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Internal Population Displacement and Vaccination Completion, Malnutrition, and Respiratory Infections Among Children in the Central African Republic

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This is to certify that the doctoral study by

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Walden University
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Abstract

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François Xavier Batalingaya

MPH, Tulane University, 1993

BS, National University of Rwanda, 1989

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

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Abstract

Forced displacement in fragile and conflict-affected countries has the potential to disrupt access to basic primary healthcare services such as immunization. The purpose of this study was to assess the association between internal population displacement and vaccination completion, malnutrition, and acute respiratory infections (ARIs) while controlling for maternal characteristics of wealth index, education level, and residence status in the Central African Republic. The socioecological model underpinned this cross-sectional study that used a secondary dataset collected in 2018 – 2019 and maintained by UNICEF. Descriptive statistics and logistic regression tests were used to analyze the data. The findings of this study revealed that internal population displacement was neither associated with vaccination completion (*OR* = .973, 95% CI [.748 – 1.265], *p* = .838) nor stunting (*OR* = .995, 95% CI [.902 – 1.098], *p* = .924). However, the odds of displaced children suffering from ARIs were unexpectedly 68.8% less than the odds of nondisplaced ones (95% CI [.610 – .777], $p < .001$). These findings require further investigation and consideration of factors such as length and reasons for displacement. While there has always been a special focus on displaced populations in humanitarian action, the findings of the study indicate that low vaccination completion among children aged 12 to 23 months, high rates of chronic malnutrition rates among children under 5 years of age, and higher odds of ARIs contraction among nondisplaced children were comparable to displaced ones. The close association between the dependent variables and the maternal characteristics calls for an increased investment in girls' and boys' education and women's empowerment that leads to wealth creation and health improvement.

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Dedication

This doctoral study is dedicated to my beloved deceased parents; a mother I never had a chance to know and a father, Fulgence who wanted me to get educated at any cost; to my wife, Epiphanie, who pushed me academically and professionally to my highest potential; to our three children Mizero, Icyiza, and Katusime; and to the millions of the people who are forcefully displaced every year due to conflicts and disasters around the world, and particularly in sub-Saharan Africa.

Acknowledgments

I believe in one God: Father, Son, and Holy Spirit. Without His love, goodness, and kindness, I would not have had the strength and courage to forget what was behind me and press ahead toward the goal to win the prize for which God has called me.

I want to acknowledge my doctoral committee chair, Dr. Hebatullah Tawfik and my committee member, Dr. Gwendolyn Francavillo for providing their invaluable support during the entire doctoral journey. Without their valuable contribution, it would have been impossible for me to complete this research study. Many thanks for all the countless hours spent on e-mails, WhatsApp, and phone calls with Dr. Tawfik throughout this journey. Without her, I would have given up.

I would also like to thank Dr. Beth Birmingham, formerly of Eastern University, along with my wife, Epiphanie, who consistently encouraged me to complete my doctoral studies.

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Section 1: Foundation of the Study and Literature Review

Introduction

The 2020 United Nations Inter-Agency Group for Child Mortality Estimation (UN IGME) indicated that over 5 million children died in 2020 before reaching their fifth birthday. According to an analysis of population data conducted by Sapkota et al. (2020), Africa has the highest child mortality globally, followed by Asia. In sub-Saharan Africa, public health researchers such as Burke et al. (2018) stated that children face the world's highest risk of dying because the region is home to some of the most fragile countries, characterized by armed conflicts and its corollary forced internal population displacements. This information was confirmed by the UN IGME report, which indicated that about 43% of the world's child deaths in 2020 occurred in conflict settings and other fragile nations.

The under-5 mortality rate in the 38 conflict settings and other fragile countries was 3 times as high as in other countries at 76 deaths per 1,000 live births in 2020 (UN IGME, 2021). One of such countries is the Central African Republic (CAR), which has continued to experience cycles of violent conflict since the eruption of the civil war in 2013 (Kah, 2018). The CAR is classified as one of the world's poorest and most fragile nations, alongside Somalia and South Sudan (Glawion, 2018). The CAR is also famously known as the worst country in the world to be a young person as per the Commonwealth Secretariat's index on employment, education, and health (as cited in Tabary, 2016).

According to the 2022 report of the United Nations Development Program (UNDP), people in the CAR are trapped in a protracted armed conflict that leads to

internal displacements and poor health outcomes in a country with the fourth-lowest level of human development index (only ahead of Niger, Chad, and South Sudan) and some of the lowest health indicators. The 2020 situation report of the United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA) estimated that 25% of the citizens of the CAR lived outside of their homes. According to the UNDP, the average life expectancy of 53.9 years is one of the lowest in the world, while the estimated maternal mortality ratio is the fifth highest in the world at 829 deaths per 100,000 live births. The infant and neonatal mortality rates are 65 and 28 per 1,000 live births respectively, while the under-5 mortality rate is 99 deaths per 1,000 live births, all amongst the highest in the world (as cited in Robinson et al, 2020). The 2018-2019 UNICEF Multi-Indicator Cluster Survey (MICS) results indicated that only 15.1% of the children were fully vaccinated by their first birthday while 28.3% of the children aged between 12 and 23 months were never vaccinated.

The aim of this study was to assess the association between internal population displacement and the under-5 mortality contributing factors of vaccine completion, malnutrition, and respiratory infections in the CAR. This study was needed because, to the best of my knowledge, research on the association between internal population displacement and the under-5 mortality contributing factors of vaccination completion, malnutrition, and respiratory infections is limited. Furthermore, the CAR is one of the countries furthest behind on the UN agenda 2030 for sustainable development. This study can provide a better understanding of access and use of a key childhood preventive service such as immunization in situations of mass population displacement. In addition,

this study may contribute to public health by guiding the design and implementation of context-specific programmatic interventions geared toward ending preventable deaths among children under 5 years of age in fragile and complex humanitarian emergencies such as the CAR.

The findings of this doctoral study can be used by the government of the CAR for policy formulation on the acceleration of the second target of the third Sustainable Development Goal (SDG), which aims to reduce neonatal mortality to less than 12 per 1,000 live births and to reduce the under-5 mortality to less than 25 per 1,000 live births by 2030. While the SDGs do not include specific targets for people on the move (refugees and internally displaced persons), they have acknowledged displaced persons as a particular category of vulnerable people in need of assistance and protection (Zeender, 2018). Moreover, national and international nongovernmental organizations (NGOs) as well as the UN agencies, funds, and programs that provide over 80% of the healthcare services in the CAR can use the results of this study to design and implement interventions for rapid reduction of preventable child deaths in line with the SDGs' goals, objectives, and targets.

Problem Statement

Population movement has always been an integral part of individuals' quest for freedom and improved economic conditions for themselves and their descendants. This is the push-pull migration theory developed in the 1880s by Ravenstein (as cited in de Haas, 2021 & in Niu, 2022). According to Issaka et al. (2017), the push factors may include job insecurity, poor working conditions, poverty, and political factors such as insecurity due

to civil unrest or ethnic and religious persecution. The pull factors are the opposite of push factors and include employment opportunities and better working conditions in the new resettlement areas (de Haas, 2021).

Population mobility in fragile contexts is nothing less than a survival strategy, not for better economic conditions as in stable contexts, but for human safety and physical security. Some of the key characteristics of fragile contexts include violence due to war and ethnic, tribal, or religious conflicts, gross human rights violations, and persecution based on gender, race, faith, citizenship, political opinion, or sexual orientation (Clauss-Ehlers, 2019). In such contexts, people do not plan well in advance when to leave or where to go to (Clauss-Ehlers, 2019). They move in all directions in search of safety and protection, guided by their best judgment. These people on the move (as they are often referred to), are classified as refugees when they cross international borders. When they remain in their own countries, they are called Internally Displaced Persons (IDPs).

In 2021, the UN refugee agency (UNHCR) reported that over 89.3 million people were in a situation of forced displacement across the globe. Among them, 27.1 million were refugees under the protection of the UNHCR, and 53.2 million were IDPs. The remaining 9 million were stateless asylum seekers and Venezuelans displaced abroad (UNHCR, 2021). Unlike refugees, IDPs are not under the protection of international refugee laws. IDPs are often forgotten by their own government and left under the care of international NGOs and UN agencies, funds, and programs. That is the reason why IDPs commonly have worse health outcomes than host populations and even refugees (Roberts et al., 2022). Furthermore, an analysis of the health Official Development Assistance

funding for IDP per capita in developing countries conducted by Roberts et al. (2022) showed an annual average decline of -38% from 2010 to 2019 (from US$5.34 to US$3.72).

The mass population movement in the CAR began with the civil conflict of 2013-2014 when the Séléka rebel movement overran the capital Bangui and overthrew the central government (Kah, 2018). The country has since then been affected by cyclic violent conflicts. Meanwhile, the proliferation of non-State armed groups complicates things even further, threatening the safety and security of civilian populations throughout the country. The signing of repeated peace deals brokered by the international community has so far failed to reconcile the over 14 armed groups operating in the country with the national government (de Vries, 2020). At the height of the civil conflict in 2013-2014, over 50% of the 4.5 million people of the CAR were forcibly displaced (Coldiron et al., 2017). Over half a million refugees fled to three of the six neighboring countries (Cameroon, Democratic Republic of Congo, and Chad) while the remaining citizens have moved into makeshift camps for IDPs scattered throughout the country (Kah, 2018). It is estimated that 70% of the countryside and one-third of the total population have been outside of the government's control for the last decade (Kuehne & Roberts, 2021). Nearly a third of the displaced families live in 76 sites for IDPs while the remaining two-thirds live with host families (UN OCHA, n.d.) Over 80% of the health services are provided by humanitarian organizations, which include the UN system and national and international NGOs (as cited in Robinson et al, 2020). Furthermore, 25% of the vulnerable families

live in hard-to-reach areas due to impassable roads and insecurity caused by the 14 active non-State armed groups (de Vries, 2020).

Bendavid et al. (2019) and Schedwin et al.'s (2022) research findings indicated that armed conflicts and the inescapable consequences of forced displacements are closely associated with a high burden of child mortality and morbidity. The CAR, which has been mired in civil and interreligious conflict for the last decade, is no exception and has one of the highest proportions of under-5 deaths. In 2015, the under-5 mortality rate in the CAR was estimated at 130 per 1,000 live births (Peyraud et al., 2018). Child mortality is often considered by public health professionals and policymakers as a key indicator of a nation's socioeconomic situation and the adequacy of its health system.

Lower respiratory infections, diarrhea, malaria, and neonatal conditions have been documented as some of the main contributors to the high under-5 mortality in sub-Saharan Africa (Roth, 2018). However, in fragile contexts, a combination of a high prevalence of acute malnutrition, low immunization coverage rates, and increased incidence of vaccine-preventable communicable diseases such as measles is often a catalyst for a daily child mortality rate above the emergency thresholds (Ogbu et al., 2022; Robinson et al., 2021).

