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Role of Primary Care Providers and Integrated Disease Surveillance in Chad

Dhoud Stave Gischel Samba
Walden University

Walden University

College of Health Sciences

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Dhoud S. Samba

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Eric Riedel, Ph.D.

Walden University
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Abstract

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Dissertation Submitted in Partial Fulfillment

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Abstract

In the Republic of Chad, primary care physicians play a central role in the detection and control of outbreaks and are critical actors in the integrated disease surveillance system through mandatory reporting. Feedback on such surveillance must reveal the needs and perceptions of these physicians. These needs and perceptions were examined using a questionnaire survey distributed to a sampling of 20 physicians in Chad. The purpose of this qualitative study was to investigate the role of primary care providers in the integrated disease surveillance to identify factors that impact complete, quality, and timely reporting. The theory of planned behavior was used for the theoretical framework. Interview data collected from the physicians via a purposive sampling strategy were analyzed. The questionnaire used a standardized, validated tool to assess the role and factors that impact complete, quality, and timely reporting related to the integrated disease surveillance system among primary care physicians. Demographics and descriptive analysis of the frequency of responses was performed. Key findings were positive for the importance of the provider's role in case detection and case reporting. These findings offer an understanding of factors that affect the complete, quality, and timely reporting and give insight into how the integrated disease surveillance system might be improved. The data show the physicians understood how to conduct disease reporting, and provide solutions for enhancing the integrated disease surveillance system. These findings support social change by informing the important practice of early detection and reporting of infectious diseases to detect and control future outbreaks.

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Chapter 1: Introduction to the Study

Introduction

In Africa, infectious diseases impose a considerable burden on communities, and disease outbreaks pose serious health threats that require timely detection and robust preventive action to avert regional or international spread (Rao et al., 2017). In the Republic of Chad, recent epidemics, including meningitis in 2010, poliomyelitis during 2011 to 2012, and dracunculiasis (guinea worm disease) in 2010 to 2018, have underscored this threat and have highlighted the need for building basic global public health capacity for detection and response (Erondu & Griffiths, 2015). The World Health Organization (WHO; 2015) defined public health surveillance as the "continuous, systematic collection, analysis, and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice." Gopichandran (2018) has described public health surveillance as the "radar" of public health. Public health surveillance delivers the data required to advance public health action and to measure the results of those actions (Abdel-Razik, Rizk, & Hassan, 2017).

Notifiable diseases surveillance functions at multiple levels (Adokiya, Awoonor-Williams, Beiersmann, & Müller, 2016). Primary care providers, nurses, and other health professionals monitor the incidence and spread of diseases and events of public health importance by designating them as reportable. They report individuals whose signs demonstrate unknown, acute problems as well as clinical and laboratory diagnoses that meet standard case definitions for the diseases under surveillance (Adokiya et al., 2016). Public health authorities then use disease reports to launch local prevention and control

measures (e.g., outbreak investigations). They count on the timeliness and completeness of reported surveillance system data to design public policies and appropriate interventions.

Bonačić, Swaan, van Steenbergen, and Kretzschmar (2015) and the WHO's International Health Regulations (IHR; 2005) have observed that the timeliness of infectious disease reporting by primary care providers is a critical element of any evaluation where early intervention is a factor. In Chad, oftentimes many more cases of nationally notifiable infectious diseases are estimated than are reported (Erondu & Griffiths, 2015). This perceived gap is critical to understanding the true nature of the nation's health, to the policies intended to contain the spread of diseases, and to the economic burden the diseases are expected to exert (Erondu & Griffiths, 2015). The disparity between the number of cases of infectious diseases believed to exist and the number of cases reported to public health authorities can be attributed to several factors: primary care provider knowledge about disease notification, which affects their reporting practices; timeliness of reporting; and inadequate or underreporting. Primary care provider knowledge about disease notification is well documented in the literature (Isere, Fatiregun, & Ajayi, 2015; Nnebue, Onwasigwe, Adogu, & Onyeonoro, 2012; Tan, Yeh, Chang, Chang, & Tseng, 2009).

The literature regarding late reporting, inaccurate reporting, or underreporting of notifiable diseases largely gives responsibility for underreporting to primary care providers, who are considered key to the disease-reporting process. Recently, researchers conducted studies to highlight the significance of the primary care provider role in

reporting have addressed the assessment of knowledge, attitudes, perceptions, and motivations vis-a-vis their reporting responsibilities. Many studies have revealed that primary care providers are ill-informed, untrained, and lacking in motivation about reporting (Vasan, Mabey, Chaudhri, Brown Epstein, & Lawn, 2017). Of significance is a Zambian study led by Mutale, Ayles, Bond, Mwanamwenge, and Balabanova (2013) in which they employed a baseline assessment to look closely into the attitudes and perceptions health workers have about their disease notification responsibilities. The researchers debated potential interventions to improve health worker motivation with mentoring, training, and support (Mutale et al., 2013). The proposed interventions were considered viable strategies to enhance the notification process in Zambia (Mutale et al., 2013). In a similar vein, I employed in this study a qualitative approach to investigate the role of primary care providers in the integrated disease surveillance in Chad and to identify factors that impact complete, quality, and timely reporting. Chad is believed to have a high number of unreported cases of notifiable diseases. Primary care providers with reporting responsibilities, therefore, were the natural choice for this study.

Chapter 1 consists of background information about integrated disease surveillance and shows why the subject is of value in Chad. In this chapter, I present the statement of the problem, purpose of the study addressing the problem, the research questions associated with the problem, and the theoretical framework related to the theory of planned behavior (TPB). I also discuss the nature of the study; definitions for the study; the assumptions, scope, and delimitations of the study; and the significance of conducting this study in Chad.

Study Background

Chad is susceptible to large outbreaks of infectious diseases because of unsafe drinking water, poor sanitation, and a high number of internally displaced populations (Azetsop & Ochieng, 2015). Since 2010, Chad has faced a massive rise in acute watery diarrhea outbreaks in many parts of the country, which have been blamed on the supply of contaminated water and unsanitary behavior (Azetsop & Ochieng, 2015). The harsh environment and social conditions promote the spread of infectious diseases in addition to providing a perfect stage for pathogens to develop resistance (Azetsop & Ochieng, 2015). These circumstances have led to the disintegration of the Chadian health delivery system.

Integrated disease surveillance of notifiable diseases is a major feature of disease control in the WHO African region. It calls for prompt detection, proper investigation, laboratory confirmation, and a timely response to critical public health events (Luswa et al., 2013). Monitoring infectious diseases poses significant challenges for the public health sector, and epidemiological surveillance systems for infectious diseases, primarily notifiable diseases, are critical (Luswa et al., 2013). Member states of the WHO Regional Committee for Africa have endorsed the integrated disease surveillance strategy (changed in 1998 to Integrated Disease Surveillance and Response, or IDSR). This happened following severe discrepancy with surveillance data published for action with vertical disease surveillance systems that worked largely on a single disease or health event (Luswa et al., 2013). The IDSR strategy, which is broad, was set up with the following purposes: (a) integration and implementation of surveillance activities with respect to

proper use of resources; (b) use of human resource processes for surveillance activities; and (c) reinforcement of disease surveillance and response systems at several levels, including community, health facility, state, and national (Luswa et al., 2013). In spite of a multitude of plans and initiatives to boost reporting of infectious diseases, late reporting, underreporting, and timeliness of reporting remain a problem for many African nations.

In a resource-limited country such as Chad, surveillance involves using traditional paper-based methods, which are both ineffectual and superficial. Thus, it is necessary to develop and implement alternative tools to enhance infectious disease surveillance systems. Recently, significant progress has been achieved in mobile computing technology, which comes with huge potential to enhance infectious disease surveillance systems (Christaki, 2015). Modern surveillance practice is moving toward a larger dependence on electronic transmission of disease information (Dixon et al., 2017).

Chad is one of the 43 countries in the WHO Regional Office for Africa to implement IDSR guidelines to enhance its capacities to detect, confirm, and respond effectively to high priority infectious and noninfectious diseases, events, and conditions (Kasolo et al., 2013). The diseases necessitating prompt reporting include acute watery diarrhea, acute respiratory infections, cholera, pandemic influenza, and meningitis. Also surveyed are diseases targeted for elimination or eradication (e.g., measles, poliovirus, and dracunculiasis; Kasolo et al., 2013). The IDSR strategy seeks to improve and put into action broad surveillance and response systems that meet African priorities (Kasolo et al., 2013). The aim of the strategy is to enhance data usage at multiple levels, including community, health facility, district, and national. This leads to greater timely detection of,

and response to, the infectious and noninfectious diseases that are the main drivers of illness, death, and disability in Chad.

In the beginning, the IDSR strategy sought to incorporate the directives and requirements for the collection, analysis, and reporting data on 19 priority diseases at the district level, with the objective to lessen the ineffectiveness brought about by parallel disease-specific surveillance programs in many countries (Kasolo et al., 2013). The Ministry of Public Health (MoH) in Chad, in its commitment to maintain its polio-free status and eliminate vaccine preventable diseases, has made efforts to strengthen notifiable disease surveillance with the establishment of the IDSR. The MoH collaborates closely with the WHO to provide supportive measures and initiatives in augmenting the surveillance system at all levels. Despite these efforts, disease surveillance has been stressed for the past years and unable to meet WHO AFRO regional standard requirements. Chad successfully eradicated the last indigenous wild poliovirus in 2012 and has been certified polio-free by the Africa regional certification committee since 2016 (Moeti, 2016). However, there was a recurrence of vaccine-derived poliovirus cases in 2013. Throughout the country, there are large pockets of areas with low routine immunization coverage for all antigens (Moeti, 2016). At the same time, measles surveillance programs in conjunction with the expanded program on immunization (EPI) have collaborated to achieve progress toward achieving measles elimination. Nevertheless, despite combined efforts, Chad still faces challenges in sustaining surveillance performance indicators (Danawi, Deen, & Hasbini, 2016).

Current challenges for conducting optimal disease surveillance in Chad are severely hampered by limited resources. First, the country's capabilities to conduct surveillance differ and range from good to nearly none (Okeibunor, Nsubuga, Salla, Mihigo, & Mkanda, 2016). Second, the surveillance system has a passive rather than an active approach to conducting routine surveillance. Third, the absence of a locally trained public health workforce for public health disease surveillance and response hinders case and outbreak detection, missing the very objective of conducting routine surveillance (Okeibunor et al., 2016).

Problem Statement

Infectious diseases are the most important cause of mortality in Chad, and infectious diseases morbidity remains a significant public health problem (Azetsop & Ochieng, 2015). Recent studies into primary care provider reporting of notifiable diseases have yielded a vast body of knowledge that point to the primary care provider as being negligent but do not provide progress on performance or for the reporting process above all (Mansuri, Borhany, & Kalar, 2014). Chad will remain susceptible to the continued spread of infectious diseases if the role of the primary care provider continues to be poorly understood (Bowden et al., 2012). My aim in this study was to recognize that role. I employed a qualitative design to explore measures that would enhance the reporting process.

In 1998, Chad adopted the WHO AFRO IDSR as its approach to monitor, prevent, and respond to priority notifiable infectious diseases (Mandyata, Olowski, & Mutale, 2017). In its engagement to sustain its polio-free status, Chad has made efforts to

bolster vaccine preventable disease surveillance through its IDSR system; however, gaps remain in its proper functioning (Danawi et al., 2016). With the recurrence of guinea-worm disease (dracunculiasis) after a 10-year absence as well as the rise of cholera, meningitis, and polio, there is an urgent need to find out what the gaps are. It is imperative to enhance the present priority notifiable disease surveillance and notification system with improved physician participation in prompt reporting of notifiable diseases to appropriate public health authorities for timely public health action.

In Chad, disease surveillance and notification include the immediate notification of epidemic-prone diseases, diseases targeted for elimination and eradication, and monthly notification of other diseases of public health importance (Isere et al., 2015). At the local level, primary care providers remain essential to effective reporting for the surveillance and notification system to be operational and active in the early detection of diseases through patient interviews and clinical judgments (Isere et al., 2015).

Purpose of the Study

In this qualitative study, I investigated the role of primary care providers in the integrated disease surveillance in Chad. A secondary objective was to identify factors that affect complete, quality, and timely reporting. It is hoped that the findings of this study can contribute to the improvement of the quality of disease surveillance and notification system in Chad.

Research Questions

Guiding this study was the following overarching research question: What are the attitudes and perceptions of primary care providers toward their role in integrated disease surveillance in Chad? In turn, this question gave rise to these three research questions:

1. What is the role of primary care providers in integrated disease surveillance in Chad?
2. What factors impact the complete, quality, and timely reporting by primary care providers in Chad?
3. How do the knowledge and practices of primary care providers regarding the completeness, quality, and timeliness of reporting differ from the currently recommended reporting process in Chad?

Theoretical Framework

The TPB was central to this study. According to the TPB, directed knowledge, beliefs, and attitudes can influence behavior (Montanaro, Kershaw, & Bryan, 2018). Ajzen (2015) suggested that behavior modification does not occur based on the precision of the information gathered by individuals, but instead by how that information is used for action. Thus, it is essential for behaviors associated with reporting infectious diseases per the recommended processes be guided by accurate information. Primary care provider awareness is critical because behavior concerning the practice of reporting infectious diseases may be influenced by knowledge, attitudes, and beliefs (Montanaro et al., 2018). As a result, gaps in knowledge may lead to missed or underreporting cases of disease (Montanaro et al., 2018). The TPB permitted the qualitative aspect of the research

approach to engage primary care providers through key informant interviews to collect knowledge, attitudes, and perceptions on factors that determined their reporting of integrated diseases. In addition, the TPB provided opportunities to influence the timely reporting of integrated diseases from the individual to the policy level.

Nature of the Study

In this study, I employed qualitative methodology to investigate the role of primary care providers in integrated disease surveillance in Chad. A secondary endpoint was to identify factors that impact complete, quality, and timely reporting. Isere et al. (2015) showed that primary care providers have performed poorly in reporting notifiable diseases. However, the reasons for this poor performance have not been properly disseminated. As society learns more about true disease burden, timely interventions by public health authorities may be applied to control and disrupt further disease manifestation. A potential positive social change could occur with the prevention of infectious disease as this could result in reduced burdens for Chadians. Qualitative research is advantageous when insufficient information is available about the phenomenon under investigation and when there is a necessity to define a phenomenon from the perspective of the participants (Patton, 2002). It is for this reason that key informant interviews were used to generate in-depth knowledge about primary care provider attitudes and perceptions about disease reporting.

Key informant interviews were conducted for data collection, and grounded theory (further explained in Chapter 3) was used for data analysis. Chad primary care providers (health workers responsible for surveillance or the person in charge of reporting

notifiable diseases) were the subjects, and they comprised a sample of 20 key informants who are in family practice, internal medicine, or pediatrics. The study was conducted at geographically representative health facility sites in N'Djamena, Chad. The subjects worked at hospitals and other health facilities.

Rapport d'évaluation de la performance du système d'Information Sanitaire de Routine (SISR) et de la Surveillance Intégrée de la Maladie et la Riposte (Moussa, N'Gbichi, Lippeveld, & Yazoumé, 2016), translated in English as *Performance evaluation report of the Routine Health Information System (SISR) and Integrated Disease Surveillance and Response*, was used to collect key informant participant data. The questionnaire was developed to better ensure the early warning of notifiable diseases, such as malaria, plague, poliomyelitis, and viral hemorrhagic fever, in Madagascar. It consists of seven sections covering data on the respondent's demographic information, availability of case investigations forms, quality of data received, respondent knowledge of disease surveillance, and attitudes towards reporting responsibilities. I administered it at each local public health facility to the primary care providers/health workers responsible for surveillance or the person in charge of reporting notifiable diseases at the selected health facility.

Definition of Terms

For the purpose of this study, the following terms are explained from the perspective of epidemiological study:

Active surveillance: A form of surveillance in which a reviewer or public health agency seeks information about health conditions through regular contact with health

care providers or a review of health facility records. The frequency of contacts could be daily, weekly, or monthly (Kihembo et al., 2018).

Case definition: Case definition in disease surveillance systems is the standard criterion that is to be met before a disease is considered a "case" (Nsubuga et al., 2010).

Completeness of reporting: The proportion of surveillance reports received of a particular disease irrespective of the time of submission (Nsubuga et al., 2010).

Epidemic: When new cases in a particular human population, during a given period, considerably surpass what is projected, based on recent experience (*Encyclopedia of Public Health*, 2009).

Evaluation: Systematic assessment of the significance, competence, efficiency, and progress of a program or policy, in relation with set objectives (Kihembo et al., 2018).

Incidence: Number of occurrences of the start of a disease or of individuals becoming ill during a specified period in a given population (WHO, 2015).

Integrated disease surveillance: Combination of active and passive systems with the use of a single infrastructure that collects information for multiple diseases or behaviors of interest (Kihembo et al., 2010).

Integrated Epidemiological Surveillance Service or Service de Surveillance Épidémiologique Intégrée: Chad's national level surveillance unit.

Notifiable disease: A disease of public health importance that should be reported to the public health authorities when a diagnosis is established (WHO, 2015).

Outbreak: An occurrence of disease greater than would otherwise be estimated in a certain time and place. Two linked cases of a rare infectious disease may be enough to constitute an outbreak (Kihembo et al., 2018).

Passive surveillance: A form of surveillance in a public health system that receives information about health conditions from health care providers or informants. The timeliness of reporting of health-related data is determined by the reporting system (Kihembo et al., 2018).

Primary care providers: For the purpose of this study, these were physicians who provide primary care for persons of all ages.

