Assessment of Community Health Workers Activities in Zambézia Province, Mozambique

Cristolde Atanasio Salomão (✉ todysalo@gmail.com)

Talata Sawadogo-Lewis

Réka Maulide Cane

António Júnior

Briana Stone

Júlia Sambo

Michael R Diaz

Fernando Padama

Humberto Rodrigues

Timothy Roberton

Acácio Sabonete

Research article

Keywords: community health workers, assessment, activities, Zambézia, Mozambique

Posted Date: January 31st, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1282919/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Introduction: Mozambique's Community Health Worker (CHW) or *Agentes Polivalentes Elementares* in Portuguese (APE) in Mozambique was reinitiated in 2010 after an unsuccessful first attempt decades prior. Years after this reinitialization, the Ministry of Health of Mozambique (MoH) and other interested parties sought to understand how the implementation of APEs interventions is progressing. Given its low coverage of many health intervention, the province of Zambézia was of specific interest.

Methodology: We carried out a cross-sectional study in six districts of the Province of Zambézia, namely: Ile, Inhassunge, Milange, Mocubela, Mulevala and Pebane. We designed a questionnaire based on government plans, APE training material, and best practices for the implementation of CHW programs found in the literature. We conducted descriptive analysis to summarize the different components of the APEs program according to responses.

Results: A total of 144 APEs were interviewed, of which 67% were male, 63% aged between 18 to 39 years, 60% had a first cycle of education and 46% had worked as APEs for 5 or more years. While 91% reported having received training after their initial training, only 19% had received training in the past 3 months. Only 48% of APEs replenished their kits every month, and stock-outs of medications ranged from 19% to 92%, with expired medication being found for 5-13% of the medications. Although the quality of supervision appears high with APEs reporting service delivery observation (88%), discussion of work performance (81%) and work-related problems (91%), checking of supplies (90%), review of records (93%), and praise (92%) during their last supervision, only 59% of our sample reported having had their last meeting with their supervisor less than 1 month ago.

Conclusions: While there have been some successes in this renewed implementation, challenges persist around ensuring the proper implementation of the program as it is designed. Additionally, a review of the program to match the current realities of field (e.g., increased population per APE, increase of the stipends) is becoming increasingly necessary.

Background

Mozambique's community health worker (CHWs) program - known in Portuguese as *Agentes Polivalentes Elementares* (APEs) - was initially launched in 1978. Despite some initial success, the program was halted in 1989 due to various obstacles - mostly centered around poor coordination of different APEs initiatives, poor monitoring and supervision, and limited support for APEs (1, 2). Despite multiple attempts to revive the program and although various non-governmental organizations (NGOs) continued to fund program-specific APEs, the official government APE program remained halted for nearly two decades (2), before being relaunched in 2010. Building on lessons learned from the unsuccessful first implementation, this relaunch included clearly defined training goals, specified activities, and a medium- to long-term plan for the program's implementation (3).

APEs are members of medically underserved communities who are designated by their communities and then trained to (1) perform health promotion activities, and to (2) provide basic health services in their communities (3). APEs provide integrated community case management (iCCM) of childhood illness (1). The APE program has made important contributions to expanding access to health services in remote communities within Mozambique (4), and if carefully implemented, can contribute to achieving increased health equity in the country (5-8).

In 2015, a technical revision to the APEs training curriculum was issued and implemented, which added the administration of family planning interventions (4). In theory, each APE is meant to be responsible for 500 to 2,000 inhabitants depending on the population density and access to health facilities (3). As part of the basic healthcare services they provide, each APE is given a medical kit which contains basic medication and commodities to diagnose and treat common minor illnesses (3). The kits are assembled by Ministry of Health and are distributed to local health centers on a monthly basis for APEs to collect and use in their communities. Each APEs' entire kit is intended to be replaced every month, regardless of the quantity of commodities used (3). The type and quantity of components in the APE kits were based on rough estimates of APEs' commodity monthly use originally calculated by the MoH. These quantities have not been significantly altered since the initiation of iCCM in Mozambique and are not based on current APE consumption data or on regional and seasonal variations in disease burden (9).