Childhood immunization is an evidence-based and effective means of lowering child mortality rates in resource-poor nations. In the CAR, the policy is for every child to be fully immunized by the first birthday. However, the recent UNICEF MICS surveys revealed that only 15.1% of the children were fully vaccinated by their first birthday while 28.3% of the children aged between 12 and 23 months were never vaccinated

(UNICEF, n.d.). Furthermore, measles is a common endemic disease in the CAR (Farra et al., 2019), and measles outbreaks are regularly reported throughout the country. Twenty-four-point six percent (24.6%) of the 2,795 samples of suspected cases of measles analyzed by the Institute Pasteur in Bangui between 2007 and 2015 were positive for the rubeola virus (Farra et al., 2019).

According to the UN IGME report (2021), the CAR is one of more than 50 countries that will not meet the SDGs on the under-5 mortality target by 2030 if no immediate action is taken to change the trend. The SDGs' objectives and targets were adopted in 2015 by the UN General Assembly as a universal commitment to eradicate poverty and hunger and protect people without jeopardizing the aspirations of future generations (United Nations, n.d.). The second target of the third SDG is to end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to less than 12 per 1,000 live births and under-5 mortality to less than 25 per 1,000 live births by 2030. With neonatal and under-5 mortality rates estimated at 28 and 99 deaths per 1,000 live births respectively, the CAR is poised to miss the SDG targets by 2030 if the trends are not reversed. Despite the ongoing civil conflict, the government of the CAR must identify and implement evidence-based strategies and context-specific interventions if progress is to be made toward achieving the SDGs while leaving no one behind.

In this doctoral study, I assessed the association between internal population displacement and the under-5 mortality contributing factors of mandatory vaccine completion, malnutrition, and acute respiratory infections (ARIs) in the CAR. While

several researchers such as Roth (2018) and Ogbu et al. (2022) have extensively studied the key factors that contribute to the high under-5 mortality burden in sub-Saharan Africa, to the best of my knowledge, an association between internal population displacement and these factors of under-5 mortality has not yet been documented in a context as fragile as the CAR, where an estimated 25% of the citizens are internally displaced. In this study, I used data from the UNICEF MICS surveys conducted in 2018-2019. These surveys provide the most recent and most comprehensive data on a wide range of issues related to maternal and child health in the CAR.

Purpose of the Study

Researchers have already identified social, economic, and biological factors that contribute to poor health in early childhood and consequently affect children's chances of survival during the first 5 years of life. The purpose of this doctoral study was neither to identify the factors that influence under-5 mortality nor to assess their relative importance but rather to assess the association between internal population displacement and some of the key factors that contribute to under-5 mortality in the CAR, an area that has been underresearched.

According to Burke et al. (2018), a recent history of the conflict is closely associated with under-5 mortality in sub-Saharan Africa because one of the inescapable effects of an armed conflict is the forced displacement of innocent civilians. The environment in which these IDPs settle plays a major role in the increased burden of child mortality and morbidity (Bendavid et al., 2021). Displacement increases the likelihood of contracting endemic diseases, such as malaria, and other major causes of

death and childhood illnesses, such as diarrhea and upper respiratory infections (Roth, 2018). While most IDPs live with host families in line with the African solidarity culture, others settle in makeshift camps with little or no healthcare services or food during the first days of displacement. In such conditions, levels of acute malnutrition increase due to food insecurity, and vaccine-preventable diseases such as measles are reported (Ogbu et al., 2022).

Bendavid et al. (2019) and Schedwin et al.'s (2022) research findings indicated that armed conflicts and the inescapable consequences of forced displacements are closely associated with a high burden of child mortality and morbidity. While Roth (2018) asserted that lower respiratory infections, diarrhea, malaria, and neonatal conditions are some of the main contributors to the high under-5 mortality in sub-Saharan Africa, Ogbu et al. (2022) stated that a combination of a high prevalence of acute malnutrition, low immunization coverage rates, and increased incidence of vaccine-preventable communicable diseases are the recipe for the high under-5 mortality rates in conflict-affected fragile contexts. However, an association between internal population displacement and the key contributing factors of under-5 mortality has not yet been documented in a humanitarian emergency as complex as the CAR, where an estimated 25% of the citizens are internally displaced.

There are several potential explanatory factors for child mortality that include factors related to pregnancy and childbirth, socioeconomic status of the household, environmental characteristics, and healthcare services utilization. Stephenson et al. (2003) grouped these factors into four categories (biodemographic, socioeconomic,

healthcare utilization, and geographic) and came up with five models for assessing the association between population displacement and under-5 mortality. While model 1 includes only displacement status as an explanatory confounding variable, the other four models fit displacement status as well as a different set of mortality determinants against under-5 mortality status.

Table 1 illustrates the potential confounding factors used in modeling the association between population displacement and under-5 mortality developed by Stephenson et al. (2003).

Table 1

*Potential Variables and Cofounders Used in Modeling the Association Between Population Displacement and Under-5 Mortality**

Model 1: Gross effects	Model 2: Biodemographic	Model 3: Socioeconomic	Model 4: Healthcare utilization	Model 5: Geographic
Displacement status	Displacement status	Displacement status	Displacement status	Displacement status
	Birth order	Mother's level of education	Tetanus toxoid vaccination	Region
	Size of the child at birth	Household wealth index	Antenatal care	
	Sex of child		Place of delivery	
	Mother's marital status		Mode of delivery	
	Mother's age at birth of 1st child		Postnatal care	
	Prematurity status			
	Breastfeeding status			

Note. *An illustration of variables and factors developed by Stephenson et al. (2003) and as cited in Issaka et al. (2017).

Model 2 biodemographic variables include displacement status, birth order, size of the child at birth, sex of the child, mother's marital status, mother's age at birth of the first child, prematurity status, and breastfeeding status. Model 3 explanatory socioeconomic variables include displacement status, mother's level of education, and

household socioeconomic ranking. Model 4 healthcare utilization variables include displacement status, tetanus toxoid vaccination during pregnancy, antenatal care, place of delivery of the baby (health facility or home delivery), mode of delivery of the baby (caesarian section or no caesarian section), and postnatal care. Model 5 variables include displacement status and region/location of residence.

Based on previous studies on determinants of under-5 mortality, in this study, I controlled for the socioeconomic variables developed by Stephenson et al. (2003) for modeling the relationship between migration and child mortality and used by researchers such as Anglewicz et al. (2019) and Issaka et al. (2017). I assessed the association between internal displacement and under-5 mortality contributing factors mandatory of vaccine completion, malnutrition, and ARIs while controlling for Model 3 socioeconomic confounding factors of mother's wealth index or status, education attainment, and residence. In this study, confounding exploratory socioeconomic variables derived from maternal characteristics because the CAR is still fundamentally a traditional society in which childcare is a primary responsibility of mothers. In addition, the secondary data used in this study were collected from women.

Research Questions and Hypotheses

I used the following research questions in this quantitative study to assess the association between internal displacement and under-5 mortality contributing factors mandatory vaccine completion, acute malnutrition, and ARIs.

Research question (RQ)1: Is there an association between internal displacement and the completion of the recommended vaccinations among children aged 12 to 23

months at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status?

$H_0$1: There is no association between internal displacement and the completion of the recommended vaccinations among children aged 12 to 23 months at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

$H_1$1: There is an association between internal displacement and the completion of the recommended vaccinations among children aged 12 to 23 months at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

RQ2: Is there an association between internal displacement and the malnutrition status of children under 5 years of age at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status?

$H_0$2: There is no association between internal displacement and the malnutrition status of children under 5 years of age at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

$H_1$2: There is an association between internal displacement and the malnutrition status of children under 5 years of age at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

RQ3: Is there an association between internal displacement and symptoms of ARIs among under-5 children during the 2 weeks preceding the survey while controlling

for the mother's characteristics of wealth index, education attainment, and residence status?

$H_0$3: There is no association between internal displacement and symptoms of ARIs among under-5 children during the 2 weeks preceding the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

$H_1$3: There is an association between internal displacement and symptoms of ARIs among under-5 children during the 2 weeks preceding the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

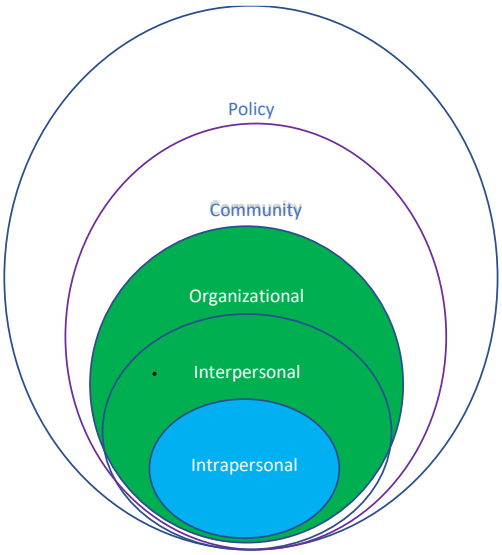
Theoretical Foundation for the Study

Even though the analytic framework developed by Mosley and Chen in 1984 is the theoretical foundation widely used by researchers to study the determinants of childhood mortality, the socioecological theoretical framework developed by Bronfenbrenner (as cited in Sallis & Owen, 2015) was the foundation of this doctoral study because it is more comprehensive. According to Mosley and Chen's (2003) analytical framework, socioeconomic variables influence the risk of child morbidity and mortality through multiple factors that include maternal, environmental, nutritional, preventive, and curative factors. Then, these socioeconomic variables influence behaviors and health outcomes at the individual, household, and community levels as per Mosley and Chen's theoretical framework. However, the Mosley and Chen analytic framework does not take into consideration the organizational and policy levels of influence on

human behaviors. Hence, my reason to use the socioecological theoretical framework instead of the Mosley and Chen analytic framework. The socioecological theoretical model was first employed by Bronfenbrenner in 1979 and later modified by McLeroy et al. (1988) for health promotion purposes. The socioecological model (SEM) addresses the importance of interventions directed at changing behaviors at personal, interpersonal, community, organizational, and policy levels to prevent unhealthy behaviors and maintain and promote a healthy living style. Figure 1 illustates the five levels of influence of the SEM used in this study.

Figure 1

*Illustration of the SEM Five Levels of Influence**



Note. *A graphic illustration of the SEM used by the CDC.