Public health surveillance: The regular, orderly gathering, analysis and estimation of health-related data required for the preparation, application, and assessment of public health practice (WHO, 2015).*Reporting:* The progression by which surveillance data passes through the surveillance system from the point of generation. It also indicates the method of reporting suspected and confirmed outbreaks (Kihembo et al., 2018).

Sensitivity in surveillance: Capacity of a surveillance system to detect and report the actual number or occurrences of health events (WHO, 2015).

Social change: The process by which alteration occurs in the structure and function of a social system (Madsen, 2018).

Timeliness of reporting: The proportion of surveillance reports received at a specified period (WHO, 2015).

Underreporting: The occurrence of the disease not reported to any level of a disease surveillance system (WHO, 2015).

Vertical surveillance: A disease surveillance system that primarily focuses on a specific disease or health event. Data related to the disease are reported to the disease control system for action (Choi, 2018).

Assumptions

I considered the following assumptions:

1. Frequent training for primary care providers and other infectious control disease professionals leads to increased timely reporting of integrated disease incidences to public health officials.
2. Primary care providers in Chad have had previous and similar training concerning reporting of integrated diseases.
3. Primary care providers would be more willing to take part in the study if they were given a confidential, anonymous questionnaire.

Limitations

In this study, I faced numerous limitations. For instance, having a small group of key informants made it challenging to guarantee a representative sample, and this sample conundrum restricted generalizability. There was also the possibility the recruitment process might not attract a diverse sample if limited to participants who were fluent in French and who worked in the capital city of N'Djamena. Key informant participants were selected from diverse medical specialty areas (public, private, or community hospitals) and were drawn from a broad range of career stages to reduce bias, resulting from differential motivations for reporting infectious diseases.

There was also the prospect of selection bias, given that I only selected primary care providers who were located in urban areas, had Internet access, and were interested in taking part in an unpaid study. Social desirability bias was also a possibility; primary care providers might not know the current processes for reporting infectious diseases and, therefore, might have chosen not to participate in the study. Finally, Chad does not have systematic datasets that could have offered the appropriate quantitative information necessary to define the impact of reporting. Data analysis was conducted by means of grounded theory.

Scope and Delimitations

The geographical location of the study was N'Djamena, Chad, in Central Africa. The sample and target population was limited to primary care providers in specialty practice areas such as pediatrics, general/family, and internal medicine. The data gathering was limited to analysis from key informant interviews. External validity was minimized, as the results of the study are not generalizable to primary care providers outside of N'Djamena.

Summary

In this chapter, I presented broad issues with primary care provider reporting of notifiable diseases. The current study was carried out to investigate the attitudes and perceptions of primary care providers in Chad who are responsible for the official notification of infectious diseases. I also sought to pinpoint strategies to ameliorate the reporting process. In the following chapters, I present further background material pertinent to infectious diseases, to notifiable disease reporting, the literature about

primary care provider reporting of notifiable diseases, the research methodology, analysis of data, and a discussion of findings. A descriptive qualitative design, using data from key informant interviews, was conducted to investigate primary care provider knowledge, attitude, and practice vis-à-vis their reporting roles. In Chapter 2, I review the literature on infectious diseases and studies conducted on provider knowledge, attitudes, and beliefs. In Chapter 3 I address the data collection method, and I recommend a plan for analysis. Chapter 4 provides a discussion on the data analysis, and I examine how it contributes to the research questions. In Chapter 5, I present conclusions drawn from the study and discuss the implications for social change.

Chapter 2: Literature Review

Introduction

Many factors pertaining to knowledge, attitudes, and practices may influence the reporting of integrated diseases (Kihembo et al., 2018). In Chad, there have been no studies conducted related to knowledge and practices of primary care providers for the reporting of infectious diseases. In a study conducted in Nigeria, Isere et al. (2015) determined that there was a good knowledge base of disease surveillance and notification system among clinicians; however, the roles of clinicians in disease outbreak prevention, control, and response were not adequately defined. Adokiya et al. (2015) and Randriamiarana et al. (2018) noted similar findings. Mandyata et al., 2017 observed a lack of understanding of appropriate reporting practices in the evaluation of integrated disease surveillance and response strategy in Zambia. Debnath and Ponnaiah (2017) discovered that health workers had a good understanding of priority notifiable diseases; however, they lacked sufficient knowledge regarding their reporting responsibilities. The purpose of this study was to gain an understanding of the knowledge, attitudes, and practices of Chadian providers for reporting integrated diseases.

The IDSR Strategy of the WHO AFRO

IDSR is indispensable to every public health system, particularly in African and other poor-income settings where infectious and epidemic-prone diseases are national priority diseases (Kasolo et al., 2013). The 44 countries within the AFRO region receive guidance and recommendations for the implementation of IDSR from the WHO and the Centers for Disease Control (CDC; Kasolo et al., 2013). The detailed objectives of IDSR

for the AFRO region offer an outline for understanding the basic functions of the strategy as defined in the *Technical Guidelines for Integrated Disease Surveillance and Response in the African Region*, 2nd ed. (2010), the main document produced to support countries in the development of their own IDSR strategies. The WHO AFRO, based in Brazzaville, Congo, has assembled a list of priority diseases, conditions, and events (Table 1) that member states can use as a guide during the development or updating of national guidelines. The IDSR strategy for each member state varies based on its local context, political situation, and level of financial aid and technical assistance received from donor organizations and nongovernmental organizations (Kasolo et al., 2013). Conclusively, member states produce a distinctive list of priority diseases, conditions, and events in line with national priorities and local epidemiologic map. The priority disease and response matrix offer a framework for designing activities for each stage of the strategy (Kasolo et al., 2013).

Table 1

WHO AFRO Priority Infectious Diseases for IDSR

Major infectious diseases of public health significance	Diseases marked for eradication/elimination	Epidemic-prone diseases
Diarrhea in children younger than 5 years old Pneumonia in children younger than 5 years old New cases of infection/AIDS Malaria Sexually transmitted infections (STIs) Trypanosomiasis Tuberculosis	Poliomyelitis (acute flaccid paralysis) Dracunculiasis Leprosy Neonatal tetanus	Cholera Diarrhea with blood Measles Meningitis Plague Viral hemorrhagic fever Yellow fever

Literature Search Strategy

The literature search for this study was guided by all major databases via EBSCO (CINAHL, Medline, PubMed, Science Direct, Science Citation Index Expanded, Nursing and Allied Health, databases of the WHO and the CDC between 1998 and 2012) and all major Internet search engines. My focus was on articles and studies published from 2008 through 2018. Keywords included *integrated disease surveillance and notification system; disease surveillance in the WHO AFRO region; clinician practices for reporting disease; clinician attitudes regarding disease reporting; communicable diseases; evaluation of the timeliness of reporting of diseases; core activities and supportive functions for disease surveillance; measuring underreporting of infectious diseases*; and *investigation and surveillance of infectious diseases*.

An EBSCO search with the phrase *integrated disease surveillance* identified 119 articles. Of these, there was no article directly related to Chad and the topic of disease reporting and notification of primary care providers that had been published within the last 20 years. My search for provider reporting practices in Africa and elsewhere turned up many studies that had been conducted in Nigeria, Zambia, Uganda, South Africa, and Ghana, just to name a few, but none in Chad. These studies are further examined in the literature review section of this chapter.

Theoretical Foundation

TPB suggests that individuals are sensible players whose intent to perform behaviors are governed by their attitudes, social or peer pressures, and behavioral control (Montanaro et al., 2018). I used this theory to assess primary care provider awareness, attitude, and knowledge about integrated disease surveillance reporting responsibilities in Chad. In this regard, TPB was useful when evaluating a primary care provider's attitude and intention to act in response to information obtained regarding the implementation of guidelines prescribing recommendations. TPB was employed to examine the effect of knowledge and attitudes for the appropriate reporting of integrated diseases. TPB suggests that attitudes are one of the three variables that regulate behavioral intention. Perception vis-à-vis the norm of the behavior and the control over the behavior make up the other two variables associated with behavioral intention. According to Montanaro et al. (2018), supporters of TPB propose that in order to modify behavior, interventions must be in place to modify the attitudes regarding the behavior and beliefs concerning behavior norm and control over the behavior.

Ownership of knowledge is also accepted as a part of behavior intention from TPB. Ajzen (2015) determined that information must offer knowledge and guidance for the behavior to occur. With respect to the purpose of this study to measure Chadian provider awareness, knowledge, and attitude regarding reporting of integrated disease, TPB formed the theoretical constructs essential to establishing and understanding the importance of factors affecting primary care provider reporting practices.

Literature Review Related to Key Variables

The key variables of this study are Chadian primary care provider awareness, knowledge, attitude, and their effect on reporting practices for integrated diseases in Chad. A literature search was done to collect information regarding provider knowledge and reporting of infectious diseases. Literature regarding each of these subjects is further discussed in this chapter.

Provider Knowledge of IDSR and Notification System

Literature searches were performed on the subject of the integrated disease surveillance and notification system in Chad and in Africa. No specific studies were found for Chad. However, there was a study found for Kenya, “Health worker knowledge of Integrated Disease Surveillance and Response standard case definitions: A cross-sectional survey at rural health facilities” (Toda et al., 2018) and for Zambia, “Challenges of implementing the integrated disease surveillance and response strategy in Zambia: A health worker perspective” (Mandyata et al., 2017). In both studies, the researchers used a survey instrument to collect information related to integrated disease surveillance for health workers.

In Kenya, Toda et al. (2018) employed a cross-sectional survey to measure the knowledge of IDSR standard case definitions of 131 health workers and their 11 supervisors working at rural health facilities and subcounty management offices in Busia and Kajiado counties. Toda et al. uncovered worrisome low levels of knowledge in Kenya. They administered a survey questionnaire to health facility in-charges or IDSR focal persons and included questions regarding their knowledge of IDSR standard case definitions (Toda et al., 2018). Participant professional backgrounds varied from nurses (70.2%) to clinicians (20%; Toda et al., 2018). The survey focused on case definitions regarding three diseases: dysentery, measles, and dengue. Toda et al. acknowledged several study limitations. First, they noted participant self-reported bias of knowledge levels while the study failed to determine if participant knowledge was converted into practice (Toda et al., 2018). Second, Toda et al. called for the improvement of the IDSR case definition among health practitioners and supervisors. They also proposed that modest interventions, for example, job aids (aide-memoires), are more useful than impromptu training workshops and planned supervision to ensure uniformed knowledge of case definitions (Toda et al., 2018). Finally, they recommended additional studies on evaluating successful methods of improving knowledge of IDSR standard case definitions (Toda et al., 2018).

In Zambia, Mandyata et al. (2017) surveyed targeted health workers through key informant interviews with direct involvement in the implementation of the IDSR at every stage of health service delivery. In total, 13 eligible health workers were interviewed for this study. Mandyata et al. determined that challenges hampering the optimal

implementation of IDSR emanated from many sources, including health worker attitude, lack of motivation, absence of training (in IDSR), and a shortage of available materials and tools to conduct surveillance. They found that training of key frontline staff was unsatisfactory (Mandyata et al., 2017). Conclusively, Mandyata et al. maintained that health workers and clinicians typically counted on their experiences and academic trainings for performing their responsibilities with respect to IDSR. Given that disease surveillance is not usually offered as a course in medical schools and universities in Zambia, the experiences or trainings of these clinicians may not be sufficient.

The WHO International Health Regulations

In 2005, a group of 196 member states adopted the legally binding instrument known as the International Health Regulations (Samhouri, Abaidani, Thieren, & Abri, 2018). The regulations were developed to urge member states to acquire and sustain core competencies for surveillance and response to a variety of public health events. The competencies consist of bolstering local infrastructure and systems to avert, identify, and take action in response to public health events as a means to prevent any international spread (Samhouri et al., 2018). The WHO AFRO region collaborated with member states to include the IHR (2005) within their current IDSR strategies, and the regulations have contributed significantly to the modifications found within the second edition of the technical guidelines for the African region (Samhouri et al., 2018). According to the guidelines, the IDSR strategy can offer the following resources to advance the implementation of IHR (2005) in the African region:

- Infrastructure and resources for surveillance, reporting, and response,

- Qualified human resources,
- Well-defined implementation protocol, and
- Integration of IHR components into standard guides for evaluation, development plan of action, technical guidelines, training materials, tools, and standard operating procedures.

The National Notifiable Diseases Surveillance System

The National Notifiable Diseases Surveillance System is a multidimensional program that comprises the surveillance system responsible for gathering, examining, and distributing health data (Sheu, Chen, & Hedegaard, 2018). At the local, state, and national levels, the program considers policies, laws, electronic messaging standards, people, partners, information systems, processes, and resources. In 1996, Koo and Wetterhall examined the early history of disease reporting and tracking. In the United States, mandatory reporting of diseases began in the late 1800s with physicians reporting selected diseases to public health authorities in Massachusetts. By the early 1900s, all states had passed comparable decrees (Koo & Wetterhall, 1996). Notifiable disease reporting gained national attention with the rise of poliomyelitis and influenza in the early 1900s. Sheu et al. (2018) found that in the mid-1920s, about 29 specified diseases were routinely reported by every state as well as the District of Columbia, Puerto Rico, and Hawaii. Individual state legislatures have the sole power to mandate disease reporting and tracking. States voluntarily and systematically collaborate with regional authorities, such as the Council of State and Territorial Epidemiologists, the National Notifiable Diseases Surveillance System, which is housed at the CDC, and the WHO. As

with other disease-tracking entities, the Council of State and Territorial Epidemiologists and the National Notifiable Diseases Surveillance System grew as indispensable and powerful partners for state health departments. Both helped to establish and spread the work of state public health departments nationally and in other countries (Sheu et al., 2018).

Today, the National Notifiable Diseases Surveillance System publishes a list of 120 reportable diseases based on information provided by state health departments. Over 3,000 public health departments use data on diseases to guard their communities. Data from physician reports feed into the majority of infectious disease surveillance systems. Physician engagement has been a valuable component for the proper functioning of public health surveillance and notification system since the start of reporting of notifiable diseases (Abubakar et al., 2013). In the African region, and specifically in Chad, disease surveillance and reporting of communicable disease cases under surveillance have significantly improved since the 1998 adoption of the regional strategy on IDSR. Thus, notifiable disease reporting is crucial in the forecasting and assessment necessary for preventing diseases, in the assurance of suitable medical therapy, and in the control of epidemics.

IDSR Implementation Structure in Chad

WHO collaborates with the CDC, UNICEF, United States Agency for International Development, United Nations Foundations, and other partners to support the direct implementation of IDSR in Africa. Their strategy is to apply a harmonized and unified approach to collecting, analyzing, interpreting, and disseminating surveillance

information on priority infectious diseases in order to aid public health decision makers in facilitating prompt and robust responses to outbreaks (Abubakar et al., 2013). Chad's decree mandating the reporting of infection diseases is laid out in the country's national health strategy for 2016 to 2030. The law stipulates that once the diagnosis of a priority disease is made, a physician or a health worker must immediately submit a paper-based infectious disease report to the appropriate local health authorities for timely public health action. In addition, clinical laboratories must report positive cases of infectious diseases. The laboratory's role is to support the physician in reporting notifiable diseases.

Throughout Chad, reporting of priority diseases is normally done via paper-based data collection forms. Local public health facilities report data directly to public health district facilities, which are located throughout the county. Local primary care providers and health workers are mandated to communicate and exchange information with the district public health offices following reports of positive cases of infectious disease. The public health district facility then communicates with the surveillance unit at the regional level where morbidity data are collected for the specific region. Health authorities at the regional health level complete a comprehensive report and forward it to the MoH.

Public Health Surveillance System in Chad

Chad is located in the heart of Africa. Its surface area is 1,284,000 km^2. The total population of the country was estimated to be 13,570,825 by 2015, based on projections from the 2009 general population census. The country is partitioned into 23 health regions corresponding to the 23 administrative regions. These regions are divided into 138 health districts with 103 functional and 1,652 peripheral "zones of responsibility"

(health areas), of which 1,334 are functional. The MoH is functionally the central command structure, with the national health authorities directly supervising the intermediate level, which, in turn, supervises activities at the district (peripheral) level. At every administrative level of the health pyramid (see Table 2), designated surveillance staff, as well as health facility staff, carry out daily surveillance activities.

Table 2

Surveillance Staff at Each Administrative Level

Administrative level	Unit	Surveillance staff focal point positions
Central	MoH and National Lab	National and deputy surveillance coordinator Data manager National laboratory focal point
Regional	Regional health delegation Regional laboratory	Surveillance lead Regional laboratory lead
District	District health hospital District laboratory	Zonal surveillance lead District surveillance focal point District laboratory lead
Peripheral	Health facility	Health facility lead

The Chadian Integrated Epidemiological Surveillance Service program manages all infectious disease surveillance activities nationwide. The program closely collaborates with specific disease programs as well as EPI. At the subnational level, specific disease programs continue to function in a vertical fashion despite the "integration" of the national surveillance strategy. In addition, the lack of integration is exacerbated by the presence of single systems for specific priority diseases (e.g., measles, guinea worm, polio, and malaria), nutrition, and other conditions. The Chadian National Committee for the Control of Epidemics meets regularly to review integrated surveillance activities; yet, this integration of activities is inadequate and does not reach every part of the country, where it is most needed. The committee has representation from every disease program as well as national and international stakeholders.