The coverage of health interventions in Zambézia is generally lower than the national average. For example, the contraceptive prevalence rate in Zambézia is 18%, compared to 27.1% nationally. 20% of women in Zambézia have not attended any pre-natal consultations, compared to the national average of 6.7%, and 75% of Zambézia's babies do not receive any post-natal consultation, compared to 55.6% nationally (4). Additionally, most of Zambézia's population is rural and 39.1% of its population belongs to the poorest wealth quintile (4). Zambézia is therefore particularly well positioned to benefit from an APE program.

We undertook this study to assess how the APE program is currently being implemented. We hope that the findings from this study will help identify where roadblocks exist and help guide decision-makers in how to address them.

Methods

Sampling

We conducted a cross-sectional survey of APEs in Zambézia province, using single-stage cluster sampling. We chose this sampling strategy as, for indicators that take individual APEs as the unit of analysis, the single-stage cluster sampling would in result in precision of +/- 10 percentage points, assuming an observed estimate of 50%, a design effect of 1.5, and an alpha of 5%. Given that there were 22 districts in Zambézia overall, this meant selecting 6 districts as our sampling units. To select districts, we obtained a list of all 22 districts in Zambézia province. We first stratified this list by urban (n=5) and

rural (n=17). We then performed systematic random sampling on each stratum to select our 6 districts, 5 of which were rural (Inhanssunge, Ile, Mocubela, Mulevala, Pebane), and 1 urban (Milange). We then obtained an updated list of all APEs currently working in the selected districts from the DDSMAS. All APEs included on this list for the selected districts were included in our sample.

Questionnaire design

We built a questionnaire to capture how well the APE program (as described in government plans) is being implemented. To do so, we examined national strategies, government documents, and the APE training curriculum to identify what knowledge, tools, medication, and activities an APE should theoretically have or do. Based on this information, we developed a questionnaire that asks about each expected activity (e.g. frequency of occurrence, knowledge about the activity), as well as each individual medication (e.g. whether the APE has it, expired status, stock-outs). Additionally, we used the Community Health Worker Assessment and Improvement Matrix (10) which summarizes the key factors necessary for a successful APE program to help our analysis. Building on both elements, we developed a questionnaire which is available as supplementary material.

Data collection

We used Open Data Kit (ODK) as our data collection platform. We carried out 14 days of data collection in the selected districts. Given that data collection occurred in January of 2020 (i.e. in the rainy season), road conditions for travel in the districts were poor. Teams were given a current listing of APEs for their allocated district. Additional APEs found during data collection were not included in the sample.

Interviews took place either in APEs' homes when road conditions permitted it, and at the health center when reaching APEs' homes was not possible. Data collectors performed an inspection of kits only when they were able to reach APEs' homes, as the kits and complete inventories are too large for APEs to travel with them.

Data analysis

We examined APEs' knowledge, activities, and presence of fit-for-use medication and equipment. We also assessed APE work satisfaction. Data were analyzed using descriptive statistics, such as frequencies and means, to summarize APE responses. Estimates were calculated accounting for our study design and sampling weights. We constructed weights for each APE based on the joint probability of being in the final sample of responding APEs, i.e., the probability that: 1) the district was sampled 2) the APE was sampled within the district (which given our study design was 100% for all APES), and 3) the APE was contactable (different for each district). To account for clustering (in this case, districts), Taylor-series linearization was used to estimate variance and calculate confidence intervals. A Finite Population Correction factor (FPC) was also applied to our estimated standard errors to account for how close our

sample size is to the whole province-level population of APEs. To apply these adjustments for our sampling design and response rates to estimate findings for Zambezia province as a whole, we employed the “svy” set command in Stata. All data presented in this paper is weighted estimates along with their 95% confidence interval for all APEs in the province of Zambezia province. Statistical analysis was performed using Stata (11).

