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Research Article

SHORT TERM EFFECTS OF PERFORMANCE BASED FINANCING ON IMMUNIZATION DATA IN THE DSCHANG HEALTH DISTRICT

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Abstract

Background: Performance Based Financing (PBF) has been widely adopted in low and middle income countries with the aim to boast their health system performance. However, very little is been known about the effects of PBF on the health information system (HIS). **Objective:** To evaluate the short term effects of PBF on the quantity and quality of immunization data in the Dschang Health District. **Method:** A cross-sectional time series study was carried out in 23 health facilities under PBF in the DHD. Our sample size was exhaustive with inclusion criteria, health facilities that have existed for at least three years (2017 to 2018 before PBF and 2019 with PBF), and have been vaccinating for this period of time and disposes all their vaccination data collection tools for this period of time. Our sample size was exhaustive. Sources of data included the vaccination registers, monthly activity report and the district health information system. **Results:** The enrolment of pentavalent1 had a decrease of 11,2% between 2017 to 2018 and 11,6% between 2018 and 2019. For pentavalent3, the number of enrolment had a decrease of 10,6% between 2017 to 2018 and 14,3% from 2018 to 2019. The timeliness of EPI data witnessed a 7,5% increase between 2017 and 2018, and a drop of 73,7% between 2018 and 2019. The completeness of EPI data for the DHD from 98% to 96,6% in 2018 to 99,2% in across the three years. Using the verification factor number of health facilities with consistent data ranges from 13% to 52% and 70% and 13% to 43,5% and 70% for 2017, 2018 and 2019 for pentavalent1 and pentavalent3 respectively. Health facilities with improved PBF score across 2019 increased from 12 to 15 with PBF score ≥ 75% between the First trimester and the fourth trimester with no major change in data indicators. **Conclusion**: the quality and precision of EPI data have improved most especially in 2019 across the years from 2017 to 2019 with PBF. However, timeliness remains relatively low and should be improved.

Keywords: Immunization, Performance base financing, Timeliness, Completeness, Consistency.

INTRODUCTION

High quality data and effective data quality assessment are required for accurately evaluating the impact of public health interventions and measuring public health outcomes (Chen *et al.,* 2014). Data, data use, and data collection process, as the three dimensions of data quality, all need to be assessed for overall data quality assessment. Public health has as an ultimate goal to improve the health status at the population level, and this can only be achieved through a collective mechanisms and actions of public health authorities within the government context (Winslow, 1920; Walker, 2008). Public health agencies have three defined functions which include: assessment of health status and health needs, policy development to serve the public interest and assurance that necessary service are provided (Medicine). In other to properly carryout this functions, the use of data, information and knowledge is indispensable thus making public health a data intensive domain (Andresen, 2010). In the current information age, the use of data has become essential for decision making in public health at the local, national, and global level but despite a global commitment to the use and sharing of public health data, this can be quiet challenging in reality. At the local level, data are used to monitor population health and to target interventions; at the national level, data are used for resource allocation, prioritization, and planning; and at the global level for estimates on the global burden of disease, to measure progress in health and development, and to contain emerging global health threats (Chan *et al.,* 2010; Heymann and Rodier, 2001).

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The Republic of Cameroon has an estimated population of 26,545,863 million inhabitants (Cameroon population, 2020). The health system in Cameroon can be described as a pluralistic system, characterized by multiple sources of financing and health care providers. The main financing bodies include government, public enterprises, foreign aid donors, private enterprises, households, faith-based missions, and non-governmental organizations; whereas providers are mostly government, independent private and faith-based hospitals (Kengne *et al.,* 2009). The coordination of health care services is centralized in the capital, with the Ministry of Health at the helm, represented by Regional Delegates of Health in the ten administrative Regions. In the early 90s, the Cameroon Ministry of Health implemented a National Health Information System (NHIS) based on a bottom-up approach of manually collecting and reporting health data (Ngwakongnwi *et al.,* 2014). Like most African countries, Cameroon lacks an organized health information system at all levels of care (BLN Webinar, 2020). An evaluation of Cameroon health information system in 2008 using the Health Metrics Network (HMN) tool out line multiple challenges centred on six factors notably; resources, indicators, sources, management of data, production of information, dissemination and used of results. This evaluation was orientated towards the composition and functionality of the health information system. Major problems identified was based on the absence of quality and quantity personnel to ensure the functionality and management, poor storing of data at all levels of the health system, managers of health facilities, care givers at all levels do not use the data they produce for management, follow up and periodic evaluation (Global Routine Vaccination Coverage, 2012). Another evaluation carried out in 2014 on the challenges to implementing a national health information system (NHIS) in