The main partners for infectious disease surveillance in Chad are the WHO, the Carter Center, Doctors without Borders, and the CDC. At the national level, the Chadian National Committee for the Control of Epidemics makes decisions concerning notifiable diseases and other health events under surveillance. The committee's main role is to measure prevalence and incidence rates, examine risk analyses for potential outbreaks, and scope. In the past few years, Chad has received generous funding in support of disease-specific initiatives—for instance, poliomyelitis from the Global Polio Eradication Initiative and guinea worm eradication from the Carter Center. Poliomyelitis is a national notifiable disease under the integrated surveillance program (see Table 3). In 2018, the notifiable diseases under surveillance included disease-specific surveillance systems for

measles elimination, tuberculosis, and trypanosomiasis, and the prevention of mother-to-child transmission of HIV.

Table 3

Notifiable Diseases Under Surveillance in Chad, 2018

Diseases targeted for eradication	Diseases targeted for elimination	Diseases with epidemic potential	Major diseases of public health significance	Diseases under surveillance
Poliomyelitis	Measles	Cholera	Tuberculosis	Hepatitis E
Dracunculiasis (Guinea worm)	Neonatal tetanus	Meningitis	Meningitis	Malnutrition
		Yellow fever	Malaria	
			Hemorrhagic fever	
			Measles	

Reporting Structure in Chad

Routine disease surveillance and EPI disease surveillance are conducted at the health district level. The districts are mandated to report suspected cases weekly or monthly even if they have no cases (referred to as “zero” reporting). Notification of suspected cases falls under the purview of the head of the health center, who initiates reporting of suspected cases by alerting the appropriate zone focal point. Clinical registers at the health facilities contain all recorded epidemiological data. Weekly, the zonal focal point receives case data counts electronically. Monthly, the aggregate number of suspected cases are tallied from the clinical registers and transferred to a standardized paper form. The zonal focal point is in charge of acquiring data from all health facilities within their jurisdiction.

At the regional level, data are collected for all individual health districts and reviewed by the regional surveillance focal point for completeness, data entry errors, duplications, and inconsistencies. Once the data are ready and aggregated for all health districts, the regional surveillance focal point submits it to the central level. Weekly reports are phoned in, and monthly reports are emailed.

At the central level, data are reviewed, aggregated for all regions, and then presented as a national summary of all integrated diseases at the weekly Chadian National Committee for the Control of Epidemics meetings by the surveillance data manager. The national summary is comprehensive in that it contains fatality rates, total death counts, and a list of districts with reported suspected cases for each disease under surveillance. In addition, the surveillance data manager shares the national data with the WHO Inter-Country Support Team based in Ouagadougou, Burkina Faso.

At the laboratory level, to ensure adequate response efforts, the national laboratory is mandated to share specimen results within 48 hours with the zonal focal point; within five days for the regional delegation; and within seven days for national level focal points. Feedback is routinely provided in the course of supervision visits for sub-national level surveillance activities. In addition, depending on the availability of resources (transportation, fuel, etc.), national surveillance and laboratory leads are responsible for conducting systematic field visits to health facilities, health districts and regional surveillance offices at least twice a month. Owing to the absence of available resources, such visits occur erratically. There is no written feedback mechanism in place. As a result, local health facility staff depends on messages from the national laboratory

focal point through district laboratory staff to learn about the results of suspected cases. The prioritization mechanism for surveillance visits (see Table 4) is part of the process to support a national surveillance system which can assist in making informed decisions about the allocation of resources.

Table 4

Prioritization Mechanism for Surveillance Visits

High priority	Medium priority	Low priority
High incidence of disease cases, large population, hard to reach health facilities, refugees, nomads, internally displaced populations.	Health facility is in a rural and low disease risk area.	Low incidence of disease cases.
Gets 1 supervisory visit a week.	Gets 2 supervisory visits a month.	Gets 1 supervisory visit a month.

Active Versus Passive Surveillance of IDSR

In public health practice, the significance of the term *surveillance* has continued to evolve over the years. Langmuir (1976) stated that surveillance in the 1950s was restricted to the monitoring of individual cases with specific diseases such as plague, syphilis, and typhus in order to assess if isolation was mandatory. Langmuir (1976) noted

the expansion of the term in the 1960s to consist of specific diseases, instead of suspected individual cases. In essence, surveillance is done actively or passively.

Passive surveillance occurs when a physician or any other primary care provider reports on specific infectious diseases (Ahorlu, Okyere, & Ampadu, 2018). Thacker et al. (1983) defined it as "provider-initiated" surveillance. *Active surveillance*, which is initiated by the health facility, involves more intensive techniques—for instance, active sentinel surveillance to monitor infectious diseases (Thacker et al., 1983). This method of surveillance involves a collection of primary care providers specifically hired to report on specific diseases. Beginning in the early 1980s, active sentinel surveillance was conducted in Pierce County, Washington to ascertain whether passive surveillance of hepatitis represented the afflicted inhabitants. The aim of the study was to measure the hepatitis incidence rate by encouraging reporting via letters to primary care providers, nurse practitioners, and laboratory staff. Because of these measures, researchers equated the number of reported cases to a similar period under passive reporting. The results indicated that 65% of passive surveillance visits were incomplete in Pierce County (Alter et al., 1987).

Jaeger et al. (2018) noted that in Chad, passive surveillance suggested that infectious diseases are underreported. In 2012, there was 1 physician for 28,466 inhabitants, rather than 1 per 10,000, as per WHO standards, and there was 1 trained nurse for 12,903 inhabitants (Azétsop & Ochieng, 2015). The country's low reporting rate of infectious diseases is largely due to a shortage of clinical staff, primarily

physicians. Health district nurses spend most of their time doing clinical work in addition to providing oversight of activities at the district level (Azétsop & Ochieng, 2015).

Studies Regarding IDSR Implementation

The implementation of IDSR has been examined intermittently, though adequately. At the global level, India is considerably the most advanced nation with respect to IDSR implementation (Phalkey, Yamamoto, Marx, & Awate, 2013). Remarkably, in the WHO African region, only former British territories have contributed significantly to this body of knowledge. Even though the WHO South-East Asia Regional Office endorsed IDSR in 2002, to date, only Indonesia, Sri Lanka, Indonesia, and Thailand have made efforts to integrate disease surveillance in the region (Phalkey et al., 2013). Phalkey et al. (2013) examined lessons learned and challenges encountered in the implementation of IDSR in low- and middle-income countries. Similar studies were initiated in Ghana (Adokiya et al., 2016; Issah et al., 2015.), Madagascar (Randriamiarana et al., 2018; NGbichi et al., 2017), Nigeria (Isere et al., 2015; Abubakar et al., 2013; Bawa & Umar, 2009; Lafond et al., 2014; Olayinka & Oluwafolakemi, 2017; Olatunde, Sekoni, & Olufunlayo, 2013; Popoola, Fatiregun, & Ige, 2018), Kenya (Toda et al., 2018; Ope et al., 2013), Zambia (Chomba, Kampata, & Wilbroad, 2017; Haakonde, Lingenda, Munsanje, & Chishimba, 2018), Uganda (Kihembo et al., 2018; Luswa et al., 2013), Liberia (Wesseh et al., 2016), India (Mukherjee & Ekadevananda, 2017; Deepak, Raut, & Anil K., 2014; Phalkey et al., 2013; Arun, Manish Kumar, Ram Bilas, & Pardeep, 2014; Ratnendra, 2012), Tanzania (Willilo et al., 2017; Nsubuga et al., 2010), Ethiopia (Graves et al., 2012.), Italy (Christian et al., 2015), Costa Rica (Toscano et al.,

2013), Grenada (Peters, 2017), Canada (Friedman, Sommersall, Gardam, & Arenovich, 2006), and the United States (Perry et al., 2007; Kannan et al., 2015).

The original impetus to propose IDSR was the result of significant flaws identified in national infectious disease surveillance, outbreak readiness, and public health response systems in a number of African nations (Kihembo et al., 2018). In addition, Nsubuga and colleagues (2010) conducted a review of the experiences of four separate African nations implementing disease surveillance and response between 1998 and 2005. WHO AFRO was a critical actor in providing continued technical assistance to individual countries in the development of their adapted versions of the guideline as well as the development of standard technical guidelines (Kihembo et al., 2018). Following the adoption of the IDSR strategy, individual countries developed shared objectives: Conduct an evaluation to identify gaps and opportunities to strengthen present national surveillance and response capabilities; cover laboratory services and infrastructure; and implement a budgeted five-year national action plan (Kihembo et al., 2018).

The first evaluation was initiated in Tanzania in 1998. Uganda and Ghana followed in 2000, and Zimbabwe concluded in 2003 (Kihembo et al., 2018). The four countries reported similar findings: a lack of well-defined priorities for disease surveillance and control; the existence of several disease-specific surveillance systems with distinctive data collection methods and processes; inadequate understanding and sensitization concerning common surveillance case definitions; late disease reporting and late investigation of case reports or suspected outbreaks. Any confirmation of potential

outbreaks by the laboratory was incomplete, with no regular collaboration or harmonization between epidemiology and laboratory staff. There were significant gaps in the analysis of data. The feedback was suboptimal from routine surveillance and regulatory visits from the central command administrative level to the peripheral public health system levels. Due to insufficient training, there was a low ability to act swiftly and efficiently to outbreaks. This was coupled with limited resources for communication and transportation to sustain surveillance and response activities at all levels (Kihembo et al., 2018).

Perry et al. (2007) examined the IDSR strategy. With the assistance of key informants and following consultations with health authorities from specific disease programs, they conducted a study to outline the surveillance skills and activities mandatory for the implementation of surveillance guidelines for 19 separate priority diseases targeted by IDSR (Perry et al., 2007). They implemented their study in the Philippines, Uganda, Tanzania, and Guatemala, respectively. The result is an IDSR matrix, which creates a skills-based vision of integrated surveillance and response. Public health leaders and other public health stakeholders can thus apply the practical skills in the development of an integrated disease surveillance system (Perry et al., 2007).

Phalkey et al. (2013) conducted a systematic review of the available literature written in English. Their goal was to identify numerous gaps with the implementation of IDSR in low-and middle-income countries, to report the lessons learned, and to determine the most important challenges that contribute to its low performance. The researchers collected a group of 33 assessment studies but found only 18 published documents

available: reports of 18 countries mostly in the WHO AFRO region (Burkina Faso, Cape Verde, Eritrea, Ethiopia, Ghana, Guinea Bissau, India, Iraq, Lesotho, Malawi, Mali, Mozambique, Nigeria, South Sudan, Tanzania, The Gambia, Uganda, Zimbabwe; Phalkey et al., 2013). They noted that gaps continued to exist despite noteworthy improvement in tackling the obstacles present with vertical disease surveillance strategies. Similar findings were noted across nations—for instance, challenges with IDSR core support functions including but not limited to a dearth of funding resources, absence of coordination between the regional and the district levels, insufficient training and high turnover rate of peripheral staff, irregular feedback from the next level, insufficient monitoring at the periphery, fragile laboratory systems in addition to the absence of tools (case definitions/reporting formats), and lack of communication and transport methods for the most part at the periphery level (Phalkey et al., 2013).

In India, Arun et al., (2014) conducted a cross-sectional study in the Haryana health district. Their goal was to measure health worker knowledge and practice concerning IDSR and to evaluate the quality of reporting of IDSR at the health facility level. Physician, clinician, and health worker knowledge, awareness, attitudes, and practice concerning IDSR have been studied extensively (Chomba et al., 2017; Mandyata et al., 2017; Aniwada & Obionu, 2016; Isere et al., 2015; Nnebue et al., 2012; Adefuye, Dairo, & Adedokun, 2009).

Aniwada and Obionu (2016) created a questionnaire that they distributed to private and public primary health care workers (physicians, nurses, midwives, laboratory technicians, scientists, community health officers, and community health extension

workers). It was designed to reveal knowledge, practice, and factors affecting the implementation of disease surveillance and notification. They found primary health care worker knowledge of infectious diseases varied based on affiliation with public and private sector: 68% of public health care workers versus 58% of private health care workers had heard of IDSR. In addition, 50% of public health care workers versus 28% of private health care workers knew the correct definition of IDSR, while 58% of public health care workers versus 25% of private health care workers had correct knowledge of diseases reported. The authors acknowledged that their study findings were consistent with findings from prior studies (Nnebue et al., 2012; Isere et al., 2015) in that primary health care workers (physicians, nurses, etc.) in both public and private facilities respectively had inadequate training and supervision with IDSR core functions; staff lacked reporting forms (Aniwada & Obionu, 2016) and rarely reported infectious diseases. They further observed that the main reason for lack of reporting was the absence of forms for public health care workers versus the lack of motivation for private health care workers. The significance of the study was the implication that enhancing surveillance and notification must necessitate continued education and feedback.

In the United States, the power to mandate notification of infectious diseases cases rests in the individual state legislatures. Roush, Birkhead, Koo, Cobb, and Fleming (1999) mailed a survey to every state epidemiologist but also included New York City, because its population is greater than some states, as well as the territories of Guam and Puerto Rico. The researchers reviewed 53 separate reports of selected notifiable diseases. They found that out of the 58 diseases and conditions requiring national notification, 35

(60%) were reported in more than 90% of the states and territories, and eight (14%) were reported in less than 75% of the states and territories (Roush et al., , 1999). The survey, in accord with other studies (Nnebue et al., 2012; Isere et al., 2015) revealed that disease surveillance routinely rests on case reports by physicians and other health care workers. Roush et al. encouraged the application of other surveillance methods to meet the growing challenges imposed by infectious diseases. These methods include sentinel surveillance, prevalence surveys, and vital records. Further, they called for the integration of the surveillance methods with the aim of expanding the breadth of data collection and to offer full evidence for measuring public health goals at the local, state, and national level (Roush et al., 1999).

In Nigeria, Abubakar, Sambo, Idris, Sabitu, and Nguku (2013) conducted an evaluation of the implementation of IDSR in Kaduna state. The aim of the researchers was to perform a comprehensive review of available resources, such as computers, printers, calculators, and Internet access, which contribute to optimal reporting of infectious diseases in Kaduna state. The authors compared the available data to similar assessments conducted in Mozambique, Tanzania, and Uganda. They found that in Nigeria, the availability of calculators was at 67% for the health facility level compared to 25% for computers. This situation was an improvement from an assessment in 2001 that showed 47% of health facilities having calculators available at the same period. However, the Nigeria findings did not match those in Uganda, where an assessment demonstrated that 78% of health facilities had calculators available (Abubakar et al., 2013). Local health facilities, LGA (local government area) facilities, and state level

facilities strongly rely on critical IDSR data management tools (calculators and computers) to conduct data entry, simple calculations, and data analysis. Kaduna state performance was superior to the 10% and 17% reported in Uganda, however, lower than the 32% reported in Tanzania, and significantly lower than the 41% to 78% reported in Ghana between 2004 and 2005 and the 20% reported in Kenya (Abubakar et al., 2013).

The authors cited a lack of feedback from the state to the LGA, similar to findings from previous assessments. This contrasted with reports in Mozambique and Tanzania that showed 50% of districts receiving feedback from the regional level. In conclusion, the authors acknowledged that the absence of feedback from higher levels discourages individuals responsible for notification, which contributes to poor performance in the future (Abubakar et al., 2013).

In Canada, Sockett, Garnett, and Scott (1996) described the structure by which information on notifiable diseases is gathered and assembled by the federal government. The Canadian government began the collection of information regarding selected notifiable infectious diseases in 1924 (Sockett et al., 1996). However, governments at the provincial level can pass legislation intended to receive individual reports of infectious disease cases. When a case is consistent with the surveillance case definition, it is formally notified to health officials at the provincial/territorial level (Sockett et al., 1996). Cases with incomplete data may receive further investigation and are either confirmed or removed. Informed decision-making and national policy development is accomplished with the Notifiable Diseases Reporting System, which collects aggregate national data. It serves a critical role that recognizes the value and use of data (Sockett et al., 1996). The

authors observed that future enhancements of the system would largely rest on continuous motivation of primary care providers and laboratories to report infectious diseases as well as the development of electronic data collection methods (Sockett et al., 1996).

In Ghana, multiple observational, qualitative studies (Adokiya et al., 2016; Adokiya, Awoonor-Williams, Beiersmann, & Müller, 2015; Adokiya, Awoonor-Williams, Barau, Beiersmann, & Mueller, 2015; Issah et al., 2015) were conducted. The goals were as follows: Evaluate the integrated disease surveillance and response system for infectious diseases control in northern Ghana; examine the reporting completeness and timeliness of the integrated disease surveillance and response system; consider challenges to the core and support functions of the integrated disease surveillance and response system in northern Ghana; and assess the usefulness of integrated disease surveillance and response on suspected Ebola cases in the Brong Ahafo region. Adokiya et al. (2015) used semistructured questionnaires to explore the knowledge of IDSR core and support functions of 18 key informants (medical officer, physician assistant, public health nurse, disease control, and laboratory and health information officers) who are in charge of health care delivery at the periphery of the health system in northern Ghana. The bulk of the informants surveyed were males (12 out of 18). Seven disease control officers, four physician assistants, three general staff nurses, one community health nurse, one biomedical scientist, one health information officer, and one nutrition officer were interviewed (Adokiya et al., 2015).

Adokiya et al. (2015) found their findings to be consistent with similar observations reported in other developing nations: Feedback on disease surveillance was given sporadically to health facilities; the availability of IDSR reporting forms and templates was limited; and personal funds were often used to pay for materials. While the study did not allow an evaluation of the impact of motivation on reporting of infectious diseases by key informants, the authors suggested that the lack of available resources related to financial, human, infrastructure, and material might have had a significant effect on reporting practices. They lamented the lack of electronic reporting at the periphery level. They discussed the importance of an electronic system to move IDSR data uninterruptedly via a monitoring, verification, and evaluation mechanism by higher levels of the health system to deliver prompt and appropriate information to health authorities for public health action (Adokiya et al., 2015).