Adoption of the SEM enables the researcher to assess the factors that influence a child's survival and well-being at the five levels of influence and their relationships to one another (Sallis & Owen, 2015). At the personal level, such factors of influence may

include childhood illnesses including vaccine-preventable diseases, nutrient deficiencies, and personal injury. At the intrapersonal level, factors of influence are mainly mother-related and may include age, parity, birth interval, prenatal and postnatal care, institutional delivery, breastfeeding, complementary feeding and weaning practices, maternal perception about child health, mother's socioeconomic status, and maternal decision-making status. At the community level, the factors of influence may include health facilities, roads, electricity, water and sanitation system, living conditions, and information technology. At the organizational level, the factors of influence may include local formal and informal rules, norms, and regulations that constrain access to preventive services such as immunizations. At the policy level, the factors of influence include national and local laws and policies that support child survival interventions. In the CAR, insecurity and taxation imposed by non-State actors who control nearly 70% of the territory prevent over a quarter of the children under 5 from accessing healthcare services (de Vries, 2020).

Nature of the Study

In this doctoral study, I used a quantitative research approach to assess the association between an independent variable and dependent variables. I analyzed secondary data from the MICS dataset to assess the association between internal displacement and under-5 mortality contributing factors of mandatory vaccine completion, malnutrition, and ARIs while controlling for mother's wealth index or status (very poor, poor, middle income, rich, very rich), education attainment (no education,

primary, lower secondary, upper secondary and above), and residency status (rural vs. urban).

The SEM provided the framework for this study that used data from the UNICEF MICS - Round 6 conducted in the CAR in 2018 – 2019. MICS surveys are household-based assessments developed by UNICEF in the 1990s to support member states in the collection, analysis, interpretation, and reporting of internationally acceptable and comparable data on women and children-focused indicators. The first five rounds of MICS surveys measured a wide range of indicators that helped member states generate data needed for policy formulation, program design, as well as the monitoring of progress towards universal commitments such as the millennium development goals. MICS Round 6 was initiated in 2016 as an effort towards collecting baseline data for the SDGs. In the CAR, the MICS-Round 6 provided reliable and timely statistical data to specifically monitor the recovery and peacebuilding plan in the CAR over the period 2017 to 2021.

I used the IBM SPSS software package to analyze the data. A dataset description is provided, including descriptive and inferential statistics. Multiple logistic regression analysis was carried out to determine whether there was an association between the independent variable of internal displacement and the dependent variables of mandatory vaccine completion, acute malnutrition, and acute respiratory infection while controlling for mother's wealth index, education attainment, and residence.

Literature Search Strategy

A doctoral study must be based on a solid and thorough literature review. For this doctoral study, I searched several databases and credible websites of international

organizations, including the Walden University Library Database, the Complex Emergency Database, Google Scholar, and the United Nations agencies, funds, and programs such as the United Nations High Commission for Refugees (UNHCR), United Nations Children's Fund (UNICEF), the World Health Organization (WHO), and the Office for the Coordination of Humanitarian Affairs (OCHA). Peer-reviewed articles were accessed through the Health Sciences Research Databases of the online Walden University Library, which include CINAHL & Medline combined, ProQuest One Academic, PubMed, and Science Direct databases.

CINAHL contains scientific research articles, peer-reviewed e-books, and other academic publications, including evidence-based policy and practice evaluation reports. ProQuest One Academic is a combined search engine for peer-reviewed articles published by AVON, ProQuest Central, ProQuest Dissertations & Theses Global, and eBook collection. The PubMed and the Science Direct databases contain millions of full-text research journals articles and e-books conducted in the fields of nursing, allied health, and medicine. I also searched the Complex Emergency Database hosted at the University of Louvain in Belgium. The database serves as a central repository of community-based mortality and nutrition surveys reports in conflicts settings. Complex Emergency Database surveys data provide information on the internal population displacement status of surveyed population to complement official government statistics in between nationwide population-based surveys and highlight vulnerability patterns and emergency response strategies. I used the following keywords both collectively and individually in my literature search strategy of reliable databases including universities

and international organizations databases: *Central African Republic (CAR), internal displacement* or *internal migration, under-5 mortality, malnutrition, childhood immunization or vaccination*, and *acute respiratory infections*.

The literature review was based on inclusion and exclusion criteria, whereby only peer-reviewed articles related and relevant to the RQs and hypotheses and published from 2018 onwards were included. Generally, research articles published before 2018 or published in a language other than English and French were excluded from this review. However, a few peer-reviewed research articles on under-5 mortality and internal population displacement or migration published before 2018 but deemed critical to this doctoral study were included.

Literature Review Related to Key Variables and/or Concepts.

In this section, I examine the literature on key variables including the country's study population, the state of the child in the CAR, displacement, and the confounding factors of mother's wealth index (very poor, poor, middle income, rich, very rich), education attainment (none, primary, lower secondary, and upper secondary and above), and residency (rural vs. urban). Furthermore, the gap in the literature related to internal population displacement and the under-5 mortality contributing factors in complex humanitarian emergencies is described.

The CAR

A former French colony, the CAR is a landlocked nation in the heart of Africa. With an area of 623,000 km² (nearly the size of the state of Texas), the CAR is a vast territory rich in natural resources but paradoxically very poor and facing recurrent

military-political crises. The estimated population in 2022 was 5.5 million, with a population density of only 8.3 inhabitants per km² (ICASEES, 2021). Figure 2 shows the study area map of the CAR.

Figure 2

*Study Area Maps: The Central African Republic**

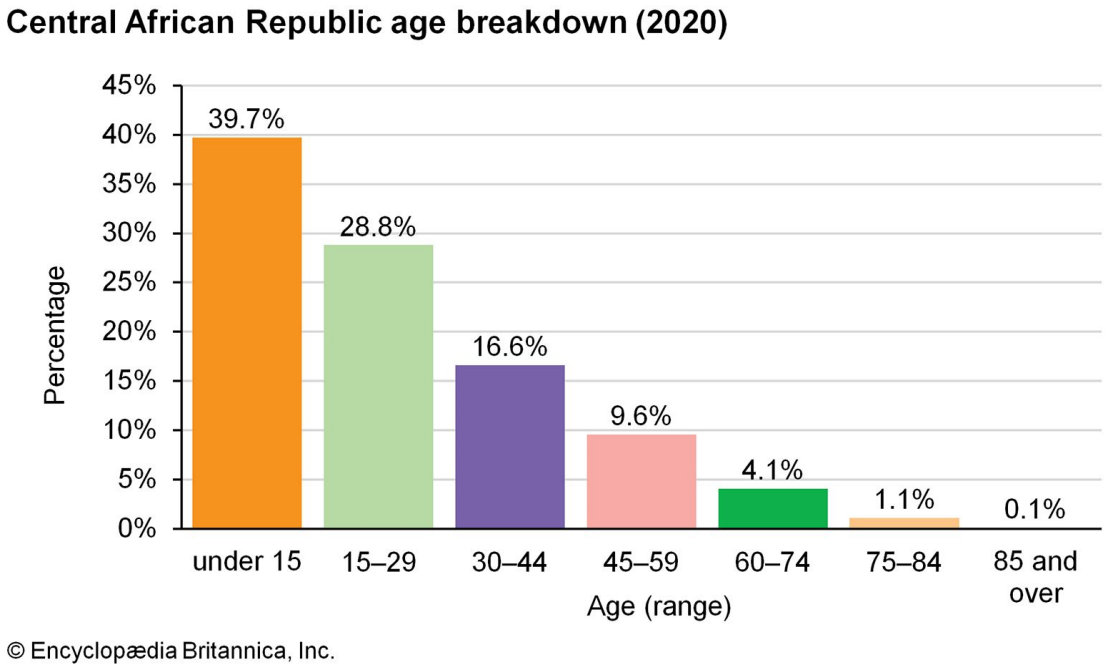
*Retrieved from https://www.britannica.com/place/Central-African-Republic

Despite its significant natural resources, the CAR is one of the poorest countries in the world and is considered the unhealthiest and the worst nation in which to be a young person (as cited in Tabary, 2016). The CAR has been affected by several decades of repeated military-political conflicts. The serious humanitarian and sociopolitical consequences have led to huge population displacements that have increased over the

past 5 years (OCHA, n.d.). The proliferation of small arms, the existence of multiple armed non-State groups, and the virtual absence of state authority in the provinces constitute the main obstacles to the restoration of security and the consolidation of peace in the CAR (de Vries, 2020). The CAR has a very young population. Over 85% of the people are below 45 years of age, a group that constitutes the first victims of the conflict (UNICEF, 2018). Separated families, closed schools, and forced labor are all obstacles to children's personal development. Figure 3 illustrates the age breakdown of the population of the CAR.

Figure 3

*Age Breakdown of the Population of the Central African Republic**



*Retrieved from https://www.britannica.com/place/Central-African-Republic

The young population of the CAR is slightly more female (52%) than male (UNICEF, 2018). However, women's central role in the management of households does not result in equitable access to educational, economic, and political opportunities. According to UNICEF (n.d.), disparities are observed from childhood, with girls attending school for an average of 6 years compared to 9 years for boys. Only one in 10 girls enroll in secondary education, compared to one in three men (31%). Without sufficient training and qualifications, women struggle to access essential social, banking, and financial services and manage their informal precarious small businesses.

As cited in OCHA (2020), the CAR is predominantly rural (80%), with a high concentration in the southern and central-western regions and in the capital Bangui with nearly a million inhabitants. The CAR is also culturally and ethnically diverse, with over 80 ethnic groups (as cited in de Vries, 2020). However, they all speak one national language, Sango, in addition to French, which is the official administrative language. While interethnic coexistence remains, intercommunal tensions are common, often exploited for political or resource-control purposes, and often leading to violent clashes with the destruction of homesteads (de Vries, 2020). According to estimates by the CAR government’s population movement commission, 641,292 people were internally displaced as of 31 August 2020. These IDPs are in addition to the 613,114 refugees from the CAR who have fled to neighboring countries (UNHCR, 2020). Almost two-thirds (67%) of IDPs live with host families, and one-third (33%) in IDP sites (OCHA, 2020). According to UNICEF (2020), one in five households accommodates one or more separated or unaccompanied minors.

Displacement and the State of Under-5 Children in Fragile Contexts

There are very limited scientific publications that provide nationwide population-based data on the state of under-5 children in fragile complex humanitarian crises due to safety and logistical constraints. Most childhood mortality data in these complex emergency settings where most of the internally displaced children live are often based on localized surveys conducted by international organizations on small samples, which makes it difficult to generalize the findings to the entire population. According to Kohrt et al. (2019), fragile contexts are often treated like outliers in global public health, with little to no evidence base to inform governments and humanitarian organizations on the best strategies and approaches to achieve sustainable development. For example, the Demographic Health Survey (DHS) databases of 27 sub-Saharan African countries that were reviewed by Issaka et al. (2017) to examine the impact of internal migration on the under-5 mortality rate did not include data from some of the major conflict-affected fragile nations of Somalia, South Sudan, and the CAR due to lack of these vital data. Some researchers have resorted to new technological advances to circumvent the paucity of vital statistics in fragile contexts. Using geospatial analyses, Bendavid et al. (2021) demonstrated a substantial-high morbidity and mortality burden borne by children because of armed conflicts. Based on databases of refugees and IDPs, the researchers were able to estimate that nearly 36 million children were forcibly displaced in 2017 (Bendavid et al., 2021).