Results

Sociodemographic characteristics

Of the 171 APEs planned for this survey, 144 (84%) were interviewed and 23 (16%) were not, due to various reasons. Of note, of those 23, 11 individuals were no longer working as APEs, it was impossible to contact 10 individuals during data collection, and 2 individuals were deceased for a total of 23 (13%). Most APEs were between 20 and 39 years old (62%), male (67%), and married (79%). More than half of the respondents (57%) have a junior secondary level and were able to read (93%) and solve a simple arithmetic equation (81%) (Table 1).

Table 1. APEs socio-demographic characteristics

<u>Characteristic</u>	<u>Estimate</u>
Average age (years)	36.6
Age distribution (%)	
<20	0.6
20-29	29.9
30-39	31.6
40-49	24.2
50-59	12.2
>60	1.5
Gender (%)	
Female	33.2
Male	66.8
Marital status (%)	
Married	79.3
Single	14.7
Separated	4.2
Widowed	1.9
Highest level of education completed (%)	
Primary	43.1
Junior Secondary	48.5
Senior Secondary	8.4
Able to read a short sentence correctly (%)	93.4
Able to solve a simple arithmetic equation (%)	81
Average number of years working as APE (years)	4.7
Women	4.1
Men	5.1

APEs workload

Table 2. Summary of APE workload, distance, and recruitment

	Est.	95% CI
Average number of communities per APE (n)	3.4	1-12
Average number of population per APE (n)	3,926	147-75,800
Average distance from the APE's home to their affiliated health facility (km)	38	0 - 190
Average distance between health facilities and district headquarters (km)	52	3-390
APEs recruited during or after 2015 (%)		
All	53.2	40.4 – 65.6
Women	59.5	39.6 – 76.8
Men	50.0	37.7 – 62.4
APE recruitment source (%)		
Recruited by community	86.2	66.5 – 95.1
Recruited by health facility	12.3	4.5 – 29.4
Other	1.5	0.3 – 7.9

APEs are on average responsible for 3,926 individuals spread across an average of 3.4 communities (table 2). They live on average 38 km away from the health facility and 52 km from the center of the district (table 2).

Training and activities

Table 3. APE training

	Est.	95% CI
APE reports having been trained as part of becoming an APE (%)	99.2	92.4-99.9
Average number of years since initial training (n)	4.9	3.9-5.9
Average duration of initial training (days)	142	133.7-150.3
APE reports receiving any training after their initial training (%)	91.7	86.7 - 95.0
Reason for not receiving training since becoming an APE (excluding initial training)		
No training was offered to APE (%)	81.4	31.9 - 97.6
Training was offered but APE could not attend because of scheduling conflicts (%)	18.6	2.4 - 68.1
Average amount of times received training since initial training (n)	5.59	1.80 - 9.40
APE reports receiving any training in the past 3 months (%)	19.7	9.8 - 35.5

The performance of APEs in terms of training is described in table 3. While 99% of the interviewed APEs reported having received training to be an APE, only 20% reported having received some training in the last 3 months before the survey.

Challenges reported by APEs

We observed the kits of 64% of the APEs that we were able to reach. We found that 81% of the kits were in acceptable conditions (Annex 1). As for the condition of the medications in the kit, the percentage of expired medications varied from 5 to 13% (Figure 1).

Regarding supervision, 99% of APEs reported that they had ever received supervision but only 18% had received supervision in the last two months. Most APEs (94%) reported that they were given suggestions and advice during the last supervision they received. During supervision only 80% of APEs mentioned that the supervisor used the checklist during supervision and 88% mentioned that the supervisor observed them while working during their last supervision. When asked about frequency of activity reports sent to supervisors, 92% had sent the activity report in the last month, 99% submitted the reports directly to the health unit and 79% received feedback from the reports (Annex 2).

With regard to the barriers mentioned for not going to the health facility when patients are referred, 45% of the APEs reported that patients do not have transport to the health facility, 20% stated that patients do not have money to go to the health facility and 15% of patients did not want to go to the facility (Annex

3). Regarding barriers to replenishing their equipment and medications, 58% of the APEs reported not facing any challenge and 31% said that the health facility had a stockout (Figure 2).