In Taiwan, Tan et al. (2009) examined private physician reporting behavior, attitude, and knowledge regarding reporting communicable disease in local clinics. The researchers sought to evaluate differences between reporting and non-reporting physicians. They mailed a structured questionnaire to a random sample of physicians (*N* = l,093) and had an 88% return rate. Physician response was measured for significance using X^2 test with SPSS 11.0 for Windows. The study was an improvement on previous studies in that the response rate of 88% was considerably higher than those who used similar data collection methods. In contrast to similar studies, the authors observed that the most common explanation for failing to report was the fear of violating patient privacy rights (Tan et al., 2009). It should be noted that reporting does not violate

patient's privacy, consistent with Articles 31 and 39 of the Communicable Disease Control Act; however, physicians are mandated to report suspected cases to the appropriate health authorities in their locality.

The authors suggested that the most fundamental ways to enhance physician reporting frequency would be to modify the misperception and change the attitude to disease reporting, such as apparent unwillingness to violate patient privacy rights (Tan et al., 2009). Certainly, the legal conditions and significance of reporting and penalties associated for not reporting suspected cases necessitate higher emphasis at every level of a physician's medical training (Tan et al., 2009). Indeed, the formation of a reward/penalty system might also be essential in enhancing disease reporting compliance in physicians.

Summary

The role of IDSR has been described as key in providing a basis for supporting the surveillance, response, and laboratory core functions endorsed by the 2005 IHR (Kasolo et al., 2013). IHR obligations serve as an incentive for countries to uphold their national commitments to IDSR strategies (Kasolo et al., 2013). Studies of IDSR implementation have been conducted globally. These studies, nevertheless, have been repetitious in that they have recurrently exposed the primary care provider (physician, health worker, laboratory technician, surveillance focal point) as grossly misinformed and unprepared regarding reporting responsibilities. In addition, such studies have not documented enhanced reporting practices by primary care providers; rather they have served to highlight challenges caused by lack of available resources and training, which

significantly contribute to underreporting by primary health providers and health facilities alike. The literature on IDSR implementation calls for a more profound probing into primary care provider motivation and attitude about their reporting practices in order to discover why challenges persist and to find out how to ameliorate the reporting of infectious diseases to health authorities for timely public health action.

My study will employ a qualitative methodology, using key informant interviews for data collection and grounded theory. In Chapter 3, I discuss qualitative methodology, sampling, data collection, and data analysis.

Chapter 3: Research Method

Introduction

The purpose of my study was to investigate the role of primary care providers in the integrated disease surveillance in Chad. A secondary endpoint was to identify factors that impact complete, quality, and timely reporting.

Qualitative data were collected from key informant interviews with primary care providers. The data collection method was key informant interviews with primary care providers in specialty areas such as general medicine/family medicine/family practice, internal medicine, and pediatric medicine. This chapter covers the research design, rationale for the design, method of implementation of the design, threats to validity, and ethical procedures.

Research Design and Rationale

My study took a descriptive qualitative research approach, using an existing questionnaire from *Performance evaluation report of the Routine Health Information System (SISR) and Integrated Disease Surveillance and Response* (Moussa et al., 2016), to investigate the role of primary care providers in integrated disease surveillance in Chad and to identify factors that affect their complete, quality, and timely reporting. The key informant participants were asked the following research questions:

1. What is the role of primary care providers in integrated disease surveillance in Chad?
2. What factors impact the complete, quality, and timely reporting by primary care providers in Chad?

3. How do the knowledge and practices of primary care providers regarding the completeness, quality, and timeliness of reporting differ from the currently recommended reporting process in Chad?

When used appropriately, qualitative research has the potential to provide rich, anecdotal information that is true to life (Patton, 2002). It is a methodical approach to obtaining insights. Moreover, it is advantageous when little information is known about the phenomenon under investigation and when there is a necessity to define an experience from the perspective of the participant (Patton, 2002). With a qualitative methodology, the researcher watches and interviews participants to explore particular themes, characteristics, attributes, and patterns of meaning of a particular phenomenon (Patton, 2002). In addition, semistructured interviews offer some flexibility in terms of qualitative data collection while simultaneously permitting more standardization versus unstructured interviews (Green et al., 2015). Such qualifications are particularly suited to the study of primary care provider knowledge, attitude, and practice of their integrated disease surveillance reporting responsibilities in Chad.

Consequently, in selecting a qualitative method for this study, I identified key information concerning attitudes and perceptions that primary care providers harbor toward their integrated disease reporting roles in Chad. An important feature of the qualitative design is the primary data obtained from a natural setting and the rich observations derived from interviews with primary care providers. Prior researchers have identified some potential themes and findings, which guided the methodology. Vraukó et al. (2018) conducted a study about physician reporting practices in Hungary and

concluded that family physicians (rural, urban, older, and female) perceived their reporting responsibilities differently. Also perceived differently was the status of the current reporting system and its efficiency (Vraukó et al., 2018). Thus, in this study, I recognized a difference in the perception of reporting of infectious diseases between rural and urban family physicians. These factors are critically significant with respect to recent studies, showing increasing low rates of reporting by primary care providers. Therefore, the common theme found in the research is that the need for improvement in the knowledge and training of primary care providers and the electronic surveillance systems have raised concerns that necessitate a deeper exploration of the low rates of reporting among primary care providers (Mukherjee & Ekadevananda, 2017).

Grounded Theory and Background

The purpose of a grounded theory interview is to investigate the participant experience of an actual phenomenon, with the eventual goal of discovering more about the phenomenon (Singh et al., 2018). Comprised of six analytical phases as represented by Figure 1, grounded theory is an inductive method for leading a qualitative research study and was the appropriate choice for this exploratory and descriptive research inquiry. It strives to form an understanding between the research objectives and the findings resulting from the key informant interview data. With the use of a grounded theory approach, researchers are able to study which factors affect a particular behavior, for example, the decision to report infectious diseases by Chadian primary providers, but similarly to know the relationship among those factors (Reitz, Horst, Davenport, Klemmetsen, & Clark, et al., 2018). To develop a theoretical model, grounded theory

collects real life observations and guarantees that the results are grounded in the social world of the individuals under study (Reitz et al., 2018). The overarching question that drove the research and analysis was as follows: What are the attitudes and perceptions that primary providers harbor toward their integrated disease reporting responsibilities in Chad? Thus, my goal was to define key informant experts who had unique and important information on the topic because of their roles and who met the following criteria: working at a periphery health facility; awareness and active participation in public health, disease surveillance, or health information activities; willingness to take part in the study; and completion of written consent. Key informant interviews are well adapted to research involving primary care providers and are valuable for investigating concepts and issues regarding primary care providers that quantitative research has not reached (Reitz et al., 2018).

In this study, I was concerned with the identification of the common or shared theme related to disease reporting and associated barriers to reporting. Thus, gaining background information from key informants was imperative in developing an in-depth understanding. The background information included job title/position, gender, education, and number of years of work. The grounded theory design provided authentic information gathered by direct communication with primary care providers. Singh et al. (2018) suggested that the theory is convenient in areas in which little or no research has been undertaken and in obtaining fresh perspective on an issue that has not profited from quantitative approaches.

Grounded theory studies have been conducted using key informant interviews for data collection in several countries involving primary care provider knowledge and attitude. Sekimoto, Imanaka, Kitano, Ishizaki, and Takahashi (2006) led a qualitative study based on grounded theory to investigate physician knowledge of scientific evidence and evidence-supported treatment and to document existing obstacles to the implementation of evidence-based policies in clinical practice. Other cases of grounded theory/key informant interviews studies involving physicians have been reported. Reitz et al. (2018) explored the obstacles, motivations, and factors influencing rural family physician choice to pursue rural full-spectrum practice. Reitz, Slier, Sudano, and Trimble (2016) used a modified grounded theory methodology and led phone interviews with 22 key informants from family medicine residencies to define faculty roles, general role conflicts, and personal belief system for evading and handling role conflicts.

The aforementioned general background supported the choice of the grounded theory approach to this study. An understanding of the attitudes and perceptions that primary providers have about their integrated disease reporting responsibilities in Chad can lead to the development of appropriate interventions.

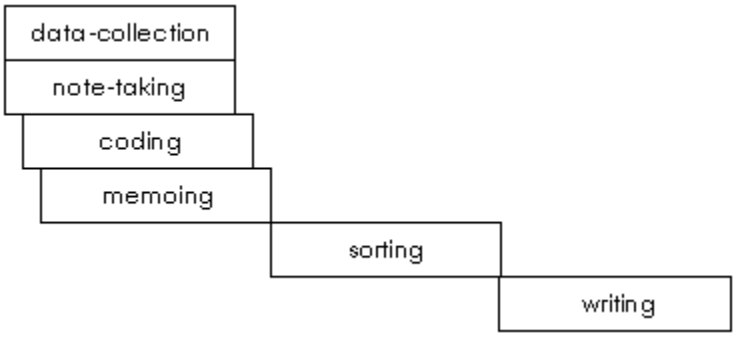

Figure 1. Graphic representation of grounded theory analysis phases. Reprinted from "Coding issues in grounded theory: *Issues in Educational Research"* by Mogdhaddam, 2006, *16*(1), 52-66.

The Role of the Researcher

While reflecting on this research topic from a personal and professional standpoint, I thought about my role as an epidemiologist with the CDC for the past 6 years, and the many years I have spent working in Chad on behalf of the global polio eradication initiative. I recognized the importance of the research topic, and after an initial literature search, concluded that it was valid for further exploration. My experience working at the peripheral level while conducting mass polio campaigns and community-based surveillance in Chad enabled me to facilitate appropriate and potentially sensitive communication regarding reporting responsibilities among primary care providers in Chad.

Thus, my understanding and culture allowed a personal connection to key informant participant knowledge, attitude, and practice of reporting without introducing bias. Therefore, to minimize biases in this study, I strictly followed Walden's ethical guidelines. In addition, the nature of the research topic augmented the crucial role I envisioned I would play during the course of the data collection. Such a role involved jointly and courteously urging key informant participants to share their reporting practices in this setting. My knowledge of disease surveillance and reporting underscored the actual experiences of the key informant participants. Therefore, my position as observer-participant in this study served to improve an understanding of the knowledge,

attitude, and practice regarding their reporting responsibilities. Finally, my role as an observer-participant and interviewer also involved facilitation and guarantee of confidentiality in the entire research process. I sent a request for informed consent to key informant participants prior to the start of the interviews.

Methodology

Singh et al. (2018) suggested that in order to develop a basic understanding of the phenomenon under investigation, it is crucial to use data generation methods that are equally flexible and sensitive vis-à-vis the social context in which data are created. They maintained that conducting an effective interview is a basic method for researchers to collect data to allow them to create analyses that highlight a phenomenon of interest (Singh et al., 2018). Fundamentally, the basic methods of qualitative research consist of interviewing individuals, recording their statements, observing individuals during the course of their day-to-day activities, and recording their behaviors. In this study, qualitative research methods were used, specifically key informant interviews along with an existing questionnaire from *Performance evaluation report of the Routine Health Information System (SISR) and Integrated Disease Surveillance and Response* (Moussa et al., 2016) to assist the progress of data collection. These methods made it possible to gain a better understanding of how primary care providers and other public health stakeholders interacted with each other, how they interpreted their collaborations, and how these implications were informed by the broader context in which reporting takes place (e.g., the hospital setting, health clinic, or physician office).

For this study, I used a descriptive qualitative design with an existing questionnaire from *Performance evaluation report of the Routine Health Information System (SISR) and Integrated Disease Surveillance and Response* (Moussa et al., 2016) to investigate the role of primary care providers in integrated disease surveillance in Chad and to identify factors that impacted their complete, quality, and timely reporting. Interviews with experts (key informants) were used to collect data and were favored due to the lack of reliable sources of systematic quantitative data that might be used for a quantitative inquiry. Furthermore, Chad does not have systematic datasets that can offer the appropriate quantitative information necessary to define the impact of reporting. Data analysis was conducted by means of grounded theory.

Data Collection Process

The collection of data and some of the data analysis took place concurrently. Recorded audiotapes of the key informant interviews provided the data for the study. The key informants were participants, who, because of their roles, were identified as being experts with unique and important information on the topic and who met the following criteria: working at a periphery health facility; awareness and active participation in public health, disease surveillance, or health information activities; willingness to take part in the study; and completion of written consent. They were asked a list of questions designed to stimulate knowledge, attitudes, and practice about their reporting roles in Chad. Any subsequent discussions were recorded and transcribed for analysis. I also observed nonverbal communication during the interview sessions. My transcripts, captured simultaneously with taping, were there to authenticate and substantiate the

transcribed record. Note taking was allowed to stretch to the time after the interview sessions concluded, so I could preserve views, thoughts, and interpretations collected from the sessions.

Unlike mail surveys, which are limited to a defined set of questions, I had the opportunity to seek face-to-face, direct verbal feedback to find out more about participant role in integrated disease surveillance and to identify factors that affected their complete, quality, and timely reporting. The preferred interview approach for this study was meant to make it possible for me to interchange openly with the participants to discover how they perceived their reporting roles and the environment that encouraged this reporting. This method would also permit the verbal, but similarly nonverbal communication (facial expressions, eye contact, tone of voice, body language, etc.) designed for gathering a broad understanding of the participant knowledge, attitude, and practice toward their reporting roles.

Moreover, being in the same room enriched the connection between the participant and the interviewer, and contributed to the open expression of the phenomenon (Hunt, Chan, & Mehta, 2011). For instance, key informant participant facial expressions and other nonverbal communication cues provided added meaning to the dialogue (Hunt et al., 2011). In addition, I was able to query key informant participants to determine further knowledge of their reporting roles. Hill et al. (2005) indicated that semistructured interviews can also function as a precursor to in-depth discussion with participants (Hill et al., 2005). The face-to-face interviewing also enriched the researcher-participant relationship and promoted full immersion in the data collection process.

For this study, I used the immersion/crystallization method to dive deep in the data collected by reading some portion of the data; and by thinking about the analysis experience and endeavor to pinpoint and express patterns or themes observed in the immersion process. These dual methods were able to be carried out until all the data had been scrutinized, and patterns and themes began to surface from the data that were valid and could be well enunciated and justified. Other researchers (Borkan, 1999; Dovey et al., 2002; Smith et al., 2003; and Tudiver & Talbot, 1999) have conducted several studies using immersion/crystallization analysis.

Study Population and Setting

This study was conducted in N'Djamena, the political capital and the most populous city in the Republic of Chad, Central Africa. The capital city is divided into eight administrative districts. Its population has grown substantially from 600,000 inhabitants 10 years ago to 1,323,000 in 2018 (Greter et al, 2018). Situated on the right bank of the Chari River, N'Djamena continuously experiences major floods in the course of the rainy season (Greter et al, 2018). Living conditions are tough as activities are largely limited to agricultural, farming, and animal rearing (Greter et al, 2018).

Many indigenous languages are spoken in N'Djamena; yet, French is the official language for education, business, and government affairs. Thus, the healthcare experts who were the key informant participants in this study could read, write, and speak fluent French. N'Djamena is directly located on the southwestern border, neighboring Cameroon (Figure 2). The capital city was the appropriate choice for this study because of its accessibility to primary care providers/health workers, competent and proficient

human personnel. There was not a single method that could serve to determine sample size in a qualitative inquiry. For Patton (2002), in contrast to quantitative studies in which the sample size is established in advance, the objective in qualitative research is to describe meanings and phenomena, which generates an acceptable sample size necessary for the achievement of the study's aim.

Figure 2. Map of N'Djamena, Chad (*Encyclopedia Britannica* online, 2012). Reprinted from Encyclopedia Britannica online, 2012, retrieved from https://kids.britannica.com/kids/article/NDjamena/346229 Copyright 1994-2017 by Encyclopædia Britannica, Inc

In this study, I was able to apply the convenience sampling method to meet the primary care provider's needs, for instance their availability and accessibility. This method of sampling permitted the voluntary participation of experts who had unique and important information on the topic because of their roles and who met the following criteria: worked at a periphery health facility; awareness and active participation in public health, disease surveillance, or health information activities; willingness to take part in

the study; and completion of written consent in the study, as it would have been practically unmanageable to interview the entire primary care provider population. Interviews involved key informants who report infectious diseases to health officials and were willing to discuss their processes. Because of vague generalizations, many researchers have challenged convenience sampling, yet, convenience sampling supports qualitative research methodology and grounded theory. In addition, it was suitable for the study population so as to be flexible to participant work schedules. Consequently, using convenience sampling made it possible to match the key informant participant schedules and accessibility.

Selection Criteria for Key Informant Participants

Eligibility for key informant participation encompassed the following: worked at a periphery health clinic; experience with reporting infectious disease to local officials; expertise and active participation in public health, disease surveillance, or health information activities; readiness to take part in the study; and completion of written consent. All key informant participants were recruited from N'Djamena, irrespective of race, ethnic, or cultural and background. The WHO office in N'Djamena served as the primary recruitment location for this study. Potential participants who saw the phone number on the posted flyers and telephoned me were engaged in a quick phone interview to determine their eligibility for participation in the study.

I selected 20 participants who met the study requirement for a one-on-one interview at a mutually agreed upon location. Key informant participants signed an informed consent document as a prerequisite to partake in the study. I cross-examined an

equivalent number of females and males, independent of social status, to discover the differences and common themes related to their experiences with reporting diseases to health officials for public health action.

Saturation was met when adequate responses defined the meaning of the phenomenon collected from a pool of 20 key informants. The main purpose of the study was to investigate primary care provider knowledge, attitude, and practice regarding their integrated disease surveillance reporting roles in Chad. While financial incentives frequently accomplish behavior modification, a decision was made to not use financial incentives to persuade participants into joining the study; instead, financial resources were used to support transportation to the location of the interview. The availability of reliable and safe transportation is a problem in Chad and, specifically in N'Djamena.

