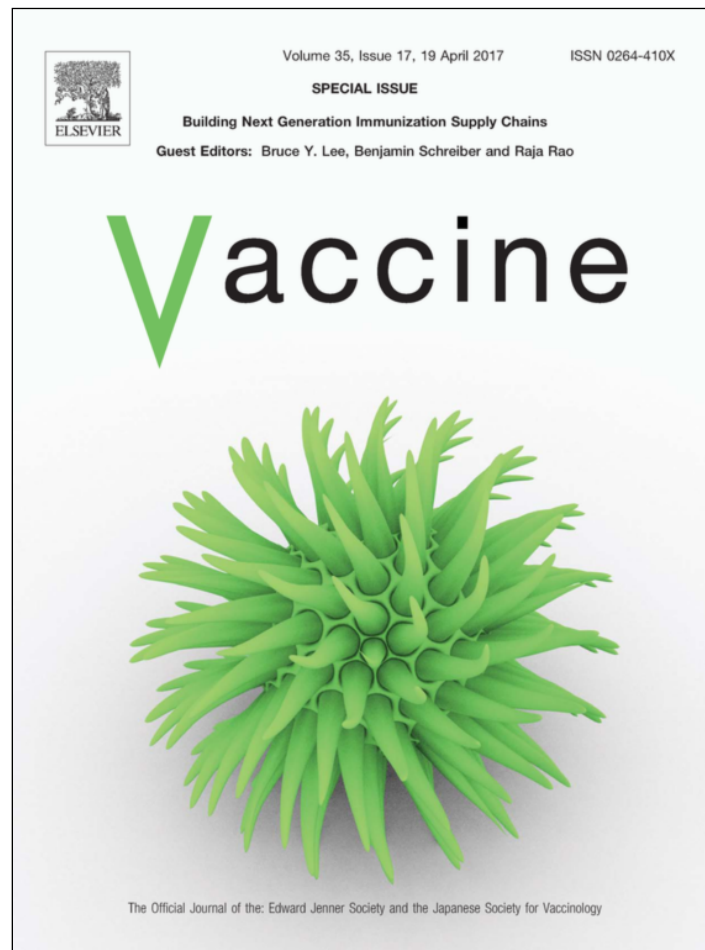


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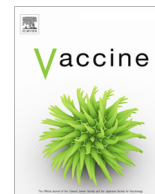
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# Professional changes induced by a redesigned immunization supply chain in the Comé Health Zone, Benin <sup>☆</sup>



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## ABSTRACT

At the end of 2013, the Government of Benin and Agence de Médecine Préventive (AMP) launched a demonstration project in Comé Health Zone (HZ) to optimize the vaccine supply chain. A key part of the demonstration project was the creation of an “informed push model” of vaccine distribution supported by a new logistician position at the health zone (district) level. At the conclusion of the demonstration project in 2015, the authors conducted an anthropological study consisting of semi-structured interviews with 62 participants to assess how the new model changed the professional identities, roles, responsibilities, and practices of personnel involved in vaccine management during and just after the demonstration project end in Comé HZ. The study found that health workers considered the logistician as a key player in enabling them to perform their public health mission, notably by improving knowledge and practices in vaccine management, providing supportive supervision, and improving the availability of vaccines and other supplies so that immunization sessions could occur more reliably and professionally within the communities they served. The demonstration project was widely accepted among study participants. The study was approved by the Cotonou Ethics Committee (CER-ISBA No. 56 dated 09/04/2015).

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## 1. Introduction

The introduction of new vaccines and increasing coverage in Gavi-eligible countries means immunization programs must ensure vaccines availability and sufficient supply chain system capacity at all levels.<sup>1</sup> As part of Immunization Supply Chain (iSC) improvements, there is a growing consensus that working on SC optimization, or ‘system design’, will be incremental. However, there is limited information at service-delivery levels on the implications of implementing real changes, in particular with regard to human resources by introducing a new post of logistician.