It has also been established that mortality data in these conflicts and postconflict settings are either underestimated or overestimated when researchers do not include

measures of sensitivity and representativeness (Le Quach, 2018). To fill this gap, Cairns et al. (2009) developed research methods to estimate crude and age-specific mortality based on the enumeration of individual residents in randomly selected households. Under-5 mortality is therefore assessed through a modified prior birth history method in which a representative sample of reproductive-aged women are questioned about dates of childbirths and deaths. Another challenge is that humanitarian organizations working in fragile contexts use different formats to capture health data, which limits the interoperability of records and their analysis. For example, Checchi et al. (2022) tried to develop a scientific approach to predict the prevalence of acute malnutrition among children under 5 years of age in Somalia and South Sudan. The researchers developed models based on 85 surveys conducted in Somalia and 175 surveys conducted in South Sudan and included variables such as measles outbreaks, availability and access to water, sanitation and hygiene services, scale and intensity of the armed conflict, type of livelihood, and purchasing power parity. Even though the predictive approach was theoretically good and could be considered for further investigation in other settings and with larger datasets, the researchers concluded that their predictive models were unusable due to the range of data used and their quality, which limited the analysis.

Nonetheless, there is an overall agreement within the global public health humanitarian community that armed conflicts and their corollary forced displacements are closely associated with increased child mortality. A 2-stage cluster survey conducted by Robinson et al. (2021) in the Ouaka Prefecture of the CAR found that the crude mortality rate of 1.33 per 10,000 persons per day exceeded the humanitarian emergency

threshold of 1 death per 10,000 persons per day and an under-5 mortality rate of 1.87 deaths per 10,000 persons per day. Regarding the association between internal migration and under-5 mortality, Issaka et al. (2017) conducted multivariate Cox proportional hazards regression analysis using DHS data of 27 sub-Saharan African countries. After adjusting for internal migration status, the researchers found a 20%, 40%, and 43% increase in the under-5 mortality rate respectively among urban-rural migrant mothers, rural nonmigrant mothers, and rural-urban migrant mothers.

When it comes to forced internal displacement, the question is whether forced displacement increases the likelihood of child death over the period from the beginning of the conflict to the date of a survey. Children are directly or indirectly affected by conflict. Gross human rights violations affecting children in civil conflicts have been documented (Ginn, 2019). These direct effects (due to violence) include bombs and gunfire, whippings, and other physical injuries. Such mistreatments affect children, regardless of their age, or whether they move or not. Crossing checkpoints during the displacement process is probably one of the most harmful and traumatic experiences for children and their mothers (Clauss-Ehlers, 2019). However, there is an argument that staying behind may not have an impact on a household's mortality rate. For example, Ginn (2019) found no statistical evidence indicating that remaining in Syria increased the likelihood of death. However, one should not forget that the living conditions and the quality of healthcare services either before or after displacement are much better in the Middle East compared to sub-Saharan Africa. What has been documented most are the indirect effects of conflicts on the lives of children under 5 years of age. Research has

provided evidence about how conflicts indirectly affect child survival through malnutrition, infectious diseases, and poor mental health.

Displacement and Childhood Immunization

The childhood immunization program established by the WHO in 1974 to control key vaccine-preventable diseases has so far contributed to a considerable decline in vaccine-preventable childhood diseases (Farra et al., 2019). The WHO policy recommends that vaccines are administered early in life to protect infants and to achieve high immunization coverage before the children encounter the wild disease-causing agents (WHO, n.d.). The CAR follows the WHO's immunization policy and schedule that calls for all children to be vaccinated against tuberculosis, polio, diphtheria, tetanus, pertussis, hepatitis B, Hemophilus influenza, pneumococcus, measles, and yellow fever before their first birthday. For vaccines that require multiple doses such as polio and pentavalent (which combines diphtheria, tetanus, pertussis, hepatitis B, Hemophilus influenza type b [Hib], and pneumococcal conjugate vaccines), the recommended interval between doses of the same antigen is 4 weeks. Multiple vaccines are administered simultaneously to reduce the number of contacts required for a child to be considered as fully immunized. If a child misses a dose of pentavalent or oral polio vaccine, immunization is provided at the next opportunity as if the usual interval had elapsed. No additional dose would be required in such situations because a longer than the recommended interval between two same doses does not reduce antibody concentrations and does not, therefore, impact a child's immunity against the targeted disease.

Forced population displacement disrupts childhood immunization programs. For example, in 2018, there were at least two outbreaks of poliovirus in insurgent-held areas of Nigeria and subsequent outbreak responses conducted during the period of 2018 to 2019 were unable to interrupt the transmission (Adamu et al., 2019). Poliomyelitis is an acute viral infection transmitted mainly via fecal-oral route in situations of poor sanitation services and that may lead to paralysis, death or permanent sequalae (WHO, n.d.). Internal population displacement is a factor that potentially favors the circulation of the virus because of the overcrowding of unimmunized population groups and lack of access and use of sanitation services. According to the WHO (n.d.), humans are the only reservoir of poliovirus. The WHO recommends that oral polio vaccines be administrated to children at birth, at 6 weeks, 10 weeks, and at 14 weeks after delivery to insure early childhood immunity against the virus.

Besides polio, which remains endemic in Afghanistan, Nigeria, and Pakistan, another highly contagious vaccine-preventable viral disease common in fragile contexts is measles (Korave et al., 2021). Measles outbreaks are common among internally displaced populations, particularly in makeshift IDP camp settings. Measles has often been the leading cause of death among children in situation of internal displacement, mainly because of the overcrowding factor (WHO, n.d.). However, the high mortality rate due to measles in such situations can be prevented by a rigorous and effective immunization program and early case management of the disease. In a context as fragile as Afghanistan, armed conflict, insecurity, internal population displacement, supply chain challenges, and vaccine hesitancy are the main factors hampering efforts to eradicate

measles, resulting in increased childhood mortality rate, a faster disease transmission, and an overburdening of the fragile public health system (Islam et al., 2022). Several conflict-affected African nations such as the CAR continue to have measles immunization coverage rates below 60%, which is not sufficient to generate heard immunity. These low immunization coverage rates and falling or stagnant rates in other countries are some of the key drivers of measles outbreaks in sub-Saharan Africa (Martin et al., 2021). Measles killed more than 140,000 children in 2018 (WHO, n.d.).

Another disease targeted by the EPI is tetanus (neonatal tetanus and wound-related tetanus) which is an important cause of death in rural and tropical areas (WHO, n.d.). However, according to the WHO, the disease is entirely preventable by Tetanus Toxoid (TT) immunization administrated in 3 doses after delivery with a four-week interval. In internal displacement settings, tetanus can be a serious health problem due to the disruption of immunization services, traditional harmful practices including home deliveries and circumcisions carried out under poor hygiene conditions and a higher than usual incidence of war-wounded persons in situations of armed conflicts.

According to the WHO, tuberculosis (TB) remains a major public health problem throughout the world. TB risk factors such as poor living conditions, overcrowding, and malnutrition which are common in IDP settings favor the spread of the disease. However, no evidence of an increasing TB transmission in IDP settings has been documented so far by the WHO. The Bacillus Calmette-Guérin (BCG) vaccine is administered at birth (or as soon as possible after birth) provides a high level of protection against the lethal form of the disease among children.

Pertussis is a common and highly contagious respiratory infection which predominantly affects children. According to the WHO, there were more than 151,000 cases of pertussis globally in 2018. Pertussis (or whooping cough) is usually an underdiagnosed disease, and its prevalence among internally displaced populations is underestimated. The infection is a concern among displaced populations because of its close association with malnutrition followed by weight loss and dehydration due to vomiting may lead to a high case fatality rate, particularly among infants and young children (WHO, n.d.).

There are several factors that are closely associated with immunization completion. Okello et al. (2022) indicate that maternal education (high school and above), TT vaccination during pregnancy, and possession of a road to health card are some of the factors association with vaccination completion in Uganda. Janusz et al. (2021) highlights the critical role played by mother's education in child's immunization completion. The researchers indicate that lower levels of educational attainment and wealth have been consistently identified as barriers to immunization completion among children 12 to 23 months in sub-Saharan Africa. Other factors that have been identified by researchers include place of residence (with those in urban settings having the advantage of rural residents), household wealth, mother's age at delivery, location of delivery (health facility or at home), childbirth order, and place of delivery (Gonzales et al., 2022; Mekuria et al., 2022; Okello et al., 2022).

A cross-sectional study conducted by Gonzales et al. (2022) using a DHS dataset in Peru found that DPT3 vaccination coverage was 72.4% whereas the WHO

recommends a minimum of 90% coverage of DPT3 vaccine coverage for routine immunization programs among children in the country. Some of the factors associated with the DPT scheme completion were language, employment, income, and easy access to a health facility with Spanish speakers, employed, and financially independent women being more likely to complete their children's DPT vaccination schemes (Gonzales et al., 2022). The same determinants of immunization completion were documented in Ethiopia from a case-control study conducted by Mekuria et al. (2022). Mothers who had not attended antenatal or had not been given information about vaccinations, and mothers who took more than 39 min to reach the nearest health facility were more likely not to complete their immunization schedule. Mothers' waiting time of more than 45 min for child vaccination and home delivery have also been identified as some of the other reasons for not completing child immunization in Ethiopia (Mekonnen et al., 2020).

Displacement and Malnutrition

One of the under-5 mortality risk factors that have been documented is acute malnutrition which is a major proxy indicator of food insecurity (Ogbu et al., 2022). Increased household food insecurity is closely associated with forced displacement while children under 5 years of age are always the first to show signs of food shortages. Malnutrition is a key indirect cause of death among displaced populations because malnutrition increases the risks of contracting lethal childhood infectious diseases such as measles (Cutts et al., 2021; Martin et al., 2021). According to the United Nations World Food Program (WFP), internal population displacement increases the vulnerability to malnutrition among children under-5 years for two main reasons. First, internal

displacement is closely associated with an abrupt substantial reduction of availability and access to food and limited purchasing power. Second, the environment in which the newly displacement populations settle is usually characterized by a lack of water, and poor hygiene and sanitation conditions, lack of access to quality healthcare services, and an increased exposure and vulnerability to communicable diseases.