An allowance of $20 was offered to cover the transportation fare of any study participant. A short summary regarding allowances and purposes was built into the informed consent document and distributed to study participants. The document outlined participant rights and roles throughout the entire research process, including but not limited to, the right to withdraw at any time or the right to not answer any questions deemed ill fitting, or to withdraw from the whole interview at any moment.

The preliminary confidential phone interview permitted determination as to whether the prospective participant met all of the criteria for study participation. After the phone interview, I scheduled face-to-face interviews with those who passed the phone interview. To guarantee confidentiality and convenience, the key informant participant

and I selected a safe location for the interview. My role was to strictly follow the standard informed consent and ethical principles that inform qualitative research.

Key Informant Interview Protocol

Before I began the interview, I offered each participant a script pertaining to the Qualitative Interview Protocol. Next, we went over the study objectives, social implications, and subsequent steps. I then opened the semistructured interview, giving the key informant participant the opportunity to communicate freely and ask follow-up questions. Walden University's approved open-ended interview questions were utilized. All participants were given the same questionnaire and follow-up questions. I clarified stated points or sought more meanings into a particular theme of the study. The goals of the interview were as follows: (a) to understand primary care provider knowledge, attitude, and practice regarding integrated disease surveillance reporting roles in Chad; (b) to understand the extent of health facilities reporting IDSR priority diseases and to verify timeliness and completeness of these reports; (c) and to understand primary provider knowledge of notifiable reporting and to identify the barriers to reporting.

The interviews lasted 45–60 minutes. A debriefing session lasting 5–10 minutes was also offered to key informant participants to give them the opportunity to reflect on the interview experience. At the conclusion, all key informant participants were given copies of the National Health Policy and a priority notifiable diseases pamphlet from the Chadian Ministry of Public Health. In qualitative research, an interview schedule contains many phases (Figure 3).

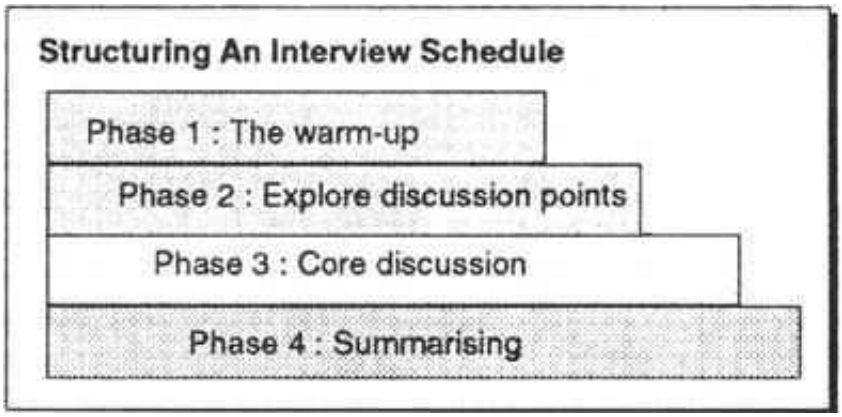

Figure 3. The key informant phases. Reprinted from "Chapter 5: Personal interviews." In *Marketing Research and Information Systems* by I. M. Crawford, 1997. Retrieved from http://www.fao.org/docrep/w3241e/w3241e06.htm#chapter%205:%20personal%20interviews. Copyright 1997 by the Food and Agriculture Organization of the United Nations.

Data Analysis Plan

In both grounded theory analysis and immersion analysis, hypothesis testing does not regulate key informant interview data. To demonstrate alignment and in advance of data analyses, each research question had to be correctly itemized. The intent of the data analysis plan was to present the data in sequence and to confirm that there would be alignment between interviews and the research questions. A taped recording was made of all interviews (with participant permission) to safeguard historical data. Coding was established as a data analysis technique employed by scientists to categorize an understanding of research data (Cresswell, 2007). This process involved taking qualitative data and administering a numerical value to certify the existence or absence of themes. The task was to identify core themes and their properties, or subthemes, until no new themes emerged. As the coding process carried on through the collected data,

emerged themes were included and merged into core themes, the anticipated result of the analysis. A descriptive summary of the core themes will be presented in the results. In immersion/crystallization analysis, core themes also emerged, albeit in a less structured and more intuitive process.

I tape-recorded, transcribed verbatim and abridged all interviews to guarantee confidentiality and accuracy. One verbatim and two abridged transcripts were generated for each interview. The verbatim transcripts were used as a reference when creating the abridged transcripts and as a lasting record of the interview.

The first pass through the data involved color-coding comments that corresponded to the purpose of the study. Color-coded themes were the role of primary care providers (administrative and technical), and factors that impacted their complete, quality, and timely reporting (positive and negative). Consequently, the role of primary care providers, and factors that had an impact on their complete, quality and timely reporting in Chad were sorted into four color-coded themes. The color-coded comments made on the first pass on abridged transcript 1 were then transferred over to transcript 2 to start the coding process. While leading this iterative process, memo cards were prepared with color-coded remarks intended to guide the last phase of analysis wherein the memo cards were spread out and placed according to the emerging plot. This "plot" described what happened during the interview sessions with respect to the isolated core themes. Classifying, reorganizing, and systematizing the memo cards while coding the data, made up the constant comparison style of analysis related to grounded theory analysis. Because the constant comparison analysis revealed the core themes and the plot, a final series of

passes through the data achieved the immersion/crystallization analysis, which resulted in the same core themes. The final core themes were generated along three dimensions: incidence, precision, and breadth. Incidence denoted the number of times a category was raised during an interview session. Precision referred to the amount of detail a category was given. Breadth referred to the number of different participants whose answers raised a theme.

Finally, the core themes isolated by the analysis process embodied the crux of what Chadian primary care providers perceive as their role in integrated disease surveillance and the factors that impact their complete, quality, and timely reporting. I will describe and explain the core themes in the next chapter on results and findings.

Threats to Validity

My interpretation and analysis of the interviews I conducted with key informants stood as the main threats to validity for the research study. Interview responses were transcribed verbatim. While I made an attempt to present participant answers verbatim, I continually examined interview questions in contrast to key informant participant answers. In addition, I allowed key informant participants to read the data analysis and provide commentaries. This constituted the second method to check study validity and helped achieve the following aims: (a) reduce the potential incongruities resulting from the interpretation of data; and (b) provide an opportunity to key informant participants to scrutinize the data to further bolster the validity of the research study. Hence, the interpretation and ensuing data analysis demonstrated the lived experiences of key informant participants and established validity.

Furthermore, recall bias had the potential to be a threat to the individual interview approach on the grounds that key informant participants would be answering questions about their experience with their integrated disease surveillance reporting roles in Chad. Bowden, Lordly, Thirsk, & Corby (2012) maintained that a self-reporting interview carries some limitations in that it potentially lacks accuracy and may not be corroborated.

Because a pilot testing design was utilized to run through interview questions, I was able to minimize threats to validity. It was my hope that the perception of potential bias would be recognized, and would facilitate the development of a trustful relationship in which key informant participants felt at ease to share their lived experiences regarding their integrated disease surveillance reporting roles in Chad, thus minimizing any threats to validity.

Ethical Procedures

Protection of Human Subjects

Human subjects were involved in this research study. In compliance with Walden University's human subject protection guidelines and to avoid breach of confidentiality or conflict of interest on my part, personal and identifying information were safeguarded and protected. Approval from the Walden University's Institutional Review Board (IRB) was sought in advance of the data collection. The approval # is 04-30-19-0143266. The data I gained from this study were used only for analysis purposes with the approval of the IRB at Walden University.

I obtained a second ethical approval from the Chadian IRB and requested permission for the study. The hands-on and collaborative nature of the information for collection had the potential for presenting serious ethical concerns.

Key informant participants were offered a guarantee that their personal information will remain confidential to individuals not associated with the study. This guarantee was continued from the launch to the final report and thereafter.

Data Treatment

Anonymity was maintained with the data collected. Professionalism was maintained in the utilization and handling of documents and reports to ensure respect for the study participants. Truthfulness and professionalism was also preserved during the analysis process. No efforts were made to misrepresent, transform, or revise data gathered in the study. In compliance with Walden University data policy, I used a coded computer to secure the electronic data collected. Paper-based data, for instance interview transcripts, have been carefully stored in a secured cabinet, in which they will remain for a period of five years per Walden University guidelines. The Walden University designated staff and I are the only individuals with access to the data. The data will be wiped at the end of 5 years.

Summary

In this chapter, I presented the methodology used for the research study. I enumerated the benefits of applying a qualitative approach to investigate the attitudes and perceptions of primary care providers toward their integrated disease reporting roles in Chad. My decision to use key informant interview research was examined as the favored

data collection. In addition, I selected grounded theory analysis and immersion analysis as the analytical methods applied for the data resulting from key informant interviews. In this chapter, I focused on proposed research design and rationale, population, and sampling procedures. I also discussed procedures used for recruitment, setting of the study, ethical considerations, data collection, and data analysis. In Chapter 4, I will cover the findings obtained from the data analysis.

Chapter 4: Results

Introduction

The purpose of my descriptive qualitative study was to investigate the role of primary care providers in integrated disease surveillance in Chad. In addition, I sought to identify factors that impacted complete, quality, and timely reporting. While primary care physicians are most likely the first and most qualified health personnel to detect and report infectious diseases, no research has been conducted in Chad on the role, knowledge, perceptions, and needs of these physicians regarding the integrated surveillance of reportable diseases. I used a descriptive approach with the goal of developing insightful descriptions. In this chapter, I present the findings that emerged from the use of a qualitative design. I conducted 20 key-informant interviews to gather responses from 20 primary care providers.

The primary research questions guiding this study were as follows:

1. What is the role of primary care providers in integrated disease surveillance in Chad?
2. What factors impact the complete, quality, and timely reporting by primary care providers in Chad?
3. How do the knowledge and practices of primary care providers regarding the completeness, quality, and timeliness of reporting differ from the currently recommended reporting process in Chad?

Public health professionals and other stakeholders can use the findings from my study to develop more effective strategies to improve the complete and timely reporting

of infectious diseases by primary care providers in Chad. In this chapter, I offer information about the study setting, participant demographics, as well as a comprehensive overview of data collection and analysis techniques. I provide steps taken to guarantee data trustworthiness. I then present the results and overarching themes that were derived from the key-informant interviews. I end the chapter with a summary and short overview of Chapter 5.

Study Setting

The study took place in N'Djamena, the capital city of Chad, which has a rapidly growing population (3.3% growth rate) in an area of approximately 520 km^2 (Mindekem et al., 2017). The city is located on the right Chari riverside and has a latitude of 12°8′ north of the equator and longitude 15°2′ east of the prime meridian (Nambatingar et al., 2017). It is an administrative center (university, industrial, and commercial). The city is divided into 10 districts and 56 quarters. The main religion is Islam (Jaeger et al., 2018). The interviews and data collection took place in the entire administrative area of the city.

Study Participants

The study was comprised of 20 participants. These were physicians who had trained in Chad and were employed by the government in public health facilities. While I had worked with public health professionals in Chad for years, I had no previous relationship with any of these participants. I collected demographic information (years in practice, specialty) about each participant. In Table 5, I present the demographic information for the 20 participants. Recruitment and selection of participants was based on availability and a purposive sampling approach, the latter of which was intended to

augment demographic diversity of the sample around the topic of reporting infectious diseases. I conducted the interviews were conducted in May 2019. I recruited the participants from health facilities in N'Djamena, Chad, and performed all interviews at their work place. I paid particular attention to having the interviews in a private setting so the primary care providers would feel comfortable to talk freely. Each interview lasted 45 to 60 minutes. All interviews were recorded after I obtained approval from participants. Interviews were conducted in French, one of the official languages in Chad, which is commonly used by Chadian primary care providers. No translator was needed because I am fluent in French and am well familiar with the culture and community of Chad, having worked there for many years. I covered all topics by asking probing questions, when appropriate. I used prepared, open-ended questions (Appendix A) to guide the discussions and to provide participants the chance to discuss critical issues.

After the interviews, I translated the audio recordings of the sessions into English and transcribed them into Word documents. Credibility was enhanced through additional visits with participants over a period of 3 days to corroborate and authenticate the data transcribed from the interviews. I interviewed all participants at their work places. I read and discussed the transcripts of the interviews to avoid misunderstanding or overinterpretation of the data. I then asked each participant to respond to the accuracy of the statements. Once they verified, I uploaded the information into NVivo 10 software for thematic analysis.

Demographics

Participants filled out a simple screening questionnaire that asked their clinical specialty and the number of years of experience in their specialty. Of the 20 participants, 15 had advanced degrees in public health. All had worked in an urban setting as primary care providers. Participants had 4 to 29 years of experience working in the public health sector.

Table 5

Demographic Information for Study Participants

Gender	Place of practice	Specialty	Years in practice	Interview date
Male	N'Djamena	Internal Medicine	29	10 May 2019
Male	N'Djamena	Family Practice	28	15 May 2019
Male	N'Djamena	Public Health	12	15 May 2019
Female	N'Djamena	Adult Medicine	6	15 May 2019
Female	N'Djamena	Clinical Pathology	32	15 May 2019
Male	N'Djamena	Public Health	18	15 May 2019
Male	N'Djamena	Public Health	4	15 May 2019
Female	N'Djamena	Public Health	3	20 May 2019
Male	N'Djamena	Public Health	19	20 May 2019
Female	N'Djamena	Public Health	19	20 May 2019
Female	N'Djamena	Public Health	3	20 May 2019
Male	N'Djamena	Public Health	7	20 May 2019
Male	N'Djamena	Public Health	12	20 May 2019
Female	N'Djamena	Public Health	16	25 May 2019
Female	N'Djamena	Public Health	4	25 May 2019
Female	N'Djamena	Public Health	6	25 May 2019
Female	N'Djamena	Public Health	12	25 May 2019
Female	N'Djamena	Public Health	9	29 May 2019
Male	N'Djamena	Public Health	11	29 May 2019
Male	N'Djamena	Public Health	4	29 May 2019

Key Informant Interviews

Over a 1-month period starting in April 2019, I telephoned each of the 20 participants and organized the interviews. They were 10 males and 10 females ranging from 40 to 58 years old. The interviews were conducted in a similar manner. I gave specifics about the informed consent form to the interviewee, explaining that by taking part in the interview, they were consenting; however, they could withdraw, without problem, at any time. All 20 interviewees had deep roots with the health system in Chad, having had professional experiences that led them to their current positions at their respective health facilities. The introductory procedures were carefully followed before each key informant interview to guarantee uniformity but also to elude bias and any possible leading by me that could have resulted in misdirection. At each interview, I defined the objective of the interview, its significance, the purpose of the audio recording, and the dissemination of the results. I then thanked each interviewee for their time and presented them with $20 as reimbursement for their travel costs.

Key Informant Interview Summary Results

The key informant interview sessions revealed three core themes that are central to understanding the role of primary care providers in the integrated disease surveillance in Chad. All 20 interviews contributed data to the themes, signifying an equal standing among the themes. However, with respect to the rate of incidence, precision, and breadth, there was some variance across key informant interviews. The five core themes were outlined with the responses to the semi structured questionnaires that led the participants through each interview.

Data Collection

What follows is a description of the steps taken for data collection. The steps followed the original data collection plan discussed in Chapter 3. I used an interview questionnaire. I modified the order of the questions based on the flow of the interview in the hopes of not disturbing the narrative. Data collection commenced in May 2019 after final approval was granted by Walden University's IRB to conduct this qualitative study. Approval was also obtained from the Ministry of Public Health in Chad "Ministère de la Santé Publique Direction Générale."

Recruitment of Key Informant Participants

Three weeks prior to the key informant interviews, I contacted the chief of the Surveillance Unit at the Ministry of Public Health in Chad. During that 3-week period, I was given a list of interested participants (10 females and 10 males) and their phone numbers. I telephoned each participant to set up their appointment, to provide information about the study and my background, to explain the extent of their involvement, and to answer any questions.

Data Analysis

I audio-recorded the interviews and listened to each recording while searching for indicators of a theme. Then, I transcribed each transcript, verbatim, using standard qualitative content-analysis methods to detect noteworthy quotations into a Microsoft Word document for an in-depth analysis. I applied a thematic approach. During the preparation of the transcripts, I measured the periods of silence, as well as any laughter that followed a participant's response and linked it with the exact questions that elicited

the vocalizations (see Bailey, 2008; Stuckey, 2014). Following transcription, I visited each participant at their workplace and invited them to review the transcript for errors or to offer comments and feedback. After all visits were completed, I advanced to the analysis stage by manually coding each of the 20 transcripts while searching for themes that included the leading points with the use of a Nvivo approach (see Basit, 2003). Upon completion of the initial coding, I assembled parallel, individual responses for each question. At that time, I removed codes that were pertinent to answering each question. I also performed a word count on each of the 20 transcripts, searching for major themes that included 30 to 50 frequently used words/phrases. In Table 6, I provide a brief overview of each research question's emerging themes.

Table 6

Emerging Themes

Research question	Themes
What is the role of primary care providers in the integrated disease surveillance in Chad?	Case detection and case reporting
What factors impact the complete, quality and timely reporting by primary care providers in Chad?	Financial, human and logistical resources; inadequate supervision/feedback from the next level; reporting completeness; reporting timeliness
How do the knowledge and practices of primary care providers regarding the completeness, quality, and timeliness of reporting differ from the currently recommended reporting process in Chad?	Data quality; ambiguity of current recommended reporting process

The subsequent sections define the steps I took to guarantee trustworthiness of data during the course of this study.