At the end of 2013, as part of the LOGIVAC<sup>2</sup> project framework, a ‘demonstration project’ was carried out in the Comé Health Zone (HZ) in Benin to optimize the vaccine supply chain [1,2]; an ongoing

project now under the responsibility of the Comé HZ. The aim of the demonstration project was to show to the ministry of health (MoH) and partners how the immunization supply chain could be redesign from a “pull” system where lower levels of the health system must travel to district and regional stores to collect vaccines, to an “informed push” model where vaccines are delivered directly to lower levels of the health system and restocked to cover needs estimated by the upper level based on reliable information. The system redesign demonstration project consisted of consolidating four sub-district vaccine stores into one new store set up at district level (known as a “health zone” in Benin), equipped with a 4x4 vehicle serving as a mobile warehouse. A key part of the new system was the creation of a staff position for a logistician at the store. The position was filled by a candidate who had obtained a bachelor’s degree in Health Logistics with the LOGIVAC project.<sup>3</sup> In the redesigned setup, the logistician manages the 4x4 vehicle and collects vaccines from the regional vaccine storage facility on a monthly basis before distributing them to the 37 health facilities and four commune health centers of the HZ. Before the demonstration project all

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<sup>1</sup> Gavi, the Vaccine Alliance. Strengthening the Immunization Supply Chain. 2016

<sup>2</sup> LOGIVAC is a project jointly implemented by Agence de Médecine Préventive (AMP) and the World Health Organization (WHO) with a generous grant from the Bill & Melinda Gates Foundation. For more information on the LOGIVAC project, refer to <http://amp-vaccinology.org/activity/logivac>

<sup>3</sup> The diploma course is provided by the Benin LOGIVAC Center, jointly created by AMP and the Regional Institute of Public Health (IRSP). For more details please refer to <http://centrologivac.org/> In Benin, four people received this training before the study: two at central level, one at regional level, and one in the Comé Health Zone.

facilities had to collect vaccines at commune level; other HZs with traditional supply chain system continue to work in this way (Fig. 1). The logistician's tasks also include (1) providing *in situ* supervision and training, (2) monitoring vaccine management, and (3) carrying out preventive maintenance of cold chain equipment. In addition to these structural reforms, training in vaccine management and equipment maintenance was provided for the HZ maintenance officer as well as for EPI staff at HZ, commune, and health facilities levels. The aim of these activities was to enhance staff's general skills in vaccine and supply chain management. In addition, a good understanding of and participation in the organizational changes brought about by the demonstration project is essential to support sustainability of the redesign beyond the project itself.

Funding by the LOGIVAC project ended in December 2014. However the logistician's position is still embedded in the HZ organizational chart. The equipment (including the mobile warehouse) has been incorporated under the MoH.

In the first quarter of 2015, the authors designed an anthropological study: (i) to assess how the new vaccine distribution system design and the introduction of a logistician position at HZ level changed the professional identities, roles, responsibilities, and practices of personnel involved in vaccine management during and just after the demonstration project in the Comé HZ; and (ii) to develop recommendations to support the sustainability of the system in Comé and the nationwide scale-up process, with particular regard to the human resources practicalities in deploying an optimized logistics system in Benin. Unlike an evaluation with predefined indicators, the anthropological approach allows for the occurrence of unexpected (unofficial or informal) changes by using open-ended guidelines. The study was approved by the Cotonou Ethics Committee (CER-ISBA No. 56 dated 09/04/2015).

## 2. Methods

This qualitative anthropological study sought open answers from participants and aimed to collect viewpoints based on their experiences. It was designed to gain an understanding of their opinions, practices, difficulties, and expectations.