Cameroon revealed an inefficient and stalled NHIS, characterised by general lack of personnel, a labour intensive process, delay in reporting data, much reliance on field staff and lack of incentives (Ngwakongnwi *et al.,* 2014). As the Government of Cameroon set new, ambitious targets, it became a critical priority to strengthen Cameroon's monitoring and evaluation system to enable health managers at every level to access high-quality data and use this information to assess gaps in the health care delivery system, guide decision-making, and measure progress toward the ultimate goal of universal health coverage (UTAP-2Atlanta, 2020). Performance Based Financing(PBF) is a reform approach in the health sector as well as other sectors such as education where health care providers receives direct incentives based on the quantity and quality of services they render. This approach has been widely implemented by most low income countries who seek to boast the performance of their health system. This approach has also been largely adopted and supported by most local Governments as well as international partners such as the World Bank (WB), Global fund (GF), World Health Organisation (WHO) among others. Once payment has been done by PBF, the health facility has complete autonomy on the income and uses it to; recruit more quality and quantity staffs, attract qualified staff in remote areas, motivate management and staff to organise outreach, motivate management and staff to be open 24/7 (during night/weekend), motivate management and staff to be creative and use resources in a more efficient way, motivate management and staff to pay attention to technical quality, motivate community workers to improve provision of information to clients. PBF is intended to contribute to improvement of health provider performance, and ultimately to improved quality of health service delivery at the operational level. At the same time, it means a fundamental change in the way the health sector is financed with a shift from input to output funding. This requires changes in accountability structures and concomitant redistribution of tasks and responsibilities between the different actors. Findings have shown that PBF influences the institutional architect in the health sector as structures are needed at the operational level for fund holding, mechanisms for accountability and transparency, and agencies to carry out the verification efforts, inclusive of community level (Sieleunou *et al.,* 2017).

METHODS

It is a cross sectional time series study carried out in health facilities under PBF in the Dschang health district using a quantitative approach to evaluate the trend in some immunisation data quality indicators with time in the said health facilities. The data quality indicators evaluated involved; the quantity of data produced in terms of number of children vaccinated with the pentavalent1 and pentavalent3 antigen, its timeliness, completeness and consistency of the later across different data collection tools. Data collection was done with the help of a design grid. Our sources of data involved; the vaccination register of health facilities selected for our study, the monthly activity report for each health facility and the DHIS2 for the Dschang health district for a period of three years (two years before the implementation of PBF and one year in PBF). Another source of data was the PBF trimestral evaluation grid for each health facility.

Study area

This study was carried out in the Dschang Health District, located in the West *region of Cameroon*. The DHD is one of the largest districts in the West region of Cameroon covering a surface area of about 1.060KM² and a population ofover 226964 habitats with people from all the ten regions of Cameroon but a greater part of the population is made up of the Bamileke**.** In terms of religion, a great majority of the population is made up of Christians, some are Muslims and others are animist. The DHD has a tropical climate with two seasons; the rainy and the dry season, mostly mountains as relief. The DHD is bordered to the South by The Health District of Santchou, to the East by Health District of Penka Michel, to the West by Fontem Health District and to the North east by Batcham Health Districts. The DHD comprise 22 Health Areas and 82 health facilities. It should be noted that each health area has an Integrated Health Centre (IHC) which is charged with providing the Minimum packet of Activities (MPA).