Trustworthiness of Data

Action was taken to reduce any threats to trustworthiness. To determine the validity of my practices and findings, different terms have been used in qualitative research (Creswell, 2017). To guarantee trustworthiness of the data, this study employed the four frequently used terms in qualitative research: credibility, dependability, confirmability, and transferability.

Credibility

According to Cope (2014), the prospects of qualitative research are credibility and trustworthiness. The researcher can enhance credibility by recounting their experiences as a researcher and validating the research findings with the participants (Cope, 2014). This can be accomplished by spending a prolonged period with the population under study to develop understanding of their culture (Shenton, 2004). During the data collection phase, I spent time talking with each participant about the aim of the study and its significance. To make sure that the participants felt at ease, I emphasized the importance of confidentiality in this study, explaining that no audio-recordings would be heard by anyone other than me, and that it was imperative that the participants provided truthful answers. I told participants they were not obligated to take part in the study and could withdraw at any time.

Patton (2002) and Shenton (2004) proposed triangulation as another method to support credibility. Triangulation of data sources is likewise essential because it has the ability to augment the range of data by having a variety of people partake in giving their views (Shenton, 2004). The key-informant interviews I conducted were followed by

debriefing sessions that were also audio-taped and transcribed to enhance the analysis. This approach worked to triangulate the content of each key-informant interview session preserved in notes and impressions. Triangulation of the data was achieved.

Dependability

Qualitative research employs dependability to demonstrate that if techniques are duplicated with the same conditions and same participants, results will be identical every time (Shenton, 2004). Dependability also relies on triangulation for its support. The ability to employ multiple data collection techniques will offset weaknesses that a method may possess (Field & Morse, 1985). I used participant interviews to allow for easy reproduction.

Confirmability

Qualitative research employs confirmability to establish that the study results are firmly grounded on the experiences and views of the participants instead of the desires or traits of the researcher (Patton, 2002). One method to encourage confirmability is for the researcher to have an independent examiner run through the project on a continual basis to review and validate the researcher's decisions (Guba, 1981; Lincoln & Guba, 1981). I was able to establish onfirmability through the use of the interview transcripts to certify the findings reflected the participants' responses.

Transferability

Transferability demonstrates whether specific results or findings of one study can be applied to situations not related to the study. Individuals can correlate the results with their own personal stories (Coper, 2014). For transferability to be established,

descriptions must be broad to allow others to evaluate whether the findings are transferable or not (Lincoln, 1995). To enrich transferability, broad description must contain raw data illustrations, and proper references demonstrating how themes emerged from data (Houghton, Casey, Shaw, & Murphy, 2013). For this study, I used broad descriptions demonstrating the value of sufficiently described data to allow others to choose whether the results are transferable.

Themes

The purpose of my study was to investigate the role of primary care providers in the integrated disease surveillance in Chad. I devised the research questions to identify factors that impact complete, quality, and timely reporting. The information I collected from the 20 key-informant interviews produced emerging themes from the data analysis with respect to each of the three research questions. In the subsequent sections, I review the findings for each of the three research questions and their core themes.

Research Question 1

Research question 1 focused on the role of primary care providers in the integrated disease surveillance in Chad. At the start, I asked participants to define their daily duties. Two subthemes emerged from the discussions: case detection; and case reporting of a suspected public health event based on the national IDSR guidelines.

Case Detection

The first subtheme that emerged from participants' responses to question 1 of section 2 as indicated in Appendix A ("Speak about your role, your responsibilities, your appreciation, and the role of your basic health center in the implementation of integrated

surveillance system over the past year at this health facility") was case detection. All participants acknowledged that IDSR was necessary and that their role was primarily to detect cases of disease. However, none of the 20 participants reported having physical copies of the Chadian national IDSR technical guidelines (2016 edition), which contain the standard case definitions for integrated disease surveillance. Ten respondents said they conducted active case search for priority diseases at the health facilities and in urban communities with health relays, and that reports were available.

Two respondents said they have led public health awareness campaigns at both the clinic and community levels. The two respondents reported that, as primary care providers, they are frequently the initial point of contact for abnormal clinical symptoms. One respondent stated, "Regardless of how badly physicians feel about the integrated surveillance system, they will always detect cases first." Therefore, physicians, nurses, and healthcare workers play a vital role in case detection and reporting potential outbreaks. Participant response to question 1 indicated an absence of standard case investigation forms at the periphery.

In addition, 18 participants reported the absence of tools for diagnosis and case reporting. Also, 13 participants acknowledged, in answering question 8 from section 2, that scarce financial resources, equipment shortage, absence of training in sample collection, inadequate storage, and transport issues mixed with poor laboratory capabilities both hindered and significantly impacted case detection and outbreak confirmation. Overall, many of the key informants described untenable demands on their time and expertise.

Case Reporting

This subtheme emerged from participant response to questions 4 and 8 from section 2 as indicated in Appendix A. All respondents said that case reporting is completed at their health centers in the district, and 17 stated that they had reported a disease in the past 12 months. Seven participants said it was their duty to fill the case reporting forms. Three expressed that maintaining an acceptable number of reporting forms as well as other job aids (such as reporting deadlines and case definitions at the periphery level) was a major source of concern for case reporting, frequently producing poor record keeping and non-reporting of data. “There is no follow-up from the Ministry of Health. Nobody cares,” one respondent said. Other participants indicated that the greater part of the IDSR systems depend on hard copies for the most part at the periphery. “We do not have all the reporting forms. It seems they (the ministry) do not find reporting an important matter,” said a respondent.

Two participants said that the case reporting forms were available at their health facilities. These included IDSR immediate notification and weekly reporting forms, case investigation forms for vaccine preventable diseases, such as acute flaccid paralysis, measles, and yellow fever. Eight participants reported taking 20–30 minutes to complete the forms while five took 30–60 minutes to complete the forms. Ten respondents said they thought the forms were easy to fill out. However, only two respondents specified that they required prior training to be able to complete the reporting forms.

When responding to questions 3 and 4 from section 2, 12 participants said that inadequate means of communication compromised the transmission and processing of

data at all levels. Two participants showed copies of documents listing the notifiable disease reports they made to health authorities. The data were recorded on paper. Sixteen participants said they had reported cases of infectious diseases this year, and only four participants did not remember when they last reported a case to health authorities. Overall, responses to this question generated substantial evidence that primary care physicians consistently report cases of infectious diseases in Chad.

Research Question 2

Research question 2 investigated the factors that impact the complete, quality, and timely reporting by primary care providers in Chad. The four subthemes that emerged were financial, human, and logistical resources necessary to improve IDSR, inadequate supervision from the next level, improvement in reporting timeliness, and improvement in reporting completeness.

Financial, Human, and Logistical Resources

Many of the participants mentioned the lack of financial, human, and logistical resources as primary factors that impact the complete, quality, and timely reporting by primary care providers in Chad. This subtheme emerged from responses made by participants to questions 1, 4, 6, 8, and 10 on section 2 as indicated in Appendix A. Responses to question 1 (“Speak about your role, your responsibilities, your appreciation, and the role of your basic health center in the implementation of integrated surveillance system over the past year at this health facility”) highlighted severe interruptions in receiving allocated budgets, which, in turn, hindered IDSR implementation.

The prompt ("What difficulties do you encounter in filling out the IDSR tools?") drew responses from several participants, who focused their attention on the fact that the absence of specific IDSR budgets at the health facility level precisely impacted operations and logistics (vehicles) and equipment (calculators, computers, printers), information education and communication materials (job aids). One participant stated, "When I inquire (about the financial resources), the district medical officer said it's none of my business. It's unbelievable."

Another participant noted, "The number of vehicles, and funds for maintenance and fuel are not enough to carry out activities, and we have to rely in greater part on NGOs. And the existing motor bikes are so old." Although most participants believed the surveillance system is reasonably responsive, they felt that for some conditions and diseases, the surveillance system does not collect sufficient financial support for improvement. Another participant said, "There are already signs that reduced funding is causing the decline in improvements made by IDSR, as demonstrated by the decline in the timeliness and completeness of reporting."

Inadequate Supervision/Feedback From the Next Level

This subtheme emerged from responses made by the participants to question 1 from section 5 as indicated in Appendix A. Participant response to question 1 ("Describe the last time you were supervised at your health center. What were your strengths and weaknesses as reported by your supervisor?") underscored the challenge in implementing supervisory visits at the operational level because of poor coordination and workflow processes. Seven participants asserted that supervisory visits were only conducted to

address issues and were not intended to serve as supportive visits with checklists to improve staff motivation and IDSR performance.

One study participant said, “I consider the supervisory framework for the integrated disease surveillance system in Chad to be well designed, because it is similar with what is happening in the AFRO region. We also receive field visits from WHO staff regularly. They help us all the time when we have issues. The problematic part is the execution from the ministry of health.”

Reporting Completeness

This core theme emerged from some of the participants’ responses to questions 1, 2, 3, and 4 from section 3 as indicated in Appendix A. Reporting completeness denotes the percentage of health providers as well as health facilities that submit on the required deadline paper-based reports or electronic reports through a manual upload on the District Health Information Management System (DHIMS2), which is an online reporting system operated by the health districts (Adokiya et al., 2016). The need to improve reporting completeness was articulated by participants in follow-up to question 1 (“What is your appreciation of the transmission of IDSR data from community agents to the health center and from the health facility to the district level—promptness and timeliness of integrated disease surveillance data and information on outbreak response”?). “Necessary measures must be taken to facilitate reporting for primary care physicians as much as possible,” said a participant.

A response to question 3 (“What do you think are the consequences of inaccurate and incomplete IDSR data?”) was a plea for the inclusion of the private sector for

reporting IDSR data: “I do know how to report—there are some guides in public health facilities—but I cannot say the same thing for my colleagues in the private sector. They do not know who and what entity to correspond with.” In addition, 17 participants pointed out that the creation of financial motivations and personal gain for physicians would significantly increase their tendency to report disease, thus improving reporting completeness. According to one participant, “primary care physicians are doing extremely poorly financially in this country. There is no additional support coming from anywhere; and the government places extra burden on us by asking us to do extra work, carry the burden for everyone, in addition to what we do routinely.”

Reporting Timeliness

This core theme emerged from analyzing participant response to question 1 from section 6 (“Give concrete examples of decisions made based on IDSR data”). Reporting timeliness is defined as the percentage of all estimated IDSR summary reports that were properly submitted by health providers and or health facilities (weekly or monthly) and timely (on the due date) either through a paper-based format or electronically via manual upload on the DHIMS2 (Adokiya et al., 2016). Several participants stressed that currently in Chad, reporting is delayed by processes that produce incomplete, untimely, and unreliable information leading to poor quality data—for example, the use of hand-delivered, paper-based systems. “The reports cannot be faxed to the district because of no fax equipment and no electricity. They have to be hand delivered,” remarked one participant. This means that reports typically arrived about a week after the diagnosis. Almost every participant appealed for alternative measures, for instance, the use of

internet-based reporting and submission of reports via personal mobile phones as done in other countries.

One participated observed that “the importance of the issue of reporting timeliness is not recognized enough in Chad.” Another participated stated, “We need to share information with each other (physicians) to improve the system. This way we can feel valuable in improving the health status in the country and the reporting completeness and timeliness of the IDSR system at the sub-national level in Chad.” Another participant said that “reporting will work effectively when it is in some way privatized. It should have private units.” Still, the overall reporting timeliness remains unsatisfactory and varies greatly across the periphery for both weekly and monthly reports.

Research Question 3

In research question 3, I explored how the knowledge and practices of primary care providers regarding the completeness, quality, and timeliness of reporting differ from the currently recommended reporting process in Chad. As with the other research questions, I used the interview guides to ask a range of questions. Two prominent themes emerged: data accuracy; and variability and reliability of standard case definitions.

Data Quality and Accuracy

The first theme that emerged from research question 3 was data accuracy. When asked about how the knowledge and practices of primary care providers regarding the completeness, quality, and timeliness of reporting differ from the currently recommended reporting process in Chad, most participants mentioned data quality and accuracy as well as the need for better communication between public health clinicians and primary care

physicians. Some participants maintained that inadequate data quality at the health facility level severely compromised the core integrated disease surveillance functions, and undermined the capability of the system to meet the disease control objectives. All participants described the elements they focus on to ensure quality and accuracy of the IDSR data that their health facilities collect and transmit to the district level. Two participants expressed that the typical reporting accuracy fluctuated by facility, and by disease. Three participants stated that there exists a disposition to both over- and underreporting. Other participants claimed that important and correct reports were difficult to find and in some instances lost registers and lost submitted reports made it challenging to validate data. One participant argued how peripheral staff had little understanding of the significance of "zero reporting" in IDSR. There was also some nonverbal resistance to this question, perhaps denoting a limited awareness of their reporting responsibilities. The participants indicated a preference for laboratory reporting of diseases to improve data quality and accuracy. Subsequent responses to question 3 ("To whom do you report?") were made by participants who mentioned the laboratory as the source of disease identification, and, thus, as the proper venue through which to report to the district. In summary, responses to question 3 were insightful, suggesting that reporting could be better carried out by laboratories rather than by primary care physicians.

Current Reporting Process

The second theme that emerged from research question 3 ("How do the knowledge and practices of primary care providers regarding the completeness, quality,

and timeliness of reporting differ from the currently recommended reporting process in Chad?") was that participating physicians found the current processes of disease reporting to be ambiguous and ineffective. Most of them recognized the process in the integrated disease surveillance system lacked many attributes, particularly where reporting disease was concerned. This question brought forth several aspects of the quest to simplify the current reporting process. Additional suggestions were made to streamline the process. One participant remarked, "Perhaps if we could just make a phone call, everything would happen on time."

Another participant stated, "The currently recommended reporting process is not very clear for physicians, because there is no standard way to do things, no organized mechanism to make things right." All participants were concerned with meeting the duties government policies foresaw. However, one participant mentioned the need to improve existing mechanisms to meet the recommended processes for reporting, as the resources to fulfill them were not always available.

Summary

The discussion of the role of primary care providers in the integrated disease surveillance system in Chad is an important one. In this chapter, I presented a full assessment of data collection methods, management of data, data trustworthiness, and data analysis. I used three research questions to guide this study. Research question 1 investigated the role of primary care providers in the integrated disease surveillance in Chad. Research question 2 explored what factors impact the complete, quality, and timely reporting by primary care providers in Chad. Research question 3 asked how the

knowledge and practices of primary care providers regarding the completeness, quality, and timeliness of reporting differ from the currently recommended reporting process in Chad. In Chapter 5, I present the interpretations of the study findings, limitations, recommendations, and social change implications this study sought to address. My chapter closes with a summary and conclusions of the study.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of my qualitative study was to identify the role of primary care providers in the integrated disease surveillance in Chad. Another purpose was to identify factors that impact complete, quality, and timely reporting. Therefore, my study was conducted to help fill the gap in the literature and contribute new knowledge regarding the role of primary care providers in Chad. I conducted key informant interviews with 20 primary care physicians in N'Djamena, Chad, to collect data. In this chapter, I present interpretations of themes that emerged from the data analysis. I then address the study's limitations, recommendations, and implications for social change. I close the chapter with a summary and conclusions.

Summary and Interpretations of Findings

My search of the literature on the integrated disease surveillance and reporting system and implementation in Chad during the past 10 years turned up only an analysis of meningitis surveillance costs in Chad and Niger. My study addressed an organizational gap. Key-informant research concerning primary care physicians has been largely rural in scope. This paucity of studies highlighted an important knowledge gap in the literature. My study is the first conducted in Chad that specifically assesses the roles of primary care physicians in disease reporting. Although the reporting system is functioning, participants noted significant gaps in case detection, the reporting process, and the investigation of reportable diseases. My study is far-reaching, as failure to report timely and investigate priority diseases may result in onward transmission and open doors to

potential outbreaks**.** In addition, Chad is a vast country, with much cross-border movement. The flow of special populations (namely nomads, refugees, and the internally displaced) makes case detection and reporting challenging without the introduction of a cross-border reporting and tracking system. Furthermore, the findings of my study correlated with the findings of studies conducted in other countries on this issue. These were discussed extensively in previous chapters. Participants revealed that the knowledge of primary care providers regarding their roles in reporting the occurrence of disease in Chad is high. One of the most important issues discussed by participants was that primary care physicians knew the basics of the surveillance system and were cognizant of their reporting responsibilities. My findings are presented in relation to the themes found in the analysis presented in Chapter 4.

Case Detection

When I asked about their roles in case detection, participants largely agreed that it is not merely an obligation but a professional and legal task as well. Other participants, however, seemed eager to switch the conversation to the issue of low case detection by other primary care physicians. They made the supposition that case detection rates are actually lower than officially disclosed, and that it is on the rise, particularly in rural and remote areas of the country. Seven participants recognized that public health workers have suspected low case detection among rural physicians in Chad, and that my study was the first to corroborate that it is occurring. Three participants acknowledged that the lack of case detection has negative implications for public health in Chad.

In addition, five participants reported concerns about the lack of services, poor resource allocation, and insufficient motivation to conduct case investigations. These issues negatively impact complete, quality, and timely reporting. Thus, the findings from this study suggest that poor case detection rates likely correlate with poor resource allocation and insufficient motivation to conduct case investigations. These factors may compromise complete, quality, and timely reporting.