The study participants were identified at various levels of the Benin health logistics system (Table 1) in accordance with the purposive sampling method and the criteria outlined below. At central and departmental level and in the Comé HZ, participants were selected among key players in the demonstration project for the optimized system, and were nominated by LOGIVAC team members. In commune health centers and peripheral health facilities, all participants were identified *in situ* by the researchers. More specifically, two health workers per establishment were selected because of their responsibility for, or participation in, vaccine management. One official from the community health committee (*comité de gestion*) per establishment was also interviewed depending on his/her involvement in monitoring vaccine quality (according to the health workers).

Of the 37 health facilities that make up the Comé HZ, 15 (health centers and health posts) were covered in the study, in addition to four commune health centers. They were selected purposively and in consultation with the AMP team, personnel from the HZ office and actors from other health facilities, as a result of interviews that raised specific challenges to be investigated. By triangulating the suggestions from the facilities, we avoided selection bias and secured a wide range of logistical situations that would have different implications for vaccine management (Table 2).

We conducted 62 semi-structured, individual interviews with study participants (Table 1) in accordance with the predefined guidelines. We opted for individual interviews rather than focus groups, as interviews provide more precise information, allow for

unexpected topics to be raised and avoid group-induced biases while enabling greater freedom of speech. The interviews were recorded with the participants' consent. In addition, 21 organograms were drawn up by the researchers in talks with 17 participants; these were also discussed with participants to clarify their mental maps of the organizational structure and where logisticians should be inserted.

The interviews were fully transcribed and translated (when conducted in local languages) by a team of experienced transcribers. They were then re-read and corrected by the researcher who had conducted the interviews, before being encoded in NVivo software using the node tree compiled from the interview guides. The entire range of perspectives and different nuances was coded to identify similarities and discrepancies, and correlated to the respondents' professional status. Recruiting study participants via purposive sampling does not use the process of identifying participants by random procedure, which is a prerequisite for statistical representativeness. However, the number of participants interviewed produced recurring answers and made it possible to highlight response types. As a result, we venture to provide quantitative information on recurrences for certain results without providing percentages that would have no statistical value. We used NVivo to produce the quantitative data and to prioritize how the themes addressed were ranked by measuring the frequency with which they were mentioned. We used the number of times a theme was raised during an interview to identify the issues that study participants were keen to discuss (Table 3). Organograms were compared and ranked according to their similarities to identify ideal types of organizational charts. The participants' socio-professional characteristics were analyzed to highlight potential determinants of the perceived or desired organizational charts.

## 3. Results and discussion

Three main items are developed and described in the results and discussion section: the study participants' expectations regarding the logistician's skills, including his/her background and position in the organizational chart; the new distribution of tasks and responsibilities after project implementation compared to the previous system; and the perceived advantages of the redesigned system.

### 3.1. Expectations regarding the logistician's profile and position

This section explores (1) participants' perceptions of who should be selected for professional logistics training, and (2) how the trained logistician was received in his/her new position. Reconstructing events following the selection of the logistician for training highlights the importance of taking into account existing professional divides. This may prevent misunderstandings and bitterness from impeding the proper implementation of the reform. This is in addition to providing clear information about the criteria for selecting logisticians. In the Comé HZ, the selection of a worker from the administrative body rather than from health professionals was interpreted negatively by some of the workers from health facilities. This exposed pre-existing rifts [3] and the opinion of these health professionals that the vaccine supply chain should come under the sole responsibility of EPI managers at district level, who know about vaccine conservation and management.

Participants in the study described those health workers responsible for vaccine management in health facilities as having a strong sense of belonging to the EPI, even if they also have to implement other health programs. The creation of the position of logistician, together with the possibility of following a diploma course with the potential for graduation (two important ways to