Data collection and analysis

Data collection tool was a standardised form design to respond to the different objectives of the study. It was modified after the pre-test. Sources of data included the vaccination registers, the monthly activity reports and the DVDMT/DHIS2 data base from 2017 to 2019. Data analysis was done based on key indicator in each objective. The enrolment of antigens was defined as the number of children vaccinated for each of the antigens per year from 2017 to 2019 as declared in the DVDMT/DHIS2 system, the timeliness was calculated by comparing the number of months with timely immunization reports sent to the Dschang district health services to the number of months with untimely immunization report send for each year from 2017 to 2019 and lastly, the timeliness was measured by calculating the percentage of complete reports of the dschang health district for each year, the consistency of immunization data was measured by calculating the verification factor (number of counted antigens administered in the vaccination registers divided by the number of antigens declared in the DVDMT/DHIS2 system (Consistent data: VF between 0.85 to 1.15, Moderate over reporting: VF between 0.7 to 0.84, Over reporting: VF <0.7, Moderate under reporting: VF between 1,16 to 1,29, Under reporting: VF >1,29) (Ronveaux *et al.,* 2016). The quantitative findings were presented using charts and tables.

Ethical consideration

We obtained consent from all facility heads before accessing their registers and other data recording tools. A research authorization was also obtained from the Dschang district health services and the National Ethical committee for Research in Human Health before carrying out this research.

RESULTS

A total number of 27 health facilities were accessed using our standardised design form after which 4 health facilities where been eliminated due to missing data for certain years leaving us with 23 health facilities included in our study. There were distributed as one District hospital, four sub divisional health facilities, ten public integrated health facilities and eight private health facilities.

Enrolment time series for pentavalent1 and pentavalent

A general decrease in the enrolment rate for pentavalent1 and pentavalent3 was observed across the years from 2017 to 2019.

Table 1. Trend in the consistency of pentavalent1 and pentavalent3 using the verification factor

Year	Mild under reporting (vf >1,29		Moderate under reporting (vf 1,16 -1,29)		Consistent data (vf 0,85 -1,15)		Moderate under reporting (vf 1,16-1,29)		Mild overreporting (<0,7)	
	Penta 1	Penta 3	Penta 1	Penta 3	Penta 1	Penta 3	Penta 1	Penta 3	Penta 1	Penta 3
2017	3(13%)	2(8,7%)	2(8,7%)	2(8,7%)	3(13%)	3(13%)	3(13%)	2(8,7%)	12(52,2%)	14(60,9%)
2018	2(8,7%)	1(4,5%)	0(0%)	1(4,5%)	12(52,2%)	10(43,5%)	7(30,4%)	9(39,1%)	2(8,7%)	2(8,7%)
2019	2(8,7%)	0(0%)	1(4,5%)	2(8,7%)	16(69,6%)	16(69,6%)	3(13%)	2(8,7%)	2(8,7%)	3(13%)

This decrease ranges between 6766 as recorded in 2017 to 6011 in 2018 (11,2% decrease) and then to 5316 in 2019 (11,6% decrease) for pentavalent1 antigen while the decrease in pentavalent3 ranges from 6511 in 2017 to 5820 in 2018 (10,6% decrease) and finally to 4987 in 2019 (14,3% decrease) (Figure 1). The greatest decrease was observed for public integrated health facilities between 2018 and 2019 (30,2% decrease) while the least decrease in enrolment was observed in sub divisional health facilities (18,1% decrease) between 2018 and 2019 for pentavalent1. A slight increase in enrolment of pentavalent1 is observed in the district hospital (13,2%) between 2018 and 2019 and in private health facilities between (9,3% increase) between 2017 and 2018 (Figure 2). Similarly for pentavalent3 enrolment, the greatest decrease is observed in public integrated health facilities (36,3%) between 2018 and 2019 while the least decrease was observed in private health facilities (12,7%) between 2018 and 2019 (Figure 3).