Case Reporting

The participants highlighted the importance of primary care physicians as the primary sources of information regarding case reporting. The majority of participants also recognized that reporting forms should be readily available. One participant remarked, "I will report if I have a reporting form in my hand." The participants argued that the perceived public health implication of epidemic-prone disease, such as polio or measles, is a major factor influencing physicians to report or not, which is in agreement with the findings of similar studies in this area. According to 10 participants, the most important suggestions for increasing primary care physician compliance with disease reporting were to streamline the reporting process and to shift the primary duty for reporting to frontline workers, such as a health care worker or a nurse.

While most participants demonstrated high knowledge of priority disease reporting, lack of knowledge was not frequently noted as a critical barrier to reporting. The findings of this study suggest the benefit of strengthening primary care physician understanding of, and conformity with, priority disease reporting by using simple procedures, such as posting the list of priority diseases, reporting process/requirements at

the workplace, and offering access to free phones on the job as a means to encourage reporting. In addition, providing incentives to primary care physicians by eliminating barriers to priority disease reporting and easing the reporting process would increase the reporting of priority diseases (Gopichandran, 2018).

This theme also revealed that primary care physicians felt that the reporting process had to be streamlined and simplified. This finding is consistent with findings in various studies of physician reporting of infectious diseases, and thus it bears implications for public health in Chad. Of particular interest to the study respondents was the desire to carry out integrated disease reporting with a single telephone call. Such phone reporting is not acceptable in Chad.

My study, the first comprehensive assessment on priority disease reporting in Chad, suggests that primary care physicians have respectable knowledge and enthusiasm vis-à-vis priority disease reporting. Studies of other nations have uncovered poor physician conformity with priority disease reporting. Consistent with findings of studies in Nigeria, Kenya, and Tanzania, in this study, I demonstrated that despite many challenges, physicians actually report the cases of infectious diseases that they identify.

Financial, Human, and Logistical Resources

Mutale et al. (2013) stated that in recent times, there has been renewed attention in financial, human, and logistical resources necessary to sustain integrated disease surveillance activities. Key informants participants in this study noted that existing levels of funding to the Surveillance Unit in the Ministry of Public Health are insufficient for the implementation of routine surveillance functions. Findings from my study indicated

that participants felt that financial resources were not sufficiently available to perform their daily duties and that interruption in obtaining allocated funds for IDSR hindered implementation. Phalkey et al. (2013) argued that access to sustainable resources (financial, human, and logistical) forms the basis of quality surveillance performance. Seven participants stated that repeated change and staff turnover at their health facilities hinder program progress.

This finding is crucial when discussing primary care physician retention. Two participants emphasized that there were no plans in place for ensuring retention and decreasing turnover. As a result, participants saw a lot of newcomers and noted fewer physicians were staying longer at their health facilities and thus missing the important training and motivation that is associated with case detection and timely reporting. Six participants observed that they had no sustainable logistic and communication resources. Furthermore, participants also noted the lack of transportation to enable them to travel to attend to infected disease patients who did not have the means to come to the clinic.

Additionally, four participants stressed that even though they had vehicles at their disposal, there was vague information about the procedures for their use and the individuals who are authorized to use them. These critical findings are in line with previous research findings that demonstrated retaining trained physicians is of utmost importance. In addition, the literature has shown that a cadre of experienced surveillance staff is strengthened with suitable and sufficient financial and logistical support for solid communication, laboratory function, and data management (Phalkey et al., 2013). Thus, the development of a stable work force of skilled primary care physicians for an

integrated disease surveillance system will ensure lasting program sustainability and viability.

Inadequate Supervision and Feedback From the Next Level

During the sessions, participant responses indicated a concern for ad hoc, irregular level of supervision and feedback from the next level. According to Sow et al. (2010), supervision and feedback to health facility personnel is necessary to strengthen the performance of IDSR in the African region. Five respondents disclosed that they had received supervision from the district level. Two revealed that they were visited at least twice since the beginning of the year while 10 received monthly visits prior to the survey. Adding to this, most participants felt that sustained supportive supervision and feedback that is aimed at reinforcing the knowledge of primary care physicians and other facility health personnel on priority diseases detection and reporting would bolster the surveillance performance in Chad. Furthermore, 10 respondents received feedback, a major component in the integrated disease surveillance system.

Three participants disclosed that they never obtained feedback about the reports they sent in, while 10 respondents received consistent feedback. Five chose not to answer the question for undisclosed reasons. One respondent said, “There must be a standard, regular and effective feedback system.” Nazzal, Said, Horeesh, and Al-Attal (2011) found that supervision keeps physicians informed about standards and procedures and encourages them to report priority diseases.

The findings from my study revealed two perspectives. First, the support functions for an integrated disease system, specifically supervision visits and feedback,

were deficient in Chad. Second, the feedback of integrated disease surveillance data to primary care physicians must continue to use standard, traditional, nonelectronic formats and focus on public health issues strictly pertinent to the physicians.

Reporting Completeness and Timeliness

Complete and timely reporting of infectious diseases is critical for a swift response by public health services (Swaan, van den Broek, Kretzschmar, & Richardus, 2018). In the United States, hospitals and laboratories initiate reporting of notifiable diseases (Dixon et al., 2017). Electronic reporting methods have numerous applications for public health surveillance (Silk, Hoke, & Berkelman, 2008). Throughout this study, participants described reporting completeness and timeliness as the percentage of all projected IDSR summary reports that they correctly submitted on a weekly or monthly basis either through paper-based or electronic submission.

Ten participants stated that most of the time, they completed paper-based reports while they rarely did electronic reporting through DHIMS2. However, three participants indicated that they saw gains in reporting completeness and timeliness with respect to internet-based disease reporting. A study conducted at the subnational level in northern Ghana by Adokiya et al. in 2016 corroborated this finding by demonstrating improvements in reporting completeness and timeliness related to both IDSR system and DHIMS2 implementation.

Internet-based case reporting, where disease reports are transmitted on a secure website, continues to show promise for improving completeness and timeliness of reporting (Adokiya et al., 2016). For example, the Netherlands has entirely transformed

its paper-based reporting system for data transmission from municipal public health services to national public health authorities (Adokiya et al., 2016). Also, the participants conveyed the belief that continued developments in information technology would effectively restructure integrated disease surveillance operations. This would improve completeness and timeliness of reporting while decreasing the workload for primary care physicians and staff at health facilities.

There remains, however, a temptation to conclude that, given the benefits of completeness and timeliness concerning electronic reporting through DHIMS2, and subsequent developments in laboratory reporting, the Chadian government might abandon primary care provider reporting as a source for obtaining surveillance data. Importantly, primary care provider reports frequently include more rich information with documentation of important data, such as patient age, street address, phone number, and disease history, than laboratory reports (Dixon et al., 2017).

The findings from my study illustrate that primary care provider case report completeness and timeliness have room for improvement. As a result, both paper-based and electronic reporting mechanisms must be strengthened for an adequate integrated disease surveillance system. Additionally, interventions that have the capacity to increase provider-based data completeness and timeliness are worth exploring.

Data Quality and Accuracy

Disease control objectives can be compromised by inadequate data quality, which may weaken our appreciation of the true disease epidemiology, and negatively impact the basic functions of an integrated disease surveillance system. The likelihood of outbreak

detection is impacted when the data gathered from the integrated disease surveillance system is of substandard quality; thus, it is particularly imperative to constantly examine and evaluate integrated disease surveillance systems in order to guarantee adequate functionality and effective consumption of resources (Venkatarao et al., 2012).

Observations from my study are largely supported by previous literature but provide additional insights and perspectives to this field of study. It was discovered that data quality was directly associated with simple and clear integrated disease surveillance forms; training quality; supervision and follow-up of health personnel who filled out the surveillance forms; and the attention and level of detail placed on data management (Venkatarao et al., 2012). A review of these facets of a surveillance system provides an indirect measure of the quality of data. Participants in my study acknowledged the necessity for regular training of surveillance personnel, as it would aid not only in strengthening the sensitivity of the integrated disease surveillance system, but also in enhancing both case detection and disease reporting indicators.

Ineffectiveness of Current Reporting Process

The second aim of my study was to identify factors that impact complete, quality, and timely reporting among primary care providers in Chad. When asked to describe how their knowledge and practices regarding the completeness, quality, and timeliness of reporting differ from the currently recommended reporting process in Chad, participants characterized the reporting requirements as ambiguous. In Chad, notifiable disease surveillance systems depend on mandatory reporting of cases by physicians. One participant stated, “Reporting is very important for us physicians too, but there is no

solid, structured system to get things right. Regrettably, the current reporting system still needs a lot of improving."

My study revealed some unexpected findings around attitudes and perceptions of primary care physicians toward the integrated disease surveillance system. A key finding for my study was that participants did not feel adequately informed about their legal responsibilities to report. Many reporting systems across the African continent rest on reporting by general physicians and health workers. Previous studies in Southern Africa, Australia, and the United Kingdom have also established that physicians have not sufficiently learned the list of notifiable diseases (Krause, Ropers, & Stark, 2005). This highlights the necessity to update physicians on a regular basis about the notifiable disease surveillance system.

The key informant interviews revealed additional, valuable material that did not merge into core themes, but it still merits consideration. Study participants expressed a strong sense of caring about patient outcomes. There was also a propensity among study participants to be attentive to economic factors related to reporting infectious diseases in clinical practice. One participant was generally familiar with cost considerations with respect to reporting positive cases. This finding suggests there is an economic awareness among some study participants to the question of reporting infectious diseases that may aid future studies involving notifiable disease reporting by primary care physicians.

In the previous sections, I interpreted the study findings of a qualitative analysis of key informant interviews that were held to determine the role of primary care physicians in Chad and factors that impact the complete, quality, and timely reporting.

Core themes emerged from the analysis and precise answers to the structured questions, including some nonverbal cues communicated by study participants during the key informant interviews framed the results into the core themes, which were the result and the aim of the study. In the next section, I discuss the limitations that my study faced, and I provide recommendations that are grounded on the study findings.

Study Limitations

There were a number of methodological limitations to this study, specifically sample size, recall bias, sampling method, and potential researcher influence. Semistructured interviews are beneficial in finding major themes but are sensitive to the interpretations of researchers (Creswell, 2007). My study involved interviewing 20 key informants. Therefore, the experiences and feelings described in the transcripts may not be an accurate representation of primary care physicians from areas outside of N'Djamena. However, one benchmark of qualitative research is to have a sufficient sample size in order to hear most of the views that might be significant to the study (DePaulo, 2000).

In addition, the use of key informant interviews was a limitation due to the likelihood for recall bias, which could have influenced the participants to offer insights that might or might not have been accurate and truthful (Hassan, 2006). Of note, I used non-probability purposive sampling to recruit participants; however, this method is considered one of the least reliable since it is based on convenience. This method could also produce poor results because the sampling does not offer evidence in order to generalize results to the whole population under study or universe of primary care

physicians in Chad (Kitchenham & Pfleeger, 2002). Finally, I am neither a physician nor am I a Chadian. This knowledge could have caused study participants to feel uneasy or perhaps apprehensive during the interviews, which may have caused them to withhold some information or feel uncomfortable talking freely. Because of these limitations, my research study must be taken in a qualitative frame of reference.

Recommendations

The core themes derived from the key informant interviews as well as the results and social implications form the basis for recommendations for future studies. Case detection and reporting indicate that primary care physicians are meeting their legal and professional mandate to report the diseases, which is important to the well-being of society. Future studies that establish some form of encouragement for reporting may well serve as a stimulus to increase reporting.

The lack of financial, human, and logistical resources for reporting infectious diseases, as highlighted by Chadian primary care physicians, suggests an imperative for public policy stakeholders to invest significant financial and human resources to improve this lack of resources. It also calls attention to the need for adherence to the African Union 2001 Abuja Summit's recommendation allocation of at least 15% of their national budgets to health (Ojo & Akinwumi, 2015).

That Chadian primary care physicians want the only laboratory in the country to assume more responsibility for infectious disease reporting is an indicator that additional studies need to be conducted by physicians and laboratory researchers to investigate the viability and practicality of such reporting. A few studies have demonstrated clinical

laboratories to be adept reporters of notifiable diseases (Godes et al., 1982; Rushworth et al., 1991; Schramm et al., 1991). A study by Fall et al. (2019) referenced electronic reporting in Chad. However, based on my 7 years of working in the country, electronic reporting is not yet operational. In view of the recommendation to boost laboratory reporting, it is advisable that studies be conducted on the efficiency of such laboratory-based reporting systems.

Based on literature and evidence, best practices from the Global Polio Eradication Initiative have been used for the surveillance of additional infectious diseases in Africa consistent with IDSR and the International Health Regulations (IHR) frameworks (Mwengee et al., 2016). Previous studies conducted in the African region also centered on the necessity to simplify reporting for physicians and health care workers. Physician pleas for simplification of reporting suggests that the Ministry of Public Health must devise processes and strategies whereby health facilities accommodate physicians on this subject in the hopes of enhancing their roles vis-a-vis reporting. Moreover, studies that investigate the simplicity of electronic versus paper-based reporting systems could assist physicians with a convenient and timesaving system. In the African region, every nation has its own reporting system; therefore, such studies carry the potential to promote standardization of priority disease reporting across the region.

The necessity to constantly sensitize and train physicians about the reporting process in Chad suggests a particular need for public health researchers to launch studies on the usefulness of a dedicated surveillance and training program in Chad. This two-year program would be focused on applied epidemiology, surveillance, and outbreak response

with the aim of building a sustainable network of highly skilled field epidemiologists, including physicians, veterinarians, and laboratory staff, who would measurably and systematically improve public health services as well as disease reporting at local, regional, and national levels. Residents in this proposed program would conduct activities that would generate evidence for actionable interventions to strengthen integrated disease surveillance, including operational research focusing on the identification of gaps/barriers as well as short-term engagement in independent program monitoring and evaluation. In particular, it is important that researchers perform studies to explore the usefulness of a program to prompt physician reporting of infectious diseases to local health authorities for timely action.

In conclusion, studies on ways to increase communication regarding public health and primary care physicians must be pursued. My finding that primary care providers in Chad feel at times disengaged from public health demonstrates a need for further exploration by public health researchers. A study led by Rothenberg et al. (1980) to improve reporting gonorrhea cases centered on an intervention of a telephone contact by the Colorado Health Department. Conceivably, a comparable study could be designed and piloted in Chad with the objectives of increasing infectious diseases reporting and reducing the sense of isolation among some primary care physicians.

Social Change Implications

The findings of my study underscore the significance of positive social change. My study's findings on the role of primary care providers in the integrated disease surveillance system in Chad and the identification of factors that impact complete,

quality, and timely reporting revealed a number of implications. They suggest that seven distinct issues, for which a variety of measures and future studies are required, compromise reporting by primary care physicians in Chad. My extensive analysis of the literature found that no studies conducted in Chad have explored both the qualitative views of primary care physicians and the factors that impact complete, quality, and timely reporting. Primary care physicians view their roles in reporting infectious diseases as crucial and would like to bridge the present knowledge gap that endures from the limited literature on the topic of reporting in Chad.

Study participant responses to the interview questions suggested that case detection and reporting is part of routine work responsibilities. They revealed other factors that are indeed pressing and could have more of an impact on the complete, quality, and timely reporting.

The dissemination of my study's findings will take place per the agreement made with the Chadian Ministry of Public Health, presentations, and peer-reviewed publications. Also, per the agreement, I will give all collected information to the Ministry of Public Health for its own use. By giving this study to the Chadian Ministry of Public Health, I hope the concerns brought to light by participant descriptions of their roles in the integrated disease surveillance system, along with an analysis of the factors that impact complete, quality, and timely reporting, will be used to offer additional human, financial, and logistical resources in the fulfillment of physician reporting responsibilities. I also hope that Chadian government officials who are in a position to

make meaningful changes will hear the requests of the participants for better communication between physicians and health authorities.

Additionally, the TPB offers implications for environmental perspectives on reporting by primary care providers in Chad, as well as around the African region. In measuring the components of TPB between many factors, such as intentions, attitudes, subjective norms, and perceived behavioral control, there are environmental and cultural perspectives that result from the use of TPB as a preventive intervention using a multilevel approach. Indeed, these findings come with research implications that may be meaningful for policymakers, and can be applied to better understand the role of primary care providers in the integrated disease surveillance and factors that impact complete, quality, and timely reporting in Chad.

Conclusion

Primary care providers in Chad face a wide variety of challenges. Consequently, their roles and perspectives must be considered when developing health services interventions that will improve integrated disease surveillance. My study contributed to the gap in the literature by being the first of its kind to investigate the role of primary care providers in the integrated disease surveillance and to identify factors that impact complete, quality, and timely reporting in Chad. In theory, the adoption of the TPB to investigate the role of primary care providers in the integrated disease surveillance in Chad allowed my study to influence not only the study population, but also communities, organizations, and government institutions.

There is a substantial amount of literature describing research on physician reporting of infectious diseases in the African region and elsewhere; however, findings from my study suggested that participants consider rapid case detection and reporting as well as the immediate response to public health outbreaks as one of their highest priorities. Participants felt other factors were of significance, chief among them maintaining political commitment, financial resources, and technical support at all levels of the health pyramid. They also stressed the immense efforts and lasting commitments of national government organizations and United Nations agencies in providing support for recurring outbreaks under very complex circumstances.

The purpose of my study was to gain an understanding of the role of primary care providers in the integrated disease surveillance in Chad. The information I collected through the 20 key-informant interviews is rich, and it sheds light on what really is of concern among primary care providers and reveals factors that impact complete, quality, and timely reporting. It is my hope that after reviewing these findings, the Chadian Ministry of Public Health will share this information with public health officials, among others, so as to create or revamp existing reporting requirements that could help address concerns discussed by the study participants. The social change implication of this study was to offer worthwhile and actionable information to help the Chadian Ministry of Public Health address the challenges and barriers faced by primary care physicians in the fulfillment of their reporting responsibilities.