Discussion

APE and the health system

Although the program prioritizes the recruitment of women to be APEs, our findings show that men continue to outnumber women – which has been a concern from the very beginning of the program (1). Encouragingly however, our findings suggest a shift towards hiring more women as of 2015 (year of the introduction of family planning to the APE program).

In terms of recruitment, only APEs who are literate and able to solve simple arithmetic equations are supposed to be allowed into the program. Nearly a fifth of the APEs are unable to solve a simple equation, which is concerning since APEs need to be able to dispense a specific amount of medication and this may impact the delivery of their services. Although some evidence suggests that interpersonal skills outweigh educational background in terms of what makes a good CHW (12), literacy and basic numeracy is also very important for anyone managing medication.

Community embeddedness is a key determinant for the success of CHW programs – in part because CHWs are typically most familiar with their community, and in part because it protects CHWs from fluctuations in political interests (12, 13). Per our findings, although most APEs were recruited by their own community, more than a tenth were recruited by health facility staff. APEs also reported that their patients did not heed their referral to the health facility because they did not want to go to the health facility (15%) and because of the APE's own poor relationship with the health facility (5%). Taken together, these elements suggest that there is room for the health system to get more engaged with the community and with the APEs themselves.

The discrepancies between the lists of APEs provided at central and local level by the APES Program may indicate the existence of a disconnect at the level of updating records. This disconnection leads to a lack of precision and integrity of information, for example, by not including the systematic updating of APEs that have already died, others that are no longer working as APEs, and new APEs found in the field and that were not included in the aforementioned lists. Proper record-keeping and quality assurance have been linked to improved performance of CHW programs (14), suggesting that there is also room for improving the monitoring system.

Infrequent supervision, supervision that does not include field visits, and supervision that focuses excessively on reports can be demotivating for CHWs (14, 15). Upwards of 90% of APEs in our sample reported that their supervisor provided praise, provided advice, and asked about work-related problems during their last supervision. This suggests that the supervisor-APE relationship typically does go beyond simple box-checking exercises. However, not all supervisors complete expected tasks, as a fifth of APEs reported that their supervisor did not complete the supervision checklist during the last supervision, and

another fifth reported not receiving feedback on their reports – both of which are required by the APE program.

Medication and commodities

We found that a concerning high percentage of APEs had expired medications in their kits at the time of inspection. This finding was surprising, given that 90% of APEs reported that their supervisor had reviewed their medication during the most recent supervision. However, APEs report receiving on average 8 supervisory visits per year – 4 fewer than planned.

We found stock-outs across all medications at the time of the study, with APEs reporting having had stock-outs within the past three months for all medications as well. Given that APEs serve on average approximately two to four times the population that their kits were designed for (3,926 individuals, compared to the 500-2,000 planned), stock-outs are unsurprising. APEs who run out of medication early in the month have no recourse to turn to and must refer patients to the health facility – who also experience frequent stock outs (16, 17). Although some diseases exhibit seasonal patterns in Mozambique (18), the medication provided in the kits does not take these patterns into account – as supported by the low availability of malaria medication in our results. Frequent occurrences of the community seeking assistance from CHWs who are unable to provide care due to stock-outs can lead to the undermining of community trust (15, 19). Similar factors are likely at play with the APE program in Zambézia as well.

The availability of all family planning items – from injectable capsules to male condoms – is particularly low, which contrasts with the APE program's focus on family planning as a priority area. This is of particular concern since interruptions in contraceptive use puts patients at increased risk for unintended pregnancies. Relatedly, misoprostol was also very infrequently available, and many APEs reported never having had it at all. Although women's health is prioritized at the policy level in Mozambique (20), breakdowns in the supply chain such as those found here threaten potential gains in women's health.

