prescreve antimalárico; Coartem	171	13
1.2.7 Prescreve comprimidos de zinco	401	30
1.2.8 Prescreve SRO	543	40
1.2.9 Aconselha dose de Coartem—3 dias	120	9
1.2.10 Aconselha dose de amoxicilina—5 dias	221	16
1.2.11 Aconselha dose de SRO—quantas vezes necessárias	345	26
1.2.12 Aconselha dose de zinco—10 dias	199	15
1.2.13 Dá a primeira dose de amoxicilina	258	19
1.2.14 Dá a primeira dose de AL/Coartem	124	9
1.2.15 Dá a primeira dose de SRO	381	28
1.2.16 Dá a dose retal artesunato/plasmotrim	107	8
1.2.17 Dá a primeira dose de zinco	302	22
1.2.18 A criança não precisa de qualquer tratamento do APE	240	18
1.2.19 Refere à unidade de saúde	764	56
1.2.20 Escreva a nota de referência	724	53
1.2.21 Aconselha o uso de rede mosquiteira para criança	284	21
1.2.22 Aconselha alimentação contínua de líquidos para criança	280	21
1.2.23 Organiza uma visita de acompanhamento	464	34
1.2.24 Aconselha a devolver ou levar a criança a unidade sanitária caso agrave a saúde	381	28
1.2.25 Regista a visita no livro de registo APE	658	48
1.2.26 Verifica o registo de vacinação da criança	202	15

**CASE 2: “Deolinda”** (10-month-old with a temperature; has not eaten in 3 days and cannot stay awake)

	APEs	
	Number	Percent
2.1.1 Identifica a criança como tendo respiração rápida/pneumonia	141	10
2.1.2 Identifica a criança como tendo malária	470	35
2.1.3 Identifica a criança como tendo sinal de perigo/sintoma de referência ou doença grave (qualquer)	750	56
2.1.4 identifica a criança como tendo diarreia	150	11
2.1.5 Prescreve antibióticos; amoxicilina	162	12
2.1.6 Prescreve antimalárico; Coartem	258	19
2.1.7 Prescreve comprimidos de zinco	104	8
2.1.8 Prescreve ORS	131	10
2.1.9 Aconselha dose de AL/Coartem—3 dias	217	16
2.1.10 Aconselha dose de amoxicilina—5 dias	96	7
2.1.11 Aconselha dose de ORS—quantas vezes forem necessárias	104	8
2.1.12 Aconselha dose de zinco—10 dias	80	6
2.1.13 Dá a primeira dose de amoxicilina	100	7
2.1.14 Dá a primeira dose de AL/Coartem	184	14
2.1.15 Dá a dose de SRO	127	9
2.1.16 Da a primeira dose de retal artesunato/plasmodium	139	10
2.1.17 Da a primeira dose de zinco	109	8
2.1.18 A Criança não precisa de qualquer tratamento do APE	227	17
2.1.19 Refere a criança à unidade sanitária	924	67
2.1.20 Escreve nota de transferência	926	67
2.1.21 Aconselha o uso de rede mosquiteira para criança	333	25
2.1.22 Aconselha alimentação contínua e dar líquidos para criança	265	20
2.1.23 Organiza uma visita de acompanhamento	512	37
2.1.24 Aconselha a devolver ou levar a criança a unidade sanitária caso se agrave	368	27
2.1.25 Regista a visita no livro de registo APE	629	46
2.1.26 Verifique a saúde da criança ou o registo de vacinação	166	12

**CASE 4: “Eduardo”** (positive RDT)

	APEs	
	Number	Percent
4.1.1 Identifica o paciente como tendo respiração rápida/pneumonia	95	7
4.1.2 identifica o paciente como tendo malária	1055	77
4.1.3 Identifica o paciente como tendo sinal de perigo/sintoma de referência ou doença grave	152	11
4.1.4 identifica o paciente como tendo diarreia	105	8
4.1.5 Prescreve antibióticos; amoxicilina	182	13
4.1.6 Prescreve antimalárico; Coartem	845	62
4.1.7 Prescreve comprimidos de zinco	108	8
4.1.8 Prescreve ORS	104	8
4.1.9 Aconselha dose de AL/Coartem—3 dias	900	66
4.1.10 Aconselha dose de amoxicilina—5 dias	78	6
4.1.11 Aconselha dose de ORS—quantas vezes forem necessárias	94	7
4.1.12 Aconselha dose de zinco—10 dias	74	6
4.1.13 Dá a primeira dose de amoxicilina	91	7
4.1.14 Dá a primeira dose de AL/Coartem	538	39
4.1.15 Dá a primeira dose de SRO	108	8
4.1.16 Dá a dose de retal artesunato/plasmodium	92	7
4.1.17 Dá a primeira dose de zinco	98	7
4.1.18 O Paciente não precisa de nenhum tratamento de APE	233	17
4.1.19 Refere a unidade sanitária	290	21
4.1.20 Escreve nota de referência	298	22
4.1.21 Aconselha o uso de rede mosquiteira	654	48
4.1.22 Regista a visita no livro de registro APE	600	43
4.1.23 Organiza uma visita de acompanhamento	513	38
4.1.24 Aconselha a voltar ou a ir para uma unidade sanitária caso se agrave	406	30