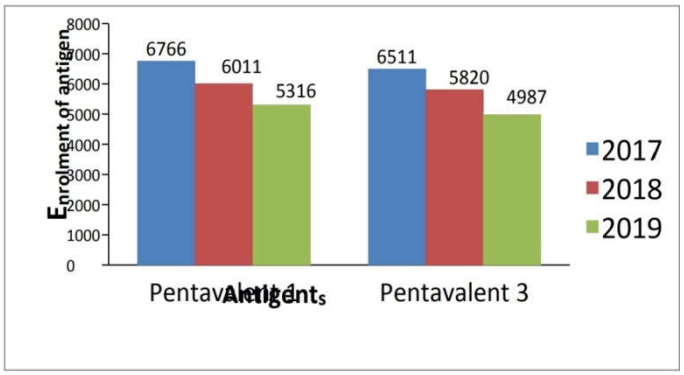

Figure 1. The trend in the enrolment of pentavalent1 and pentavalent3

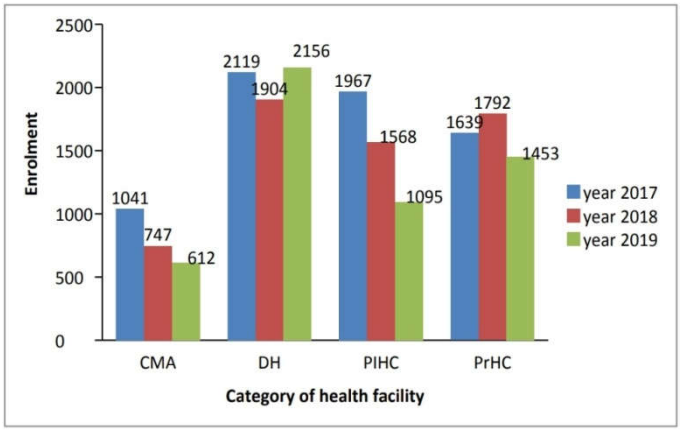

Figure 2. Trend in the enrolment of pentavalent1 antigen per category of health facilities

Trend in timeliness and completeness

The proportion of health facilities reports send on time increased from 241 to 259 (7, 5% increase) between 2017 and 2018. Between 2018 and 2019, a sharp decrease from 259 to 68 (73.7% decrease) was observed (Figure 4).

The trend in the completeness of healthcare reports in the DHD varied from 98% in 2017 down to 96,6% in 2018 and again increases to 99,2% in 2019 (Figure 5).

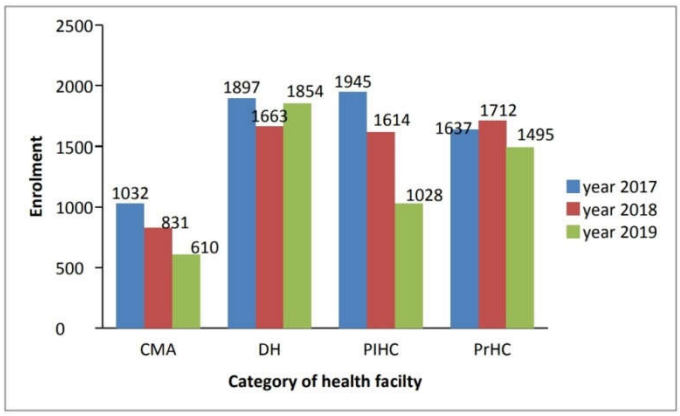

Figure 3. Trend in the enrolment of pentavalent3 per category of health facilities