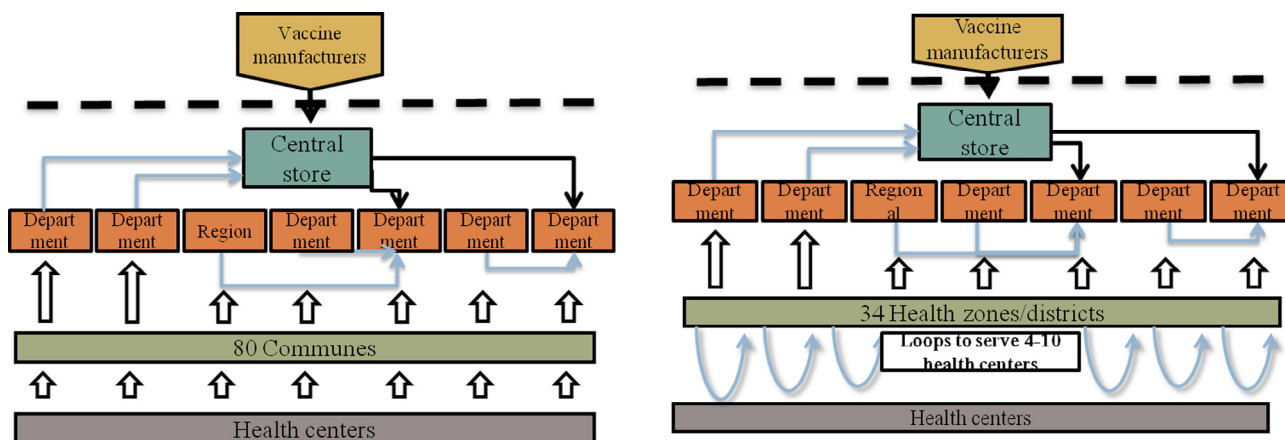


Fig. 1. Vaccine circuits before and during the demonstration project.

**Table 1**  
Number of study participants per level of the Benin health logistics system.

Level of health logistics system	Number of participants
Central	04
Departmental	02
Comé Health Zone	07
Commune health center	16
Peripheral health facility	28
Community health committee	05
Total	62

motivate and retain health workers in developing countries [4]), is seen as a rare opportunity to recognize and value the commitment of an EPI manager. This helps to explain the disappointment felt by some of the HZ level workers when an individual from another professional body was selected. Most of the participants in the study at central, district, and health facility level recommended selecting a registered nurse. Other participants suggested that in order to avoid the level of qualification being a criterion for selection, nurses and midwives with significant EPI experience should be given priority. These participants were mostly health professionals. A smaller number of participants – among those involved in the demonstration project in the HZ – stated that there were advantages of choosing a resource or operations manager given his/her competences in supply and stock management, rather than a healthcare professional.

**Table 2**  
Description of criteria for selecting peripheral health facilities.

Commune	Peripheral health facility	Level of difficulty to be reached	Type of equipment	Experience of vaccine stock-out
Bopa	Badazoui	Difficult to reach in rainy conditions	Solar and oil equipment	Vaccine shortage reported during supervision
	Possotomé	Easily accessible	Electrical equipment	
	Yégodoé	Difficult to reach in rainy conditions	Oil equipment	
	Gbakpodji		Solar equipment breakdown	
	Lobogo			
Comé	Honvè-Comé		NanoQTM ice box	Stocks vaccines from Kpétou health facility
	Kpétou		Electrical equipment breakdown	
	Agatogbo			
Grand-Popo	Avloh	Difficult to reach	Solar equipment. Pirogue endowment	
	Djanglamey		Oil equipment	
	Sazoué	Easily accessible	Solar equipment	
	Hilla-Condji	Frequent blackouts	Electrical equipment	
Houéyogbé	Honhoué		Solar and oil equipment	
	Sè		Electrical equipment	
	Tokpa	Difficult to reach	Solar and oil equipment	

It should be noted that, in spite of these different points of view, nearly all participants recognized the logistician's legitimacy as a result of the diploma training he had received. In short, the diploma appears to confer status. In addition, the position of logistician does not confer disciplinary powers, and this needs to remain the case if the role is to be accepted. Workers in the health facilities value highly what they perceive as a mentoring relationship, which may be categorized as supportive supervision rather than supervision for the purpose of control. This outcome has similarities with earlier studies that found peer-to-peer management in other areas in Benin was in line with local expectations for human resources management [5,6].