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Appendix A: Interview Questionnaire for Rapid Assessment of the Integrated Disease Surveillance and Response System at the Basic Health Center Level

Interviewer's name:
Interview location:
Interview date:
Interview time:
Name of health center and location:

Introduction:
Hello, Mr. /Ms. ------. I would like to talk to you about your role, your responsibilities, your appreciation, and the role of your basic health center in the implementation of an integrated disease surveillance system (IDSR) over the past year at this health facility. Our interview is part of a research study designed to evaluate the IDSR system in Chad. The interview will be structured in seven parts. (Note: The researcher is not to influence the respondent's remarks. They will let the respondent speak, and will support the interview with follow-up questions.)

Section 1: Basic information about health center and respondent

First and Last Name	
Job Title/Function	

Section 2: Please speak about your role, your responsibilities, your appreciation, and the role of your basic health center in the implementation of integrated surveillance system over the past year at this health facility.

1. Describe the tasks you perform at the health center as part of the implementation of IDSR.
2. How often and by what process does data from community agents arrive at the health center?
3. What tools do you use for collecting data for IDSR at the health center?
4. What difficulties do you encounter in filling out the IDSR tools?
5. What factors have an impact on the correct filling out of IDSR tools?
6. What can you say about your workload for filling out the data collection tool for IDSR?
7. What is the procedure at the health center level to find or check IDSR data?
8. Do you keep copies of the weekly reports that you send?
9. Please talk about your experience in the collection and electronic transmission of IDSR data.
10. In the context of your health center, what can electronic tools offer to strengthen IDSR? What are potential challenges?

Section 3: Please speak about the quality of IDSR data.

1. What is your appreciation of the transmission of IDSR data from community agents to the health center and from the health center to the district level (promptness and timeliness of surveillance data and information on outbreak response)?
2. What prevents you from getting quality data at your health center?
3. What do you think are the consequences of inaccurate and incomplete IDSR data?
4. What elements do you focus on to ensure the quality of the IDSR data that your health center collects and transmits to the district level?

Section 4: Please speak about your training as it relates to IDSR.

1. What are your thoughts about your training related to IDSR in terms of the quality of the training, the methodology used, the length of training, and the impact on your performance in the implementation of your activities?

Section 5: Please talk about supervising activities related to IDSR at your health center.

1. Describe the last time you were supervised at your health center. What were your strengths and weaknesses as reported by your supervisor?
2. Describe your last supervision of community agents related to IDSR. What observations did you make, and which aspects of IDSR did you focus on?

Section 6: Please talk about the reporting of IDSR data at your health center.

1. Please give concrete examples of decisions made based on IDSR data.

Section 7: Conclusion

You have provided me with a lot of information about your role in the IDSR process. I have gone through all the sections I needed to cover. Do you have anything else to add? All the information you have supplied will remain anonymous. The information from your center will be analyzed and presented with answers from other centers. The overall results will be shared with you and all the health centers. Thank you for giving me this interview. I appreciate your help, and your opinion is very useful.

Adapted from: MEASURE Evaluation. (2015). Guide d'Entretien de l'Evaluation qualitative de la SIMR. Chapel Hill, NC: MEASURE Evaluation, University of North Carolina.

Appendix B: Letter of Introduction

Hello,

You are invited to participate in a study that will investigate the role of primary care providers in integrated disease surveillance in Chad. A secondary endpoint will be to identify factors that impact their complete, quality, and timely reporting. I am conducting this study to learn more about this issue since it has not been studied in the past in Chad.

Study Title

The Role of Primary Care Providers in Integrated Disease Surveillance in Chad: Identifying Factors that Impact Their Complete, Quality, and Timely Reporting

Participation in this study involves completion of a face-to-face interview to discuss reporting by primary care providers to local health authorities for timely action. The interview will last for approximately 30-45 minutes. The interviews will be audiotaped and later transcribed for the purpose of data analysis. The interview will take place at the Ministry of Public Health, removed from noise and distractions. A minimal transportation fare will be provided.

Selection criteria

Eligibility for key informant participation will encompass the following: physician working at a periphery health clinic; experience with reporting infectious disease to local officials; expertise and active participation in public health, disease surveillance, or health information activities; readiness to take part in the study; and completion of written consent.

Inclusion Criteria:

- >18 years
- Self-identify as Chadian national
- French speaker
- Physician working at a periphery health clinic
- Experience with reporting infectious disease to local officials
- Expertise and active participation in public health, disease surveillance, or health information activities;
- Readiness to take part in the study; and completion of written consent.
- Residency in N'Djamena

Exclusion Criteria:

- < 18 years
- Non physician
- Non-French speaker

Risks and Discomforts

No risks or discomforts are anticipated from your participation in the study.

Benefits

Your voluntary participation may assist in defining barriers and opportunities for improving the current reporting of integrated disease by primary care providers in Chad. Additionally all interview participants will be offered a one-time gift of $20. This will be provided to you upon completion of the interview.

Confidentiality

All data will be kept confidential and the information collected in the course of this study will remain in a secure cabinet during this project. There will not be any identifying names on the surveys or interview transcripts; they will be coded and the key to the code will be kept locked away. Your names and any other identifying details will never be revealed in any publication of the results of this study. The tapes will be destroyed at the completion of the study after 5 years. Data will be reported in an aggregate manner only. The results of the research will be published in the form of a research paper and may be published in a professional journal, book form or presented at professional meetings.

Withdrawal without Prejudice

Participation in this study is voluntary; refusal to participate will involve no penalty. You are free to withdraw consent and discontinue participation in this project at any time without prejudice or penalty. You are also free to refuse to answer any question we might ask you.

If you have other questions or concerns about the study please contact the chair of the Institutional Review Board of Walden University either call +1-800-925-3368, ext. 1210 or e-mail irb@waldenu.edu. Walden University's approval number for this study is 04-30-19-0143266 and it expires on 04-29-2020.

Researcher contact information: Dhoud Samba, PhD Student, Walden University

Appendix C: Chad Ministry of Public Health Authorization to Conduct Research

Unity-Work-Progress
وحدة عمل تقدم

REPUBLIC OF CHAD
PRESIDENCY OF THE REPUBLIC
MINISTRY OF PUBLIC HEALTH
DIRECTORALE GENERAL
N°0918/PR/ MSP/DG/2019

AUTHORIZATION TO CONDUCT RESEARCH

I, the undersigned, **Dr. Mahamat Hamit Ahmat,** Deputy Director-General of the Ministry of Public Health, authorizes **DHOUD SAMBA,** student at Walden University in the United States to conduct research on the topic "The Role of Primary Care Providers in the Integrated Disease Surveillance in Chad to Identify Factors that Impact Complete, Quality, and Timely Reporting". The overall objective of this research project is to identify the role of primary health care providers in the integrated surveillance of the disease in Chad. A second objective will be to identify factors that impact complete, quality, and timely reporting.

The institutions involved and the researchers have taken all the necessary steps to ensure that the populations concerned are fully informed of the objectives of this research and nothing is undertaken without their consent. Thus no member of the community would be forced to participate in this research. Any participant will be free to withdraw at any time from the study in accordance with basic ethics.

Apart from these ethical considerations, we support this study which is part of the health policy and meets one of the priority research themes defined by the Ministry of Public Health, the fight against vaccine preventable diseases.

Finally, the results of this research will be made available to the Ministry of Public Health for any useful purpose.

Signed in N'Djamena on this 20th day of February 2019

Dr. Mahamat Hamit Ahmat

Appendix D: Guide d'entretien pour l'évaluation rapide du système intégré de surveillance des maladies et la riposte au niveau des centres de santé

Nom de l'intervieweur:

Lieu de l'entretien:

Date de l'interview:

Durée de l'interview:

Nom du centre de santé et lieu:

Introduction:

Bonjour, M. / Mme. ------. J'aimerais vous parler de votre rôle, de vos responsabilités, de votre appréciation et du rôle de votre centre de santé dans la mise en œuvre du système de surveillance intégrée de la maladie et la riposte (SMIR) au cours de la dernière année dans cet établissement de santé. Notre entretien fait partie d'une étude de recherche destinée à évaluer le SMIR au Tchad. L'entretien sera structuré en sept parties.

(Remarque: le chercheur ne doit pas influencer les remarques du participant. Il laissera le participant s'exprimer et soutiendra l'interview avec des questions complémentaires).

1ere Partie: Informations sur le centre de santé et le participant

First and Last Name	
Job Title/Function	

2ème Partie: Veuillez parler de votre rôle, de vos responsabilités, de votre appréciation et du rôle de votre centre de santé dans la mise en œuvre du système de surveillance intégré au cours de la dernière année dans cet établissement de santé.

1. Décrivez les tâches que vous effectuez au centre de santé dans le cadre de la mise en œuvre du SMIR ?.

2. À quelle fréquence et selon quel processus les données des agents communautaires arrivent-elles au centre de santé?

3. Quels outils utilisez-vous pour collecter des données pour SMIR au centre de santé?

4. Quelles difficultés rencontrez-vous pour remplir les outils SMIR?

5. Quels facteurs ont un impact sur le remplissage correct des outils SMIR?

6. Que pouvez-vous dire au sujet de votre charge de travail pour remplir l'outil de collecte de données du SMIR?

7. Quelle est la procédure à suivre au niveau du centre de santé pour rechercher ou vérifier les données du SMIR?

8. Conservez-vous des copies des rapports hebdomadaires que vous envoyez?

9. Veuillez parler de votre expérience dans la collecte et la transmission électronique des données SMIR.

10. Dans le contexte de votre centre de santé, que peuvent offrir les outils électroniques pour renforcer le SMIR? Quels sont les défis potentiels?

3ème Partie: Parlez de la qualité des données SMIR.

1. Que pensez-vous de la transmission des données SMIR par les agents communautaires au centre de santé et du centre de santé au niveau du district (promptitude, complétude des données de surveillance et des informations sur la riposte à la flambée)?

2. Qu'est-ce qui vous empêche d'obtenir des données de qualité dans votre centre de santé?

3. Selon vous, quelles sont les conséquences de données SMIR inexactes et incomplètes?

4. Sur quels éléments vous concentrez-vous pour garantir la qualité des données SMIR que votre centre de santé recueille et transmet au niveau du district?

4ème partie: Veuillez parler de votre formation en ce qui concerne le SMIR.

1. Que pensez-vous de votre formation liée au SMIR en termes de qualité de la formation, de méthodologie utilisée, de durée de la formation et d'impact sur votre performance dans la mise en œuvre de vos activités?

5ème Partie: Veuillez parler des activités de supervision liées au SMIR dans votre centre de santé.

1. Décrivez la dernière fois que vous avez été supervisé dans votre centre de santé. Quelles ont été les forces et les faiblesses signalées par votre superviseur?

2. Décrivez votre dernière supervision des agents de la communauté liée à SMIR. Quelles observations avez-vous faites et sur quels aspects du SMIR vous êtes-vous concentré?

6ème Partie: Veuillez parler de la déclaration des données SMIR dans votre centre de santé.

1. Veuillez donner des exemples concrets de décisions prises sur la base de données SMIR.

7ème Partie: Conclusion

Vous m'avez fourni beaucoup d'informations sur votre rôle dans le processus du SMIR. J'ai parcouru toutes les sections que je devais couvrir. Avez-vous quelque chose à ajouter? Toutes les informations que vous avez fournies resteront anonymes. Les informations de votre centre seront analysées et présentées avec les réponses des autres centres. Les résultats globaux seront partagés avec vous et tous les centres de santé. Merci de m'avoir accordé cette interview. J'apprécie votre aide et votre avis est très utile.

Référence

Adapté de: MEASURE Evaluation. (2015). Guide d'Entretien de l'Evaluation qualitative de la SIMR. Chapel Hill, NC: MEASURE Evaluation, University of North Carolina.

Appendix E: Lettre d'invitation à l'étude

Bonjour,

Vous êtes invités à participer à une étude sur le rôle des prestataires de soins de santé primaires dans la surveillance intégrée des maladies au Tchad. Un critère d'évaluation secondaire consistera à identifier les facteurs qui influent sur la complétude, la promptitude et la qualité des rapports. Je mène cette étude pour recueillir des informations complémentaires sur cette question car elle n'a jamais été étudiée au Tchad.

Titre de l'étude

Le rôle des prestataires de soins de santé primaires dans la surveillance intégrée des maladies au Tchad: identification des facteurs qui influent sur la complétude, la promptitude et la qualité des rapports. La participation à cette étude implique la tenue d'un entretien face à face pour discuter de la notification des prestataires de soins de santé primaires aux autorités sanitaires locales afin que des mesures soient prises dans les délais. L'entretien durera environ 30 à 45 minutes. Les entretiens seront enregistrés sur bande audio puis transcrits dans le but d'analyser les données. L'entretien se déroulera au Ministère de la Santé Publique à l'abri du bruit et des distractions. Un tarif pour transport minimal sera fourni.

Les critères de sélection

L'admissibilité à la participation comprendra les éléments suivants: un médecin travaillant dans une clinique de santé périphérique; expérience de la déclaration de maladies infectieuses aux autorités locales; expertise et participation active aux activités de santé publique, de surveillance des maladies ou d'information sur la santé; volonté de participer à l'étude; et la complétude du consentement écrit.

Critères de sélection:

- > 18 ans
- Nationalité Tchadienne
- Francophone
- Médecin exerçant dans une clinique de santé périphérique
- Expérience en matière de notification des maladies infectieuses aux autorités locales
- Expertise et participation active aux activités de santé publique, de surveillance des maladies ou d'information sur la santé;
- Volonté de participer à l'étude; et la complétude du consentement écrit.
- Résident à N'Djamena

Critère d'exclusion:

- <18 ans
- Non médecin
- Non Francophone

Risques et inconvénients

Aucun risque ou d'inconvénient n'est prévu pour votre participation à l'étude.

Avantages

Votre participation volontaire peut aider à définir les obstacles et les possibilités d'améliorer la notification actuelle des maladies intégrées par les prestataires de soins de

santé primaires au Tchad. De plus, tous les participants à l'entretien se verront offrir une somme totale de $20. Cette indemnité vous sera fournie à la fin de l'entretien.

Confidentialité

Toutes les données resteront confidentielles et les informations recueillies au cours de cette étude resteront dans une armoire sécurisée pendant ce projet. Il n'y aura pas de noms identifiants sur les sondages ou les transcriptions des entretiens; ils seront codés et la clé du code sera gardée sous clé. Vos noms et tout autre élément d'identification ne seront jamais révélés dans aucune publication des résultats de cette étude. Les bandes seront détruites à la fin de l'étude au bout de 5 ans. Les données ne seront rapportées que de manière globale. Les résultats de la recherche seront publiés sous la forme d'un document de recherche et pourront être publiés dans une revue professionnelle, sous forme de livre ou présentés lors de réunions professionnelles.

Retrait sans préjudice

La participation à cette étude est volontaire. Le refus de participer n'entraînera aucune pénalité. Vous êtes libre de retirer votre consentement et d'interrompre votre participation à ce projet à tout moment, sans préjudice ni pénalité. Vous êtes également libre de refuser de répondre à toute question que nous pourrions vous poser.

Si vous avez d'autres questions ou préoccupations au sujet de l'étude, veuillez contacter le président du comité d'éthique de recherche institutionnel de l'Université Walden au +1 800 925-3368, extension. 1210 ou par courrier électronique irb@waldenu.edu. Le numéro d'approbation de cette étude par l'Université Walden est 04-30-19-0143266 et expire le 29-04-2020.

Coordonnées du chercheur: Dhoud Samba, étudiant en doctorat, Université Walden

Appendix F: Demande d'autorisation de recherche au Tchad

Unité-Travail-Progrès
وحدة عمل تقدم

REPUBLIQUE DU TCHAD
PRESIDENCE DE LA REPUBLIQUE
MINISTERE DE LA SANTE PUBLIQUE
DIRECTION GENERALE

جمهورية تشاد
رئاسة الجمهورية
وزارة الصحة العامة
إدارة العامة

N°0918/PR/ MSP/DG/2019

AUTORISATION DE RECHERCHE

Nous soussigné **Dr Mahamat Hamit Ahmat,** Directeur Général Adjoint du Ministère de la Santé Publique, autorise **Dhoud S. Samba,** étudiant à Walden University, USA de mener des recherches sur le thème : « Le rôle des prestataires de soins de santé primaires dans la surveillance intégrée des maladies au Tchad pour identifier les facteurs qui influent sur la détection, et la notification complète des cas ».
L'objectif global de ce projet de recherche est d'identifier le rôle des prestataires de soins de santé primaires dans la surveillance intégrée de la maladie au Tchad. Un objectif secondaire sera d'identifier les facteurs qui ont une incidence sur la production de rapports complets, de qualité et dans les délais.
Les institutions impliquées et les chercheurs ont pris toutes les dispositions requises pour que les populations concernées soient largement informées des objectifs de cette recherche et rien ne soit entrepris sans leur consentement. Ainsi aucun membre de la communauté ne serait contraint à participer à cette recherche. Tout participant sera libre de se retirer à tout moment de l'étude selon le respect de l'éthique.

Hormis ces considérations d'ordre éthique, nous soutenons cette étude qui entre dans le cadre de la politique sanitaire et satisfait l'un des thèmes prioritaires de recherche défini par le Ministère de Santé Publique celui de lutte contre les maladies évitables par la vaccination.

Enfin, les résultats de cette recherche seront mis à la disposition du Ministère de la Santé Publique pour toute fin utile.

Fait à N'Djamena le 20 Février 2019

Dr Mahamat Hamit Ahmat