Training

Almost all APEs have been trained to carry out health activities in their communities, we found that refresher trainings over time are infrequent. This suggests that APEs have not had sufficient or recent training in practice, which can affect performance and the impact of their activities on communities (21), in-service training aims to update CHW with new policies and programs, reinforce initial training, and ensure they are practicing skills learned (21). In-service training is provided at regular intervals, varying from monthly to twice a year, and offered in the form of workshops, monthly meetings, and refresher courses (22). According to James et al., continuous training programs are more likely to contribute to improving the level of systems in environments with limited resources (23). Continuing, or refresher, training provide an opportunity to update APEs on new skills, to reinforce their initial training, and to

ensure they are practicing skills learned. Beyond pre-service training, many countries also provide in-service trainings to extend or refresh the skills of the CHWs (24).

Barriers and bottlenecks

Transport was the most frequently reported difficulty for APEs to both to collect their kits and to refer patients. This is a common issue for CHW programs generally (25) since these programs tend to be implemented in remote regions where access to a health facility is difficult. Although the APE program does provide bicycles, no provisions are made for repairs and maintenance.

Only a quarter of APEs reported having received their stipend within the past month, and approximately a third reported not having received it within the past three months. The amount of the monthly subsidy (1200 Meticaïs, roughly equivalent to 16 United States dollars at time of writing) has also not increased since the inception of the program a decade ago, despite the fact that APEs were informed that it would (15) and that the guidelines do plan for adjusting for inflation over time (3). Small payments that are delivered infrequently have been identified as demotivating factors for CHWs in other similar settings (19, 25).

Although we were unable to capture it quantitatively, some APEs accidentally revealed wearing more than one hat by showing the research team cellular phones, contraceptives of a different type, and medications of different brands when asked to show their APE kits. All of these are items that are not included in the APE kit but are part of kits of other NGO-based health outreach programs in the region. A complex funding landscape and vertical programming is a well-documented issue in Mozambique (26), and that APEs would diversify both their income and medical source is unsurprising. APEs in Mozambique already report feeling overburdened (15, 27), and having to resort to adding on additional positions may worsen the situation.

Limitations

Data collection took place during the rainy season, which meant that road conditions made it impossible to reach all of the APEs' communities to observe their kits. The kits that we were able to observe belonged to APEs who resided close enough to a functional road to be reached by car, short walk, or motorbike – and who therefore have easier access to their health facility. Additionally, given the seasonality of certain diseases, data collected during the dry season may have presented a different picture in terms of consumption of medication.

Conclusion

A decade after it was reinitiated, Mozambique's APE program has had some successes, but challenges persist. Most urgently, more focus on ensuring a steady supply of APE kits and subsidies being delivered

regularly and on time is necessary. While supervision seems to be of high quality, the health system must ensure that it occurs more frequently. Since the workload has increased for the APEs, a review of the program to match the current reality is necessary – either more APEs need to be hired, or the supplies and support – both financial and through supervision – planned for each APE must be increased.

List Of Abbreviations

APEs	Agentes Polivalentes Elementares
CHW	Community Health Worker
CITI	Collaborative Institutional Training Initiative
DDSMAS	Direcção de Saúde, Mulher e Acção Social
DPS	Departamento Provincial de Saúde
iCCM	Integrated Community Case Management
INS	Instituto Nacional de Saúde
JHU	Johns Hopkins University
MoH	Ministry of Health
NGO	Non-Governmental Organization
ODK	Open Data Kit
PSMCN	Plataforma de Saude da Mulher e Criança e Nutrição
WASH	Water Sanitation and Hygiene

Declarations

Ethics approval and consent to participate

All members of the research team completed their human research certificate delivered by the Collaborative Institutional Training Initiative (CITI) program. Surveyors and supervisors were trained in the ethics of data collection in the field using the JHU and INS ethics manual. The study obtained ethical approval from the INS Institutional Health Bioethics Committee (Ref. 112 / CIBS-INS / 2019) and from the Institutional Review Board of Johns Hopkins University (IRB00009411). No study activity was initiated prior to the final approval of the protocol.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request and with authorization from the Instituto Nacional de Saúde and from Johns Hopkins University, who co-own the data.