The 21 organizational charts drawn up in discussions with some study participants from all levels of the health pyramid were reduced to seven different kinds of chart known as ideal types. Most situated the logistician at HZ level (13), while others (7) placed him/her in the commune health center organizational structure. One participant suggested a direct reporting relationship between the regional logistician and the HZ logistician. These suggestions depended on the professional status of participants: the logistician was often situated at the same organizational level as the interviewee, revealing a practical relation between the logistician's responsibilities and the participants' own tasks. It is worth noting, however, that few participants (2) suggested they were the logistician's superior, as they explained that a multiplicity of skills was necessary for monitoring and supervising the logistician's work.

**Table 3**  
Ten main themes addressed with the greatest frequency.

Theme	Number of interviews in which the theme was addressed	Number of references to theme in the corpus	Order of importance
Equipment maintenance: roles and practices	54	230	1
Selection process for the logistician hired for the demonstration project in Comé	52	229	2
Perception of the new professional status of logistician (usefulness, tasks, skills)	53	219	3
Perceptions of how the logistician fits into the organizational structure of the health system	55	207	4
Effects of suspending travel to commune warehouses	52	170	5
Stock management: importance and distribution of responsibilities	51	164	6
Perception of training received and its importance	46	158	7
Knowledge about the demonstration project and LOGIVAC	53	156	8
Recommendations for the profile of logistician (training, level, skills)	44	137	9
Perception of new vaccine circuit	50	134	10

### 3.2. New distribution of tasks and responsibilities

Participants were asked to comment on how the demonstration project, and specifically the addition of a logistician, changed the distribution of tasks and responsibilities within their facilities.

Actors involved in the project were familiar with the title of logistician. By contrast, the term was unknown in the health facilities where the logistician was identified more by the tasks he performed (e.g. manager, accountant, or deliveryman). The lack of familiarity with the title 'logistician' among health facility workers may be explained by the fact that the profession is not yet recognized by the MoH, the ministry of public services and the ministry of finance. The logistician's tasks, however, were accurately described. This reveals how the logistician is appreciated mostly because of his/her contribution to the daily management of vaccines and not because of the perception of the title.

Some health facility EPI responsables (who may be a doctor, a nurse, or a midwife) explained that they delegated different tasks regarding vaccine needs assessment, stock control, temperatures, and vaccine quality monitoring to their nurse aids or the logistician. Several explanations for this were given: participants at central level saw it as a sign of dissatisfaction about the reform (i.e. clear refusal to work with the logistician) or, more generally, as a lack of interest in EPI activities that do not generate income for their facility or rewards for staff. In contrast, health facility workers described their relief at being able to delegate activities for estimating and controlling vaccines to the logistician, as they might find these tasks difficult. Furthermore, they noted the delegation enables health facility workers to devote themselves to other activities (care, childbirth, administration, and center maintenance). In facilities where tasks were not delegated, participants stated that there was a renewed discipline and commitment to the tasks for which they are responsible. The constant presence of the logistician, together with his rigorous monitoring and supportive supervision, were given as motivating factors, notably for health workers who don't usually receive training as they are not officially responsible for vaccine management.

Study participants were asked to describe how maintenance tasks shifted once the pilot implementation was initiated. In reality, after the demonstration project, preventive maintenance is supposed to be carried out by the health facility EPI manager and should be supervised by the HZ maintenance officer. After the demonstration project, it is usually performed by nurse aids and supervised by the logistician from the HZ. Workers who are responsible for the preventive maintenance of cold chain equipment are rarely the same as those who receive training. Although some tasks were formally assigned to and carried out by the logistician, the role of the HZ maintenance officer for preventive and curative maintenance was not reformed within the demonstration project, despite being clearly described at central and region level

and by all key actors at HZ level (including the maintenance officer). The HZ maintenance officer post seems very limited in the field due to several challenging factors: a lack of available transport resources for carrying out tours to health facilities; the absence of daily allowances for such trips (although certain benefits are provided for bi-annual tours); and a shortage of spare parts for repairing defective equipment. In addition, interviewers at HZ level said that there is a lack of information on the procedures to be followed for managing failures in the equipment provided by the demonstration project (by donors in general).