Ogbu et al. (2022) conducted a logistic regression analysis to assess the association between the under-5 mortality rate and population residence status in sub-Saharan Africa and found a daily under-5 mortality of 2.07 deaths, which is above the emergency threshold of 2 deaths per 10,000 children per day. However, the prevalence of global acute malnutrition and measles vaccine coverage was higher in internally displaced children compared to nondisplaced populations, indicating a reduced access, availably. and utilization of food among children under-5 years of age but increased access to childhood immunization services. The results of a study conducted by Cumber et al. (2018) among IDPs in northern Cameroon corroborate the findings of Ogbu et al. (2022) whereby the increased rates of severe acute malnutrition among displaced Cameroonian children and refugee populations from CAR were a major contributing factor of increased under-5 mortality among the two vulnerable population groups. Within the same region of Central Africa, results of a cross-sectional analysis conducted by Iacoella and Tirivayi (2020) in the areas affected by the Boko Haram insurgency in northeastern Nigeria indicate that displacement increased the probability of acute malnutrition among children under-5 years of age by 57%. However, population displacement is not always associated with increased acute malnutrition. Representative

cross-sectional surveys conducted among Syrian refugees in Lebanon, Jordan, and Iraq in 2013 – 2014 indicate that global acute malnutrition remained relatively low even though nearly fifty percent of the Syrian populations were in situation of displacement, either as IDPs in Syria or as refugees in neighboring countries (Hossain et al., 2018).

Even though malnutrition rates increase during the early days of displacement, they tend to stabilize thereafter. The results of 3 cross-sectional cluster surveys conducted by Leidman et al. (2020) among the displaced Rohingya populations settled in informal sites in Bangladesh showed significant progressive reductions of acute malnutrition and micronutrient deficiencies with subsequent reduction of child mortality rates (Leidman et al., 2020). In Colombia, a study by Vargas and Hernandez (2020) indicates that political conflicts leading to forced displacement are one of the key determinants of malnutrition in a country with an estimated six million IDPs (or 15% of the entire population). The other main determinants of malnutrition in the context of forced displacement in Colombia and Venezuela include poverty, an impaired health environment with reduced access to quality healthcare services, increased costs of basic foodstuffs, drought, inequity in food availability and distribution, and poor hygiene conditions and sanitation services (Vargas & Hernández, 2020). Population displacement is also associated with inadequate feeding practices. The findings from a cross-sectional study conducted in the context of internal population displacement in northern Burkina Faso by (Bougma et al., 2022) the likelihood of malnutrition, disease, and death increases during the first two years of life due to inappropriate feeding practices and poor environmental conditions associated with population displacement.

Displacement and Infectious Diseases

Human mobility and the sudden change of environment increase the likelihood of disease transmission particularly among displaced populations who are disproportionally vulnerable to infectious diseases (Greenaway & Castelli, 2019). The environment in which IDPs settle plays a major role in the increased burden of child mortality and morbidity (Bendavid et al., 2021). There are several interconnected factors that lead to increased vulnerability to infectious diseases and poor health among displaced populations. During the mass displacement and settlement process, crowded and unhygienic living conditions facilitate the spread of upper respiratory infections, waterborne diseases, skin infections, and childhood vaccine-preventable diseases, notwithstanding the latent traumatic experience of displacement (Greenaway & Castelli, 2019). After IDPs have settled, undetected psychological conditions and other underlying and untreated chronic non-communicable diseases lead to poor health outcomes (Clauss-Ehlers, 2019).

According to Roth (2018), displacement increases the likelihood of contracting endemic diseases such as malaria and other major causes of morbidity and death among children under-5 years of age, primarily diarrhea and upper respiratory infections. During humanitarian crises, ARIs and diarrheal diseases constitute the two major causes of ill health in all population age groups, with ARIs cases representing 20-35% of the causes of death among under-5 children (Chen, et al, 2022). Diarrheal diseases are the major causes of ill health among displaced populations due to untreated and insufficient water provision, poor hygiene and sanitation services, overcrowding, and food insecurity that

leads to malnutrition (Roth, 2018). There is a close association between malnutrition and diarrheal diseases because malnutrition increases the acuteness and duration of diarrhea, and a diarrhea episode may lead to malnutrition.

Between 25 and 30% of deaths among children under 5 years in developing countries are caused by ARIs, with pneumonia alone accounting for over 90% of these deaths (Roth, 2018). According to van Zandvoort et al., (2019), birth weight, malnutrition, poor breastfeeding practices, Vitamin A deficiency, smoke from cooking fuels, and overcrowding constitute some of the major risk factors for contracting pneumonia among displaced and refugee children under-5 years of age. In their systematic scoping review of childhood pneumonia in humanitarian settings, Chen et al. (2022) report of a multi-country study that found a mean incidence of pneumonia of seventy-one per 100 child-years in African forced displacement camps compared to 305 per 100 child-years in Asian camps. The researchers added that the likelihood of pneumonia infection was higher in lager displacement sites with continuous new arrivals, in sites with inadequate water supply, or in displacement where the healthcare system had a higher percentage of first visits.

There have also been indications of increased prevalence of infectious diseases among the host communities following forced displacements. For example, the movement of refugees from Rwandan to the Democratic Republic of Congo (DRC) between 1994–2003 fueled an exponential increase of waterborne diarrheal diseases among the under-5 children in the country (Mbaka & Vieira, 2022). However, this increased prevalence of infectious diseases among host populations was refuted in other

contexts. For example, Turkey hosted 3.4 million Syrian refugees in 2017 who faced many disease conditions during their exodus and allegedly carried communicable diseases to the hosting communities. Even though Aygün et al. (2021) study results of the effect of Syrian refugees on Turkey natives' mortality provided an indication of increased child mortality in the country, the researchers found no evidence of an association between the Syrian population displacement and the contraction of diseases or death among the host communities.

Displacement, Children Under-5 Years of Age, and Migration Model 3

Socioeconomic Confounding Factors

Findings from research by Stephenson et al. (2003) indicate that a relationship between internal displacement and under-5 mortality can be explained by differences in mothers' socioeconomic status and use of health services as well as displacement and residence status (rural versus urban). Socioeconomic power shifts and financial distress created by internal displacement negatively influence women's access and utilization of healthcare services for themselves and their children (Amodu et al., 2020). According to Antai et al. (2016), the disruption of family and community social networks, the loss of dignity and homes, the increased vulnerability to diseases with reduced purchasing power, and the challenges in settling in new, unfamiliar, and often hostile environment, predispose displaced children to diseases and poor health outcomes. A multilevel Cox regression analysis using conducted by Antai et al. (2016) on a nationally representative sample in Nigeria concluded that children of rural nondisplaced mothers had significantly lower risks of under-5 death compared to children of rural–urban migrant mothers who

seemed to have difficulty adjusting into the new urban areas. Stephenson et al. (2003) reached the same conclusion in India some years earlier.

One key factor widely believed to play a major role in a woman's decision-making process is the educational level. In their cross-sectional study, Janusz et al. (2021) found that the proportion of fully vaccinated children in sub-Saharan Africa was much higher among children born to wealthier mothers with higher education attainment levels. Another study conducted in Uganda found that a woman's high education attainment and wealth were closely associated with increased access and utilization of childhood preventive services such as immunization (Okello et al., 2022). In their household survey conducted among internally displaced populations of northern Burkina Faso, Bougma et al. (2022) report that large household size, mother's rural residency, low maternal education, and mother's marital status negatively influence children's complementary feeding practices.

There are disparities faced by displaced women while seeking health care for themselves and their children. A systematic review of the literature on women migration in India and healthcare utilization conducted by Parvathy and Hemalatha (2021) revealed that healthcare utilization was influenced by sociodemographic factors. The researchers indicate that low education and income levels were closely associated with healthcare utilization among displaced women. The other issue women and children face in fragile contexts is the availability of quality healthcare services. And even in areas where services are available, IDPs may face challenges accessing services. For example, telephone interviews of a sample of IDPs conducted by Igwe et al. (2021) in Abuja and

Maiduguri, Nigeria revealed health inequalities despite the availability of healthcare facilities. Some of the challenges to access and utilization of services by IDPs included corruption, inadequate staffing pattern, poor hygiene practices and sanitation services, bureaucratic impediments, and the lack of or insufficient trained and experienced social workers (Igwe et al., 2021).

Definition of Key Terms Related to the Study

Acute malnutrition: A calculated variable whereas acutely malnourished children are those with a weight for height z-score (WHZ) below -2 standard deviation while not acutely malnourished are those children between 6 and 59 months WHZ greater or equal to -2 standard deviation.

Acute respiratory infections: MICS survey assesses the episodes of ARIs among children under-5 years of age by asking whether the child presented symptoms of ARIs during the two weeks preceding the survey. Symptoms of ARIs include coughing or sneezing, a sore throat, blocked or runny nose, and fever.

Completion of mandatory vaccination (or *immunization*): Children aged 12–23 months who had received all the EPI targeted vaccines, while “incomplete vaccination” is defined as children who had missed one or more of the required or mandatory vaccine doses.

Education attainment: Measures the highest level (grade or school levels) ever attained by the mother. CAR MICS surveys list four levels: No education, primary school level, lower secondary school level, and upper secondary school and above.

Internal displacement: The movement (either forced or voluntary) of individuals within their country of origin, without crossing international borders. Most publications refer to this phenomenon as internal migration. However, for the case of the CAR, I prefer using the concept of internal displacement in line with the jargon of the international humanitarian community (Zeender, 2018). In this study, an internally displaced person (independent variable) is a study subject (child under-5 years of age) who relocated (either voluntarily or forcibly) from the usual area of residence regardless of the reasons of displacement or born from a mother in situation of internal displacement.

Mother's wealth index or status: MICS surveys compute mother's wealth index or status using an analysis of reported ownership of key household assets which proxy indicators of living standard in the household. CAR MICS6 categorized wealth status into five groups: very poor, poor, average, rich, and very rich.

Residence: Refers to the area of residence of the mother of child caretaker at the time of the survey. It is either rural or urban.

Assumptions

MICS is a highly regarded international household survey program designed by the UNICEF in 1995 as part of the UN agency's mandate to promote the wellbeing of women and children worldwide. MICS surveys provide internationally acceptable data to strengthen UN member states' progress towards universal commitments of better world women and children. MICS survey methodology is statistically sound, and the program generates data on key indicators that help shape policies for improving the lives of

women and children. It can therefore be assumed that MICS data are reliable and findings generalizable to the context or country under study.

Scope and Delimitations

The limitations of the internal displacement variable are related to the use of a secondary dataset originally collected for a purpose other than the capstone. Responses to the questions in the CAR MICS 2018-2019 individual questionnaire on the internal migration status of respondent women and men will serve as the basis of the independent variable of this study. One of the questions survey participants were asked was whether they have migrated from another locality or not and for how long they have been continuously living in the current residence.

Thus, the MICS6-RCA dataset does disaggregate data based on reasons for displacement, which could be either forced displacement or voluntary migration. According to researchers, over 80% of the citizens of the CAR experienced some form of security-related displacement over the past 20 years (de Vries, 2020). It is therefore impossible to differentiate IDPs based on settlement sites. According to the UN OCHA, nearly a third of the displaced persons live in the 76 informal settlement sites for IDPs managed by international NGOs, while the remaining two-thirds live with host families either within or outside areas under the control of the fourteen-armed groups still active in the country.