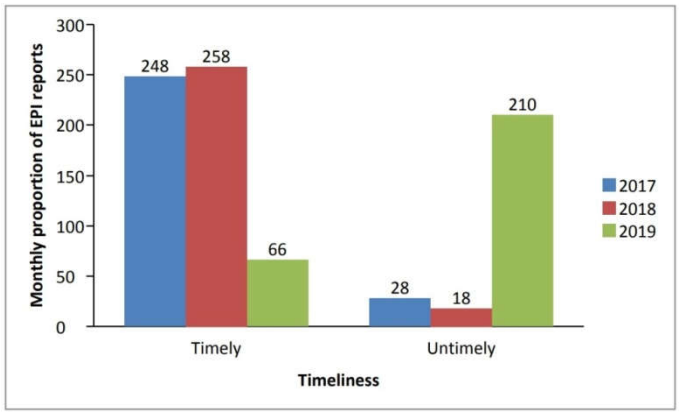

Figure 4. Trend in the timeliness of immunization reports

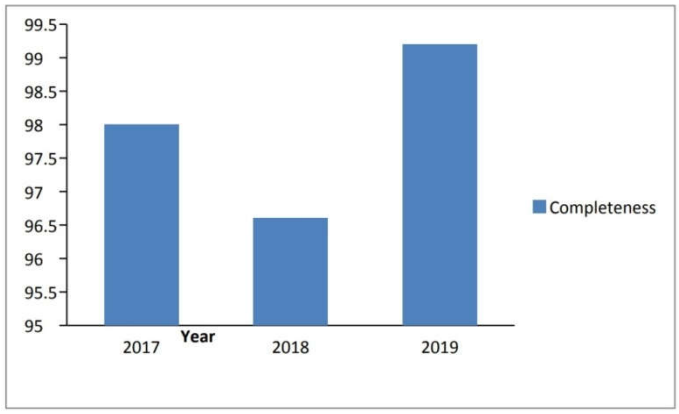

Figure 5. Trend in the completeness of health facility reports as recorded in the DVDMT/DHIS2 system

Trend in the consistency of immunization data

For penta1 antigen, the number of health facilities has increased from 3(13%) in 2017 to 12(52%) in 2018 and to 16(70%) in 2019. For penta3 antigen, the number of health

facilities has also increased from 3 (13%) in 2017 to 10 (43,5%) in 2018 and then to 16(70%) in 2019. The number of health facilities with moderate over reporting varies from 3 (13%) for penta1 in 2017 to 7(30,4%) in 2018 and down to 3(13%) in 2019. The number of health facilities with moderate over reporting for penta3 antigen ranges from 2(8,7%) in 2017 to 9 (39%) in 2018 and to 2 (8,7%) in 2019. The number of health facilities with mild over reporting for pent1 ranges from 12(52,2%) in 2017 to 2 (8,7%) in 2018 and remains the same for 2019. The number of health facilities with mild over reporting for penta3 decreases from 14(60,9%) in 2017 to 3 (13,0%) in 2018 and then to 2(8,7%) in 2019. Number of health facilities with moderate under reporting ranges from 2 (8,7%) to 0 to 1(4,3%) for penta1 and 2 to 1 to 2 penta3 for the respective years; 2017, 2018 and 2019. The number of health facilities with mild under reporting varies from 3(13,0%) to 2 (8,7%) to 2(8,7%) for penta1 and from 2(8,7%) to 1(4%) to 0 for penta3 for the year 2017, 2018 and 2019 respectively.

DISCUSSION

From the results above, the enrolment of pentavalent1 and pentavalent3 across the year 2017, 2018 and 2019 as recorded in the DVDMT (2017 and 2018) and the DHIS2 (2019) data base have decrease. This results are similar to the WHO UNICEF estimates time series for Cameroon which shows that the vaccination coverage for pentavalen1 in Cameroon has decrease from 83% in 2017 to 76% in 2018 to 75% in 2019 and the vaccination coverage for pentavalen3 has also decrease from 74% in 2017 to 67% in 2018 which remains constant in 67% in 2019. This decrease in enrolment can be looked upon in two dimensions; an improvement in the quality of data available for estimates at the national and international level following over reporting in previous years and on the second part due to a decrease in the performance of the EPI. However, it should be noted that a decrease in vaccination coverage exposes the population to vaccine preventable diseases. This can be seen in a study conducted by David Sinclair *et al.* 2019 which showed that a 5% decrease in the vaccination rate is associated with 40% 4000% increase in potential outbreak size based on the metropolitan area (Sinclair *et al.,* 2019). In this study, the former dimension is very likely to be true. A study carried out by Simon Forcha in Douala Cameroon (2016) on the effects of PBF on data from the EPI showed a more précised and quality data from health facilities under PBF compared to those which were not in the PBF program (Simon, 2016). We observed that the greatest decreased was seen between 2018 and 2019 (11,6% for Pentavalent1 and 14,3% for Pentavalent3 which was the period in which PBF was implemented in the DHD.