### 3.3. Perceptions of the new vaccine distribution circuit: a practical circuit based on mutual support and in response to demotivating factors

Study participants were asked to describe the value of the new vaccine distribution circuit created by the mobile warehouse and the logistician's intervention.

Officially, before the demonstration project, the peripheral health facilities officers had to retrieve vaccines from the commune health centers weekly, for each immunization day. With the new vaccine distribution circuit and new cold chain equipment, the health facilities officially receive the vaccines from the logistician each month. In practice, two types of events (vaccine stock-outs and equipment failures) may give rise to an alternative vaccine circuit that could be described as practical (i.e., adopted on a daily basis according to practical necessity). This circuit, which relies on mutual support between neighboring health facilities, is characterized by a short flow chain (geographic proximity), operating horizontally (between health facilities at the same level or the level directly above) rather than vertically. This alternative vaccine circuit was adopted before the demonstration project and is still preferred when stock-outs and equipment failures occur in the new system. One noticeable difference after the demonstration project is that the logistician now takes part in this alternative circuit. Indeed, when there is vaccine stock-out, three strategies are implemented by health facilities to anticipate or address the situation: the logistician is contacted to distribute the vaccines in the facility; vaccines are collected at the HZ depot by the health facility; or restocking takes place at neighboring facilities. Health facilities that are difficult to access are particularly affected when there are stock-outs of vaccines or other supplies, with participants expressing the fear that the mobile warehouse cannot access the sites due to poor road conditions. When cold chain equipment fails (due to defective parts, kerosene stock-outs, or wicks coming to an end) or when there is an extended power outage, the strategies in place mean that vaccines continue to flow between health centers, sometimes on the advice of the HZ logistician. When the failure lasts longer, the EPI manager or health worker in attendance calls a colleague from neighboring health facilities to find the nearest

center with functioning equipment and available storage capacity to accommodate the vaccines from their facility. When the outage lasts until the next vaccine supply, the HZ logistician is informed and delivers the vaccines to a neighboring health facility with functional cold chain equipment. Far from being rare, vaccine stock-outs and equipment failures may occur regularly. By taking into account the informal alternative vaccine circuit, the logistician within the demonstration project ensures the balance and monitoring of vaccine stocks in all health facilities. This consideration contributes to the acceptability of the demonstration project with the health workers who appreciate the adaptability of the project to their working conditions (i.e., stock-outs and equipment failure). The advantages of the reform cited by the health workers can be divided into three categories (Table 4). The main benefit was the improved vaccine quality and therefore the service they deliver to populations. Working conditions were considerably improved, especially for workers in health facilities that are remote from commune vaccine stores, who previously faced numerous obstacles to secure supplies. The time saved as a result of the reform is highly important from the health workers' point of view. They underline how this extra time over a single day enables staff to carry out routine immunization activities and so-called mop-up activities late in the day, which allows them to catch up with unvaccinated children by using the remaining doses of vials opened on the same morning. The other major advantage was a decrease in the potential for tensions that could arise between health facility workers and staff in the commune stores, and between vaccinators and beneficiaries. The availability of vaccines in the health facilities has also contributed to this improvement. These results confirm existing studies on the main determinants of health worker motivation in Benin, such as having the resources required to perform one's work, [5] and being appreciated by the population [7].

**Table 4**  
Summary of the main areas of impact of the demonstration project from the perspective of the 44 workers from the health facilities and commune centers.