It is also important to note that while the data collection method was statistically sound and the data were reliable, the interviewers were unable to access 99 of the 550 sampled enumeration zones due to insecurity (presence of uncontrolled armed groups

operating in some of dense forest areas and insufficient secure buffer zones in urban areas) and accessibility problems (due to lack of passable access roads).

Significance of the Study and Implications for Positive Social Change

Despite their intensity, scale, severity and impacts on the lives of millions of people in resource poor nations of Africa, Asia and Latin America, humanitarian crises that result from armed conflicts, forced displacement, natural disasters, and outbreaks of major diseases are often treated as outliers in global public health with little to no evidence base to inform governments and humanitarian organizations on the best strategies and approaches to respond to their unique challenges. Nonetheless, these humanitarian emergencies affect more people nowadays than at any other point in recent history (Kohrt et al., 2019).

To the best of my knowledge, one of the areas of these humanitarian crises that has been little researched is the association between forced population displacement and the key contributing factors of under-5 mortality in these complex humanitarian and fragile settings. This doctoral study will provide a better understanding of access and utilization of a key childhood preventive service such as immunization in situations of mass population displacement with the aim of providing guidance in the design and implementation of context-specific programmatic interventions geared towards ending preventable deaths among children under-5 years of age and therefore contribute to achieving one of the key ambitious health targets of the SDGs. Furthermore, this study will guide government policymakers in the development of policies for the acceleration

of the UN agenda 2030 for sustainable development while leaving no one behind, particularly IDPs.

Summary and Conclusions

Forced displacement negatively impacts the wellbeing of children because the ultimate outcome of such a phenomenon is the disruption of key preventive services such as childhood immunization and sudden rise of acute malnutrition and infectious diseases resulting from reduced availability and access to food, loss of shelter and dignity, inadequate and insufficient water, poor living hygiene conditions and sanitation services, an impaired healthcare system, inadequate skilled healthcare workers to manage obstetrical emergencies, lack of educational and training infrastructure and services, absence of culturally sensitive health and humanitarian professionals, and maladjustment (Hirani & Richter, 2019). Often neglected by their own governments and left under the care of international organizations, IDPs bear the brunt of the world's child mortality burden. It is an area that has been under-researched by public health experts. My review of published surveys and scientific studies, doctoral dissertations, and the limited population-based national records and publications demonstrated a need to study the association of the internal displacement phenomenon and some key contributing factors of under-5 mortality.

In this section, I described the three RQs and the hypothesis to be tested based on a thoroughly defined problem statement and study purpose. I also provided the nature of the study as well as the rationale for basing this cross-sectional study on the

socioecological theoretical framework developed by Bronfenbrenner before stating the implications for social change as well as the limitations and scope of the study.

In the next section, I discuss the rationale for selecting the cross-sectional study design as well as the methodology to be used. I will conclude this section by discussing the threats to validity and study's ethical considerations.

Section 2: Research Design and Data Collection

Introduction

The purpose of this quantitative research was to assess the association between internal displacement and contributing factors of under-5 mortality in the CAR. Previous studies identified the factors that influence under-5 mortality and their relative importance. However, the importance of under-5 mortality contributing factors of immunization completion, acute malnutrition, and ARIs in contexts of mass population displacement such as the CAR has been underresearched. Such an association is needed for policy formulation on SDG 3 acceleration and particularly for the reduction of preventable under-5 deaths in the CAR.

In the previous section, I conducted a literature review of key variables of interest, including the state of the under-5 children in the CAR, the factors associated with the completion of mandatory immunization, the risks of increased acute and chronic malnutrition, and the factors of contraction of respiratory infectious diseases in the contexts of internal population displacement. In this section, I articulate the rationale for conducting a cross-sectional study design to answer the three RQs. I also describe the methodology used, including the selection of the study population and data collection, analysis, and reporting. Finally, I discuss the threats to validity as well as the ethical procedures of the study.

Research Design and Rationale

I used a cross-sectional study design to analyze a secondary dataset collected in the CAR in 2018 – 2019 by the MICS team. A cross-sectional study design was the most

appropriate for this study because it facilitates the assessment of the association between the independent (internal displacement) and the dependent variables of vaccination completion, acute malnutrition, and ARIs while controlling for the confounding factors of women's wealth index, education attainment, and residence at a single point in time. Moreover, cross-sectional studies are inexpensive and require limited time to complete because the data are readily available from the primary data collection institution.

According to Reynolds and Guest (2017), a cross-sectional study design allows the researcher to gain an understanding of a particular phenomenon in a defined population at a single point in time. Using this study design provided the opportunity to measure the association between internal population displacement and the contributing factors of under-5 mortality in the CAR using an existing dataset. Cross-sectional study results can be generalized to the overall sampled study population. However, a cross-sectional study design cannot establish a causal relationship between variables (Cox, 2020a).

Methodology

The methodology section includes the target population, the sampling techniques, and the calculation of the sample size. In this section, I also present the data analysis plan, describe in detail the instrumentation and operationalization of the variables, and discuss the threats to validity and the study's ethical considerations.

Study Population

The primary target population of this quantitative cross-section study was the children under 5 years of age in the CAR. A landlocked nation in Central Africa nearly

the size of the state of Texas, the CAR is one of the least densely populated countries in sub-Saharan Africa, with an estimated total population of 5.5 million (as cited in OCHA, 2020). Despite its significant natural resources, the CAR has the fourth-lowest level of human development, the lowest gross domestic product per capita at purchasing power parity, and a life expectancy at birth of 53.9 years (UNDP, 2022).

The government policy is for every child to receive mandatory immunizations before their first birthday. I targeted children between 12 and 23 months of age to analyze the vaccine completion outcome variable in response to RQ1. For analysis of the acute malnutrition outcome variable in response to RQ2, the target population was children between 6 and 59 months whose weight-for-height *z*-scores had been calculated. Finally, for the analysis of the ARI outcome variable in response to RQ3, the target population was all children under 5 years of age. Even though the primary target population of this study was children under 5, analysis of the model 3 exploratory socioeconomic confounding variables of wealth index, education attainment, and residence derived from maternal or caregiver characteristics because the CAR is still fundamentally a traditional society in which childcare is a primary responsibility of mothers.

Sampling and Sampling Procedures

Analysis of existing datasets has become one of the most popular methods for describing public health conditions in a given population or community (Cox, 2020a; Reynolds & Guest, 2017). Secondary data can be a private or public dataset under the care of a collecting agency or the institution that funded the data collection process. Accessing a secondary dataset depends on the collecting agency, funding institution, or

governmental entity's willingness to make the data available to a researcher who was not involved in the data collection process or maintenance.

The dataset used for this doctoral study was MICS6-RCA maintained by UNICEF, collected in the CAR in 2018 – 2019 by the MICS – Round 6 team led by the National Institute of Statistics and Social and Economic Studies (ICASEES) of the government's ministry of economy, planning and cooperation, and funded by the World Bank, the UN *Ezingo* Fund, the UNFPA, and the UNICEF. The MICS6-RCA survey measured key indicators of children and women's physical health, education, financial status, housing situation, and overall well-being. The CAR MICS survey was objective and provided high quality data and other reliable information on the CAR's progress toward the achievement of the SDGs. Two questionnaires (corresponding to two sampling units) were used for the analysis: the one for mothers or primary caretakers of children under 5 years of age, and the one for women of reproductive age (15 – 49 years). The MICS6 dataset for the CAR has 9 SPSS data files corresponding to the 9 units of analysis. I combined and used 2 of the 9 data files containing information on women of reproductive age. The study population group in the 2 files had the same identifiers.

The sample for the CAR MICSs 2018-2019 was designed to provide estimates for many indicators about the situation of children and women at the national level and for the seven regions of the country. The household selection process involved a 2-stage cluster sampling methodology in rural and urban areas by drawing a systematic sample of 20 households from each sample enumeration area. A total of 11,000 households were selected at the national level.

Data Accessibility and Permission

The 2018-2019 CAR MICS6 dataset is freely available through the UNICEF website and is made available to investigators upon request. This publicly accessible resource has been stripped of all personal identifiers and individual level information. The CAR ICASEES maintains the personal identifiers that can connect individuals and specific households surveyed. However, that information is not publicly available and was not necessary for this study. Therefore, this study posed no risk to human subjects and qualified for expedited appraisal by the Institutional Review Board (IRB).

Power Analysis/Sample Size Calculation

I used the latest version of the OpenEpi operating system to calculate the sample size of the study population. Developed by Dean, Sullivan, and Soe in 2014 to support medical and public health practitioners in the development of epidemiological and statistical data required for evidence-based practice, the OpenEpi is a web-based freely available statistical package with the capacity to calculate the sample power size for several studies (Sullivan et al., 2009).

At the initial stage, I selected the cross-sectional study option of the OpenEpi statistical calculator to the calculation of my sample size. I selected the *OR* with the potential to generate the maximum sample size for the study. In the second stage, I selected 80% desired power because my research hypothesis was a two-sided significance level test and a 95% confidence level. I then selected an evidence-based *OR* that would provide a maximum sample size for the study. I conducted a literature review and found that results of Issaka et al. (2017) demonstrated that the mother's level of

education was closely associated with under-5 mortality among children born of migrant mothers with an *OR* of 1.60 (95% CI: 1.47-1.73). Based on this evidence, I used an *OR* of 1.6 to estimate my sample size, which is deemed appropriate to generate adequate power. Using the OpenEpi model, the statistical calculator indicated that I would require a sample size of 2,592 research subjects.

Instrumentation and Operationalization of Constructs

Instrumentation

I extracted data from the MICS-6 in the CAR, conducted in 2018 and 2019 by the ICASESS, in collaboration with UNICEF, as part of the MICS global survey program. Two questionnaires were used for the analysis: the one for mothers or primary caretakers of children under the age of 5, and the one for women in reproductive age (15 to 49 years). In addition, the mother's displacement status was included to assess the association with children's vaccination acute malnutrition and ARIs. The mother's other characteristics that included were wealth index, education attainment, and urban or rural residence. The wealth index in MICS is presented as 5 quintiles and recoded into poor (the first two quintiles), average (the third quintile), and rich (the last two quintiles).

Operationalization of Variables

Independent Variable. The independent variable (internal displacement) was a dichotomous categorical variable that indicated whether the study subject (child under 59 months of age) was in situation of displacement or not at the time of the survey. Displaced children included both misplaced after they were born as well as those born while the mother was in situation of internal displacement.

Dependent Variables. This study included 3 dependent variables and 3 confounding variables. The dependent variables were immunization completion, acute malnutrition, and ARIs while the confounding variables were the mother's wealth index, education attainment, and residence.