The trend in the effective of monthly timely reports for EPI showed a slight increase between 2017 and 2018 (4%) but drops drastically in2019 (74,4%) with the implementation of PBF. This decrease can be attributed the introduction of the DHIS2 data base in this district during this period. Adaptation to technology, lack of adequate human and material resources, week internet infrastructure and frequent power failure are some of the challenges that hinders the effectiveness of the DHIS2 system in sub-Saharan countries such as Cameroon. However, maximum use of PBF resources by health facilities can go a long way to improving on the timeliness of EPI data. The completeness of data showed a slight increase between 2018 and 2019 (2,6%) with the implementation of PBF. The precision and quality of immunization data across the year from 2017 to 2019 has improved. This can be seen in the increase in the number of health facilities with consistent data across the years. It can also be seen in the decrease in the number of health facilities with mild over reporting and mild under reporting. This show an improvement in recording and reporting in health facilities carrying immunization services and are under PBF in the DHD. This is so because all health facilities now have an obligation to register all the clients vaccinated during each vaccination session in the vaccination registers because all payments from PBF are based on the number of antigens administered and registered in the register. This therefore turns to reduce the rate of over reporting in health facilities (Figure 5).

However, the relationship between PBF verification and decrease in over reporting is not really clear. This is because a great decrease in the number of health facilities with mild over reporting was seen between 2017 and 2018; 12 (52,2%) to 2 (8,7%) respectively for pentavalent1 and 14 (60,9%) to 2 (8,7%) for pentavalent3 respectively. It should be noted that PBF was adopted in the DHD in the last trimester of 2018 but took its effective course in 2019. This implies that the decrease in the number of health facilities with mild over reporting seen between 2017 and 2018 might have been course by a different factor not evaluated in this study. This is further explained by the fact that between 2018 and 2019, the number of health facilities with mild over reporting had no change for pentavalent1 while for pentavalent3; the number has increased by 1, which is 2 in 2018 and 3 in 2019. This number is lower than the decrease witnessed between 2017 and 2018 when there was no PBF. However, the number of health facilities with moderates over reporting witnesses a great decrease between 2018 and 2019 with the implementation of PBF. This is also similar with the number of health facilities with consistent data for both antigens whose greatest increase was seen between 2018 and 2019 with the implementation of PBF. Data inconsistency however remains a great problem in most low and middle income countries resulting in poor decision making as well as poor orientation of resources (Seemeeh *et al.,* 2017).

Limits of the study

Our study design was a great limit to our study as it does not permit us to conclude with certitude if the changes observed are due to PBF or not. Also, our sample size cannot permit our study to be applied on a large scale.

Conclusion

The enrolment in pentavalent1 and pentavalent3 has decreased across the years from 2017 to 2019 with the greatest decreased witnessed in 2019 with the implementation of PBF as recorded in the DVDMT/DHIS2 data base of the DHD. The timeliness of monthly activity reports has decrease between 2018 and 2019 with the implementation of PBF and this decrease can be attributed to the introduction of the DHIS2 software in the year 2019 in this said district. The completeness has also witness a 2,6% increase between 2018 and 2019 following the implementation of PBF. The precision and quality of EPI data has also increased across the year from 2017 to 2019. Despite great improvement in the precision and the quality of immunization data across the years, these achievements cannot be fully attributed to PBF. More studies especially analytic studies would go a long way to fully establish the relationship between data quality and PBF.

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