Competing interests

The authors declare that they have no competing interests.

Funding

This study was carried out as part of the National Evaluation Platform (NEP) project funded by Global Affairs Canada (project number CA-3-M013604001). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Authors' contributions

CS, BS, AJ, HR, RMC, TSL, TR and AS planned and designed the study. CS, BS, TSL, and FP supervised the study teams collecting the data. TR, BS, AJ, FP, JA, TSL, CS, MD and RMC performed data analysis. CS, AS, RMC, TR and TSL prepared the manuscript. All authors read and approved the final manuscript.

Acknowledgements

The authors would like to thank IIP-JHU, the Mozambique Ministry of Health (MISAU), the Instituto Nacional de Saúde (INS) and the Mozambique APE Program. We are also grateful to all APEs and APE supervisors who participated in the evaluation, from the Provincial Health Department (DPS), District Health, Women and Social Services (SDSMAS) and health facilities in Mozambique.

References

1. Chilundo BG, Cliff JL, Mariano AR, Rodriguez DC, 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:ii54-ii64.

2. Ndimba SD, Sidat M, Give C, Ormel H, Kok MC, Taegtmeyer M. Supervision of community health workers in Mozambique: a qualitative study of factors influencing motivation and programme implementation. *Hum Resour Health*. 2015;13:63.
3. Ministério da Saúde Moçambique. Programa de Revitalização dos Agentes Polivalentes Elementares. Maputo, Moçambique: Direcção Nacional de Saúde, Ministério da Saúde. March 2010.
4. Ministério da Saúde Moçambique. Currículo do curso de agente polivalente elementar. Maputo, Moçambique: Direcção de Recursos Humanos, Direcção Nacional de Saúde, Ministério da Saúde. August 2015.
5. Guenther T, Sadruddin S, Finnegan K, Wetzler E, Ibo F, Rapaz P, et al. Contribution of community health workers to improving access to timely and appropriate case management of childhood fever in Mozambique. *J Glob Health*. 2017;7(1):010402.
6. Lehmann U, Friedman, I, Sanders, D. REVIEW OF THE UTILISATION AND EFFECTIVENESS OF COMMUNITY-BASED HEALTH WORKERS IN AFRICA. 2004. Available from: <https://pdfs.semanticscholar.org/7a0c/fd44975b00b045c7957c9327a87c9fcc6b63.pdf>
7. Littrell M, Moukam LV, Libite R, Youmba JC, Baugh G. Narrowing the treatment gap with equitable access: mid-term outcomes of a community case management program in Cameroon. *Health Policy Plan*. 2013;28(7):705-16.
8. McCollum R, Gomez W, Theobald S, Taegtmeyer M. How equitable are community health worker programmes and which programme features influence equity of community health worker services? A systematic review. *BMC Public Health*. 2016;16:419.
9. USAID. DELIVER PROJECT, Task Order 4. Mozambique: Strengthening the Community Health Worker Supply Chain. Arlington, VA; 2012. Available from: https://chwcentral.org/wp-content/uploads/2013/11/USAID-Deliver_Mozambique-CHW-Supply-Chain.pdf
10. Crigler L, Hill, K, Furth R, Bjerregaard D. Community Health Worker Assessment and Improvement Matrix (CHW AIM): A Toolkit for Improving Community Health Worker Programs and Services. Bethesda, MD: USAID Health Care Improvement Project; 2011.
11. Stata Statistical Software: Release 16 [Internet]. StataCorp LLC. 2019.
12. Cometto G, Ford N, Pfaffman-Zambruni J, Akl EA, Lehmann U, McPake B, et al. Health policy and system support to optimise community health worker programmes: an abridged WHO guideline. *Lancet Glob Health*. 2018;6(12):e1397-e404.
13. Schaaf M, Warthin C, Freedman L, Topp SM. The community health worker as service extender, cultural broker and social change agent: a critical interpretive synthesis of roles, intent and accountability. *BMJ Glob Health*. 2020;5(6).