Completion of mandatory vaccination (or immunization) was defined as children aged 12 months to 23 months who had received all the EPI targeted vaccines and was a dichotomous categorical variable recorded as 1 for *complete vaccination* and 0 for *incomplete vaccination*, which was defined as children who had missed one or more doses of recommended vaccines.

Acute malnutrition was a calculated scale variable in MICS. I converted this scale variable into a categorical variable for analysis by assigning "1" for children whose WHZ was below -2 standard deviation (indicating acute malnutrition) and "0" for children whose WHZ was equal or greater than -2 standard deviation (indicating not acutely malnourished).

ARIs were another dichotomous categorical variable coded as "0" indicating "no IRAs" and "1" indicating "IRAs."

Confounding Variables. Wealth index was nominal variable categorized into five groups: 0 or *very poor*, 1 or *poor*, 2 or *average*, 3 or *rich*, and 4 or *very rich*.

Education attainment was another nominal variable categorized into four levels: 0 or *no education*, 1 for *primary school*, 2 for *lower secondary*, and 3 for *upper secondary and above*.

Residence was dichotomous categorial variable coded as 1 for *urban* and 2 for *rural*.

Table 2 describes the variables used, including the variable names, labels, values, and level of measurement.

Table 2

List of Variable Names, Labels, Values, and Level of Measurement

Variable name	Variable label	Variable value	Level of measurement
WB15	Internal displacement	0 = No (not displaced) 1 = Yes (displaced)	Nominal/Dichotomous
IM11	Vaccination completion	0 = No (not fully vaccinated) 1 = Yes (fully vaccinated)	Nominal/Dichotomous
WHZ	Acute malnutrition	0 = No (not acutely malnourished or Z-score >=-2SD) 1 = Yes (acutely malnourished or Z-score <-2SD)	Scale
CA17	Acute respiratory infections	0 = No (no ARIs) 1 = Yes (ARIs)	Nominal/Dichotomous
Windex5	Wealth index or status	1 = very poor 2 = poor 3 = average 4 = rich 5 = very rich	Nominal
Melevel	Education attainment	0 = no education or preschool 1 = Primary 2 = Lower secondary 3 = Upper secondary or higher	Nominal
HH6	Residence	1 = urban 2 = rural	Nominal

Note. WB15 – Displacement status; IM11 – Vaccination completion status; WHZ – Weight-for-Height Z-score; CA17 – ARI status; Windex5 – Wealth index; Melevel – Mother's education level; HH6 – Household residence status.

Data Analysis Plan

I used the latest version of the IBM SPSS statistical package to generate descriptive and inferential statistics, describe the dataset, and determine whether there was an association between the independent variable of internal displacement and the

outcome variables of completion of mandatory vaccination, acute malnutrition, and ARIs. SPSS was the appropriate statistical package with the capacity to produce inferential and descriptive statistics required to address my three RQs. Descriptive statistics included frequencies and percentage distributions. Missing values were excluded, and percentages were only based on the number of nonmissing values.

RQs and Hypotheses

I used the following RQs to assess the association between internal displacement and under-5 mortality contributing factors mandatory vaccine completion, acute malnutrition, and ARIs.

RQ1: Is there an association between internal displacement and the completion of the recommended vaccinations among children aged 12 to 23 months at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status?

$H_0$1: There is no association between internal displacement and the completion of the recommended vaccinations among children aged 12 to 23 months at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

$H_1$1: There is an association between internal displacement and the completion of the recommended vaccinations among children aged 12 to 23 months at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

RQ2: Is there an association between internal displacement and the malnutrition status of children under 5 years of age at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status?

$H_0$2: There is no association between internal displacement and the malnutrition status of children under 5 years of age at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

$H_1$2: There is an association between internal displacement and the malnutrition status of children under 5 years of age at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

RQ3: Is there an association between internal displacement and symptoms of ARIs among under-5 children during the 2 weeks preceding the survey while controlling for mother's characteristics of wealth index, education attainment, and residence status?

$H_0$3: There is no association between internal displacement and symptoms of ARIs among under-5 children during the 2 weeks preceding the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

$H_1$3: There is an association between internal displacement and symptoms of ARIs among under-5 children during the 2 weeks preceding the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

Statistical Tests for the Study Outcome

I will perform a multiple logistic regression analysis to address each one of the three RQs. I selected the multiple logistic regression statistical test to assess the strength of each variable because both the independent and the dependent variables are categorized as categorical variables. According to Warner (2021), multiple logistic regression is the appropriate statistical test to predict the value of a variable based on the value of two or more predictors. All statistical tests will be performed at a 5% (0.05) significance level with the estimate of effects calculated at the 95% confidence interval, the *OR,* and a *p*-value of less than or equal to 0.05.

At the initial stage, I will run the individual variables in univariate logistic models and assess the association between the independent variable and each one of the dependent variables. Then I will evaluate whether the confounding variables contribute to a change in the observed association by 10% or more in the outcome variable. In the last stage, I will include all the significant variables in the model while excluding the insignificant variables. However, all the significant variables in the univariate logistic models will be kept in the final model.

In my presentation of the findings, I will present 3 final models (1 for each RQ). For each final model, I will produce an unadjusted (crude) and an adjusted odds ratio (in which I would have had controlled for all confounders).

Validity

According to Golafshani (2003), reliability is concerned with the question of whether a measure reflects what it is supposed to be representing. Establishing the

validity of this study helps determine whether the study instrument is the best one for the study. According to Stewart and Hitchcock (2020), there are two types of threats to validity: internal and external threats to validity.

Threats to Internal Validity

A researcher must be able to demonstrate that the variables under study are not influenced by some other factors other than what the study was designated to investigate. Otherwise, this could lead to threats to internal validity. It is therefore important for an investigator to identify and mitigate the threats and their potential effects to internal validity before the study results can be generalized to the population beyond the study subjects. Hence the need to eliminate systematic bias and random error that could lead to an erroneous relationship between the independent and the dependent variables in order to ensure the validity of the study results. It is for this reason that I will control the confounding variables of the mother's wealth index, education attainment, and residence to contain threats to internal validity.

Threats to External Validity

According to Stewart and Hitchcock (2020), threats to external validity arise when a researcher uses the results of a study to draw improper or incorrect inferences beyond the sampled study population or generalize the findings to other contexts and past or future conditions. Every research setting is unique, and so is the study population or the timing of the study. Generalization of study results to population groups other than those sampled or to settings that have not been part of the study could give rise to external threats to validity (Stewart & Hitchcock, 2020).

The results of this study will only be generalizable to the study population of under-5 children in the CAR. The type of study design, methods, or the study population were selected to mitigate any threats to external validity.

Ethical Procedures

Voluntary participation, informed consent and the safety of research subjects are some of the key ethical considerations in research. Collection, analysis, interpretation, and dissemination of data on human subjects is not only an expensive and time-consuming endeavor that must be carefully planned and well implemented, but also conducted under a code of conduct that aims to prevent any harm to the study participants whether inadvertently or not (Cox, 2020b).

The study will utilize data from the UNICEF MICS6-RCA surveys conducted in 2018-2019. This dataset, which has been stripped of all personal identifiers and individual level information, is freely available upon request. For the UNICEF MICS survey, every study subject provided verbal consent and was ensured of the confidentiality and anonymity of the information. For participating children, adult's consent was obtained prior to initiating interviews and anthropometric measurements. Survey participation was voluntary, and participants were informed of the right to withdraw from the survey at any time or refuse to answer all or some of the questions.

Moreover, I will uphold the highest virtue of academic integrity by respecting the data use and confidentiality agreements at every stage of the study and by acknowledging that improper leak of confidential information could be harmful to study population and

lead to legal implications on my part. Once access to the dataset is obtained, I will not allow any other individual to access, modify, or transmit the data.

Finally, I will make sure I obtain the Institutional Review Board (IRB) approval before data analysis. The IRB committee is responsible for making sure that the research aims, design and methodology are ethically acceptable and follow Walden University's code of conduct on research as well as the CDC's guidelines and other United States federal government's regulations on the protection of human subjects. The IRB approval number for this study is 05-30-23-0750014.

Summary

In this section, the research design and methods that were used in this study were explained in detail. A thoroughly detailed methodology section that includes the study population and the sampling techniques was provided and discussed. A sampling strategy that includes the inclusion and exclusion criteria of the sampling frame was discussed and justification provided. I also defined and discussed the operationalization of the independent variable and the independent variables as well as their levels of measurement. I restated the 3 RQs and hypotheses prior to discussing the statistical methods that will be used to address these questions. I selected the IBM SPSS statistical software for data analysis. Internal and external threats to validity and their potential effect on the study results were discussed and mitigations strategies identified. Finally, ethical considerations and authorization for accessing the dataset were explained including the required permission from the IRB committee that would allow me to use

the secondary data. In the next Section, I will present and discuss the results and findings of the study in relation to the 3 RQs.

Section 3: Presentation of the Results and Findings

Introduction

The primary purpose of this quantitative doctoral study was to assess the association between the independent variable of internal population displacement and the dependent variables of vaccination completion, malnutrition, and ARIs in the CAR. The high burden of under-5 mortality in fragile contexts with mass population displacement prompted the need for this study. The findings of this study may contribute to public health by guiding the design and implementation of evidence-based context-specific interventions for reduction of preventable child deaths in the context of humanitarian emergencies in line with the SDGs goals, objectives, and targets. In this study, I used a cross-sectional design by analyzing secondary data from the UNICEF MICS surveys conducted in the CAR in 2018-2019.

In Section 1, I stated the problem and defined the purpose and nature of the study as well as the rationale for basing it on the SEM. I also conducted a literature review of key variables of interest before stating the implications for social change and scope and limitations of the study. In Section 2, I explained the research design and methods used, including the study population and the sampling techniques. I also defined and discussed the operationalization of the variables as well as their levels of measurement. Threats to validity and their potential effect on the study results were discussed, and mitigation strategies were identified. Ethical considerations and authorization for accessing the dataset were explained, including the required permission from the IRB committee. I presented the following RQs and hypotheses:

RQ1: Is there an association between internal displacement and the completion of the recommended vaccinations among children aged 12 to 23 months at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status?

$H_0$1: There is no association between internal displacement and the completion of the recommended vaccinations among children aged 12 to 23 months at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

$H_1$1: There is an association between internal displacement and the completion of the recommended vaccinations among children aged 12 to 23 months at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

RQ2: Is there an association between internal displacement and the malnutrition status of children under 5 years of age at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status?

$H_0$2: There is no association between internal displacement and the malnutrition status of children under 5 years of age at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

$H_1$2: There is an association between internal displacement and the malnutrition status of children under 5 years of age at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

RQ3: Is there an association between internal displacement and symptoms of ARIs among under-5 children during the 2 weeks preceding the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status?