Theme	No. of times mentioned	Rank
EPI quality	97	
Vaccines available at all times (if no failures) and missed immunization opportunities avoided	32	1
Traffic accidents avoided	18	3
Uninterrupted cold chain	10	6
Broken vials avoided	9	7
Management of expiry dates	6	9
Reliability of temperature monitoring	5	10
Problem of access routes avoided	5	10
Other	12	
Impact on perceived working conditions	83	
“Pain relief” or stress relief (including for workers in commune centers)	24	2
Traffic accidents avoided	18	3
Reduced frustration regarding absenteeism/unavailability of vaccines at the commune depot with round trips avoided	15	4
Improved quality of relationship with populations by removing waiting times and absenteeism	11	5
Other	15	
Time	39	
Time saved to treat patients	11	5
Time saved for more outreach strategies	7	8
No change	5	10
Other	16	
Financial impact	15	
No change (no advantage for the worker as no prior benefit)	9	7
Other	6	

### 3.4. Limitations

The study has some limitations. It provides a snapshot, and is not an impact study that would make it possible to compare perceptions before and after the project was implemented. The changes documented are those identified by the study participants. In addition to the interviews, observations could have been carried out to confirm what the study participants described as new practices resulting from redesigning the system, such as mop-up activities or the practical circuit based on mutual support. Moreover, quantitative data could be produced to support these results.

## 4. Conclusions and recommendations

The Comé HZ workers perceived crucial improvements thanks to the demonstration project such as the vaccine and service delivery conditions and quality, as well as capacity in vaccine management through improved supervision. In the redesigned system, health facility personnel said they now spend less time on vaccine supply (as vaccines are distributed to them), and consequently have more time to administer vaccines to unvaccinated children. This has had a direct impact on the working environment of health facility personnel and their appraisal of their work. The interviews highlighted the pressures the health workers faced before the demonstration project (and still face when vaccine stock-outs and equipment failures occur) when carrying out EPI activities in front of their beneficiaries.

Health workers are in favor of the involvement of the logistician, who is seen as a key player to enable them to perform their public health mission, notably by improving nurse aids' knowledge and practices in vaccine management through supportive supervision. The system redesign appeared to be widely accepted because it had a mitigating effect on the constraints and demotivating factors faced on a daily basis.

Another outcome is the preference for a horizontal, mentoring, or peer-to-peer relationship between the logistician and health workers. This preference for horizontal relationships is also apparent when vaccine stock-outs and equipment failures occur, and colleagues from the same level are asked for support. We recommend that the logistician should be introduced and operate as a service provider acting on behalf of EPI workers and populations, providing supportive supervision on the immunization supply chain.

To ensure the acceptability of the reform, the logistician's position in the organization chart should circumvent existing local professional divides. One potential recommendation is that the work of the HZ logistician could be supervised and monitored by more than one actor. The head of administration and resources for the HZ could be the most appropriate line manager due to his/her responsibility for managing inputs and equipment, which are key aspects of the HZ logistician's work. The regional logistician would have technical responsibility for his work; using supervision to ensure that the logistician completes his/her assigned tasks rigorously. Finally, the head nurse (*major*) from the HZ level should be able to assess the work of the logistician as recipient of the service that he/she provides, introducing a provider-client service perspective.

## Contributors

EG developed the study protocol, supervised data collection, conducted the analysis and contributed enormously to writing the report and manuscript. DA coordinated the implementation of the study in Benin. DA and RG provided technical input for developing the protocol, discussing results and writing the report

and article; they also carried out the data collection. PJ recruited the core team, oversaw the development and implementation of the project, and provided input on developing the protocol, data analysis, the study report, and manuscript writing. All the authors agreed on the final draft.

### Role of the funding source

This study was implemented as part of the LOGIVAC project conducted jointly by Agence de Médecine Préventive (AMP) and the World Health Organization (WHO) with a generous grant from the Bill & Melinda Gates Foundation.

### Conflict of interest

EG and PJ work for AMP, which receives grant-specific support from the Bill & Melinda Gates Foundation. DA and RG work at the University of Abomey-Calavi, which has no financial relationship with this project.

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