14. De Koning K, Kok M, Ormel H, Kane S, Rashid S, Sarker M, Gemechu D, Ahmed R, Syafruddin D, Otiso L, Namakhoma I, Sidat M, Tulloch O, Theobald S, and Taegtmeier M. A COMMON ANALYTICAL FRAMEWORK ON FACTORS INFLUENCING PERFORMANCE OF CLOSE-TO-COMMUNITY PROVIDERS. Royal Tropical Institute; 2014. Available from:
<http://www.reachoutconsortium.org/media/2859/reachout-inter-country-analysis-and-framework-report.pdf>
15. Kane S, Kok M, Ormel H, Otiso L, Sidat M, Namakhoma I, et al. Limits and opportunities to community health worker empowerment: A multi-country comparative study. *Soc Sci Med*. 2016;164:27-34.
16. Hasselback L, Crawford J, Chaluco T, Rajagopal S, Prosser W, Watson N. Rapid diagnostic test supply chain and consumption study in Cabo Delgado, Mozambique: estimating stock shortages and identifying drivers of stock-outs. *Malar J*. 2014;13:295.
17. Wagenaar BH, Gimbel S, Hoek R, Pfeiffer J, Michel C, Manuel JL, et al. Stock-outs of essential health products in Mozambique - longitudinal analyses from 2011 to 2013. *Trop Med Int Health*. 2014;19(7):791-801.
18. Stone B, Sambo J, Sawadogo-Lewis T, Roberton T. When it rains, it pours: detecting seasonal patterns in utilization of maternal healthcare in Mozambique using routine data. *BMC Health Serv Res*. 2020;20(1):950.
19. Saprii L, Richards E, Kokho P, Theobald S. Community health workers in rural India: analysing the opportunities and challenges Accredited Social Health Activists (ASHAs) face in realising their multiple roles. *Hum Resour Health*. 2015;13:95.
20. Qiu M, Sawadogo-Lewis T, Ngale K, Cane RM, Magaco A, Roberton T. Obstacles to advancing women's health in Mozambique: a qualitative investigation into the perspectives of policy makers. *Glob Health Res Policy*. 2019;4:28.
21. O'Donovan J, O'Donovan C, Kuhn I, Sachs SE, Winters N. Ongoing training of community health workers in low-income and middle-income countries: a systematic scoping review of the literature. *BMJ Open*. 2018;8(4):e021467.
22. Javanparast S, Baum F, Labonte R, Sanders D, Rajabi Z, Heidari G. The experience of community health workers training in Iran: a qualitative study. *BMC Health Serv Res*. 2012;12:291.
23. Kathryn T, Natalie B. Regulatory Frameworks for Community Health Worker Programs. Leavitt Partners; 2016. Available from:
<https://www.williamjames.edu/academics/lifelong/ce/upload/Regulatory-Frameworks-for-Community-Health-Workers-Programs.pdf>

24. Kumar M, Nefdt R, Ribaira E, Diallo K. Access to healthcare through community health workers in East and Southern Africa 2014. Available from: 10.13140/RG.2.1.1771.4089.

25. Chandani Y, Andersson S, Heaton A, Noel M, Shieshia M, Mwiroti A, et al. Making products available among community health workers: Evidence for improving community health supply chains from Ethiopia, Malawi, and Rwanda. J Glob Health. 2014;4(2):020405.

26. Mussa AH, Pfeiffer J, Gloyd SS, Sherr K. Vertical funding, non-governmental organizations, and health system strengthening: perspectives of public sector health workers in Mozambique. Hum Resour Health. 2013;11:26.

27. Dias J, Tomé, T. Inverted State and Citizens’ Roles in the Mozambican Health Sector. 2018.

Annex

Annexes 1-3 are not available with this version

Figures

Figure 1

Percentage of APEs that had given commodities and the expiration status of each commodity

Figure 2

Barriers reported by APEs for the replenishment of equipment and medications