## Appendix C: APE official medicine kit list in Portuguese and categorization used

Item	Category
Tetraciclina 1% bisnagas de 5 g	Topic agent
Clorexidina em gel, 7, 1%	Topic agent
Paracetamol 500 mg	Analgesics
Paracetamol 250 mg	Analgesics
Amoxicilina 250 mg	Antibiotic
Mebendazol 500 mg	Antiparasitic
Cetrimida 15%/Clorexidina di-gluconato 1, 5%, 500 ml	Antiseptic
Adesivo (2,5 cm x 5 m)	Consumable
Algodão Hidrófilo, estéril, 500 g	Consumable
Compressa esterilizada (10 cm x 10 m)	Consumable
Ligadura de gaze (10 cm x 10 m)	Consumable
Envelopes de plástico para embalar comprimidos (60 x 80 x 0.025 mm)	Consumable
Sabonetes de 110 mg	Consumable
Caixa Incinerador	Consumable
Luvas de observação	Consumable
Preservativos Masculinos	Contraceptives
Levonor + Etinil (Microgynon)	Contraceptives
Levonorgestrel (Microlut)	Contraceptives
104 mg/0.65 ml injectables	Contraceptives
Hexacloro de Benzeno 600 mg/60 ml	Fungicide
Sal Ferroso 90 mg + Ácido Fólico 1 mg	Micronutrients/supplements
Zinco 20 mg	Micronutrients/supplements
Amoxicilina 125 mg	Micronutrients/supplements
Vitamina A + E (Composta)	Micronutrients/supplements
SRO de baixa osmolaridade	Rehydration salts
Testes Rápidos de Malária (com lancetas e pipetas)	Test kit
Arteméter + Lumefantrina 20 mg/120 mg (6 x 1)	Antimalarial treatment (tablets)
Arteméter + Lumefantrina 20 mg/120 mg (6 x 2)	Antimalarial treatment (tablets)
Arteméter + Lumefantrina 20 mg/120 mg (6 x 3)	Antimalarial treatment (tablets)
Arteméter + Lumefantrina 20 mg/120 mg (6 x 4)	Antimalarial treatment (tablets)
Artesunato 50 mg	Antimalarial treatment (tablets)
Artesunato 200 mg	Antimalarial treatment (tablets)

## Appendix D: upSCALE in Inhambane and Zambezia

### Share of APEs who were trained on upSCALE app

APE is trained on upSCALE	Yes	No	Doesn't know
Zambezia	37.0%	61.69%	0.26%
Inhambane	96.6%	3.45%	0

### APEs' use of upSCALE

	Zambezia			Inhambane		
	Alw ays	Som etim es	No	Alw ays	Som etim es	No
Over the past month, the phone on which you access upSCALE functioned normally	64.0 %	12.5 %	23%	32.0 %	10.7 %	56.0 %
Over the past month, the wifi/mobile data on your phone was functional	66.0 %	13.0 %	20%	28.6 %	10.7 %	59.5 %
Over the past month the upSCALE application functioned normally	67.0 %	8.0%	24%	23.8 %	15.5 %	59.5 %
Over the past month, the solar-powered phone charger was functional	26.6 %	3.0%	69%	29.8 %	3.6%	66.7 %
Number of households APE registered on upSCALE (mean)	142			194		

### Share of APE supervisors who were trained on upSCALE

APE supervisor trained on upSCALE	Zambezia	Inhambane
Yes	53%	29.7%
No	47%	70.3%

### Supervisors' use of upSCALE

	Zambezia				Inhambane			
	Alw ays	Som etim es	No	Do e sn't kno w	Alw ays	Som etim es	No	Do e sn't kno w
Over the past month, the phone on which you access upSCALE functioned normally	26%	57%	17%	0	27%	9%	64%	0
Over the past month, the wifi/mobile data on your phone was functional	29%	60%	9%	0	36%	0	64%	0
Over the past month the upSCALE application functioned normally	29%	49%	20%	0	27%	9%	64%	0
Over the past month, the solar-powered phone charger was functional	29%	26%	40%	5.7%	0	0	91%	9%