$H_0$3: There is no association between internal displacement and symptoms of ARIs among under-5 children during the 2 weeks preceding the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

$H_1$3: There is an association between internal displacement and symptoms of ARIs among under-5 children during the 2 weeks preceding the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

In this section, I synthetize and present the findings of the data analysis. General descriptive statistics of the sampled population are provided. I also report the results of statistical analyses, including univariate and multivariate logistic regression analysis for the 3 RQs. The results from the statistical analysis tests presented in this section are organized by RQs and hypotheses.

Accessing the Secondary Dataset for Analysis

The MICS6 dataset is freely available through the UNICEF website and is made available to investigators upon request. The MICS6-RCA was conducted in 2018 and 2019 by the ICASESS of the Ministry of Economy, Planning, and Cooperation, in collaboration with UNICEF, as part of the MICS global survey program.

The MICS6-RCA principal investigators used a 2-stage cluster sampling methodology to select a systematic sample of 20 households from each one of the 550 sampled enumeration zones. The total number of households selected at the national level was 11,000. However, interviewers were unable to visit 99 of the 550 enumeration zones due to insecurity caused by armed groups. The interviewers visited 8,994 households sampled and found 8,302 occupied. Of these, 8,133 were successfully surveyed, with a household response rate of 98%. In the households surveyed, 9,778 women aged 15 to 49 were registered. Of these, 9,202 were successfully interviewed, representing a response rate of 94.1% among the households surveyed. There were 9,037 children under the age of 5 listed in the household questionnaire. Questionnaires were completed for 8,923 of these children, corresponding to a response rate of 98.7% within the households surveyed. The calculated overall response rates were 92.2% for women aged 15 to 49 and 96.7% for children under 5 years of age. A sensitivity test was conducted, and the results indicated that the data were missing completely at random (p = .076).

Results

Description of the Sampled Study Population

The MICS6-RCA dataset contained 9,202 valid records of women of childbearing age (15 – 49 years) with a mean age of 28.03 years, a median of 27.0 years, and a mode of 18 years. The total number of children under 5 years of age with valid records was 8,923. The mean age was 2.03 years (24.36 months), a median of 2.0 years (24 months), and a mode of 3 years (36 months). Table 3 presents children distribution by age group.

Table 3

Children Sample Distribution by Age Group

Age group	*N*	%
0 – 11 months	1,793	20.1%
12 – 23 months	1,685	18.9%
24 – 25 months	1,738	19.5%
36 – 47 months	1,892	21.2%
48 – 59 months	1,815	20.3%
Total	8,923	100%

Out of the 8,923 children sampled, 8,150 (91.3%) were matched with their mothers in SPSS analysis. A child was matched to a woman if the ID number of the child's caretaker was the same as the woman's ID number. The 773 (8.7%) missing values were of children who were under the care of an individual other than the mother at the time of the survey or could not be paired with their mothers due to coding errors. I conducted a sensitivity test and concluded that the data were missing at random (p = .076).

The Independent Variable: Population Displacement

Women of childbearing age were asked the asked the following question: For how long you have been living in the current location? Only 39.9% responded "always or since birth," meaning they had never been displaced while the remaining 60.1% experienced some form of displacement during their lives. Table 4 presents women of childbearing age by length of displacement. Only 4.4% of the women had been displaced for less than a year while 24.6% had been displaced for 10 years or more.

Table 4

Women's Length of Displacement

Displacement length	*N*	%
Never displaced	3,676	39.9%
<1 year	401	4.4%
1-4 years	1,787	19.4%
5-9 years	1,071	11.6%
>=10 years	2,267	24.6%
Total	9,202	100%

Table 5 presents children's displacement status by age group.

Table 5

Children Age Group and Displacement Status

	Displacement status					
	Never displaced		Displaced		Total	
Age group	*N*	%	*N*	%	*N*	%
0	677	21.7%	1,076	21.4%	1,753	21.5%
1	574	18.4%	1,045	20.8%	1,619	19.9%
2	626	20.1%	939	18.6%	1,565	19.2%
3	659	21.1%	1,004	20.0%	1,663	20.4%
4	584	18.7%	966	19.2%	1,550	19.0%
Total	3,120	100.0%	5,030	100.0%	8,150	100.0%

Most of the children in the sample were in a situation of displacement. Out of the total 8,150 children under 5 years of age, 5,030 children (representing 61.7% of the total sample) were either born in a situation of displacement or were displaced after birth compared to only 3,120 children who never experienced displacement. In every age

group, displaced children represented over 60%. For example, 1,076 (61.4%) of the 1,753 children less than 1 year old were displaced compared to 1,045 (64.5%) of the 1,619 in the 1-year-old age group and 966 (62.3%) of the 1,550 in the 4-year-old age group.

Maternal Characteristics of Wealth Index, Education, Attainment, and Residence

Among the 9,202 women of childbearing age sampled, 1,434 women (15.6%) were considered as very poor while 2,534 women (27.5%) were considered as very rich by local standards. Wealth index is a computed factor that takes into consideration the living standards of home ownership or rental, number of rooms, type of roof, urban or rural residency status, and ownership of household assets such as radio, television, bicycle, and livestock. Wealth status uses quantiles to categorize households into five groups (*very poor*, *poor*, *average*, *rich*, and *very rich*). Table 6 presents the mother's wealth index distribution per quantile.

Table 6

Women Wealth Index and Displacement Status Crosstabulation

	Displacement status					
	Not displaced		Displaced		Total	
Wealth index	*N*	%	*N*	%	*N*	%
Very poor	664	18.0%	770	13.9%	1,434	15.6%
Poor	764	20.8%	831	15.0%	1,595	17.3%
Average	730	19.9%	959	17.4%	1,689	18.4%
Rich	702	19.1%	1,248	22.6%	1,950	21.2%
Very rich	816	22.2%	1,718	31.1%	2,534	27.5%
Total	3,676	100.0%	5,526	100.0%	9,202	100.0%

Table 7 presents the mother's level of education. Only 824 (9%) of the women sampled completed secondary school or higher while 2,985 women (32.4%) completed

only preschool and 3,720 (40.4%) completed lower primary. In other words, 6,705 women sampled (72.8%) never went beyond sixth grade (lower primary and below). Among the 824 women with secondary education and higher, 615 (74.6%) were displaced compared to the 1,674 (56.1%) of the 2,985 women with preschool education and below.

Table 7

Mother's Level of Education and Displacement Status Crosstabulation

	Displacement status					
	Not displaced		Displaced		Total	
Mother's level of education	*N*	%	*N*	%	*N*	%
Preschool	1,311	35.7%	1,674	30.3%	2,985	32.4%
Lower primary	1,589	43.2%	2,131	38.6%	3,720	40.4%
Upper primary	566	15.4%	1,106	20.0%	1,672	18.2%
Secondary and higher	209	5.7%	615	11.1%	824	9.0%
DNK	1	0.0%	0	0.0%	1	0.0%
Total	3,676	100.0%	5,526	100.0%	9,202	100.0%

Note. DNK = Does not know.

Regarding the residence status, 5,049 women interviewed (54.9%) reported living in rural areas while the remaining 4,153 (45.1%) were living in urban centers. It is important to note that most IDP centers in the CAR are considered as urban centers; this is the reason why 2,786 (67.1%) of 4,153 women in the sample reported as living in urban centers were displaced. Table 8 presents women's displacement and residence status.

Table 8

Residence and Women Displacement Status Crosstabulation

	Women displacement status					
	Not displaced		Displaced		Total	
Residence	*N*	%	*N*	%	*N*	%
Urban	1,367	37.2%	2,786	50.4%	4,153	45.1%
Rural	2,309	62.8%	2,740	49.6%	5,049	54.9%
Total	3,676	100.0%	5,526	100.0%	9,202	100.0%

Dependent Variables of Vaccination Completion, Malnutrition, and ARIs

Vaccine Completion

Vaccination completion is defined as children aged 12 to 23 months who had received one dose of BCG vaccine, three doses of polio vaccines (excluding one dose of polio vaccine at birth), three doses of the pentavalent vaccine (containing antigens against diphtheria, tetanus, pertussis, hepatitis B, and Hemophilus influenza type b), three doses of pneumococcal conjugate vaccine, one dose of the measles vaccine, and one dose of the yellow fever vaccine before their first birthday. Out of the 1,685 children aged 12 to 23 months sampled population, 1,151 (68.3%) had a known and valid vaccination completion status. The remaining 534 children (31.7%) had an unknown or invalid vaccination completion status. Because of the missing data, I conducted a missing completely at random (MCAR) sensitivity test that yielded a $p = .076$, which is not significant. The total number of children aged 12 to 23 months who were fully immunized was 749 children (65.1%) while the remaining 402 (34.9%) had incomplete vaccination records. Out of the 1,151 children with a known vaccination completion status, 425 children (36.9%) were never displaced while the remaining 726 children

(63.1%) were in a situation of displacement. Table 9 presents vaccination completion by displacement status.

Table 9

Vaccination Status and Displacement Status Crosstabulation

	Displacement status					
	Never displaced		Displaced		Total	
Vaccination status	*N*	%	*N*	%	*N*	%
Incomplete	154	36.2%	248	34.2%	402	34.9%
Complete	271	63.8%	478	65.8%	749	65.1%
Total	425	100.0%	726	100.0%	1151	100.0%

Malnutrition

I distinguished 2 types of malnutrition for this study: acute malnutrition and chronic malnutrition. Acute malnutrition is a calculated variable whereas acutely malnourished children are those with a weight for height z-score (WHZ) below -2 standard deviation while not acutely malnourished children are those with a WHZ greater or equal to -2 standard deviation. Chronically malnourished children are those whose height-for-age z-score (HAZ) is below -2 standard deviation while not chronically malnourished children are those with a HAZ greater or equal to -2 standard deviation. The dataset contained biologically implausible values such as WHZ/HAZ of +-10 which were more likely errors in data entry or measurement. In the SPSS analysis, I excluded values with height-for-age z-scores below -6 SD or above +6 SD, and weight-for-height-scores below -5 SD or above +5 SD because these were invalid data (DHS, n.d.). Out of the 8,923 children under-5 years of age measured, 8,639 (96.8%) had valid WHZ values. The remaining 284 (3.2%) had flagged values (either with values missing or with weight-

for-height-scores below -5 SD or above +5 SD) and were subsequently excluded from the data analysis process. The global acute malnutrition rate (wasting) in the sampled population which is defined as the proportion of children under-5 years of age with a weight for height z-score below -2 SD was 5.1%. The acute malnutrition rates of the 7,914 children out of the 8,150 with a known displacement status were 4.9% for the displaced and 5.2% for the never displaced populations. Table 10 presents a crosstabulation of acute malnutrition rates and displacement status.

Table 10

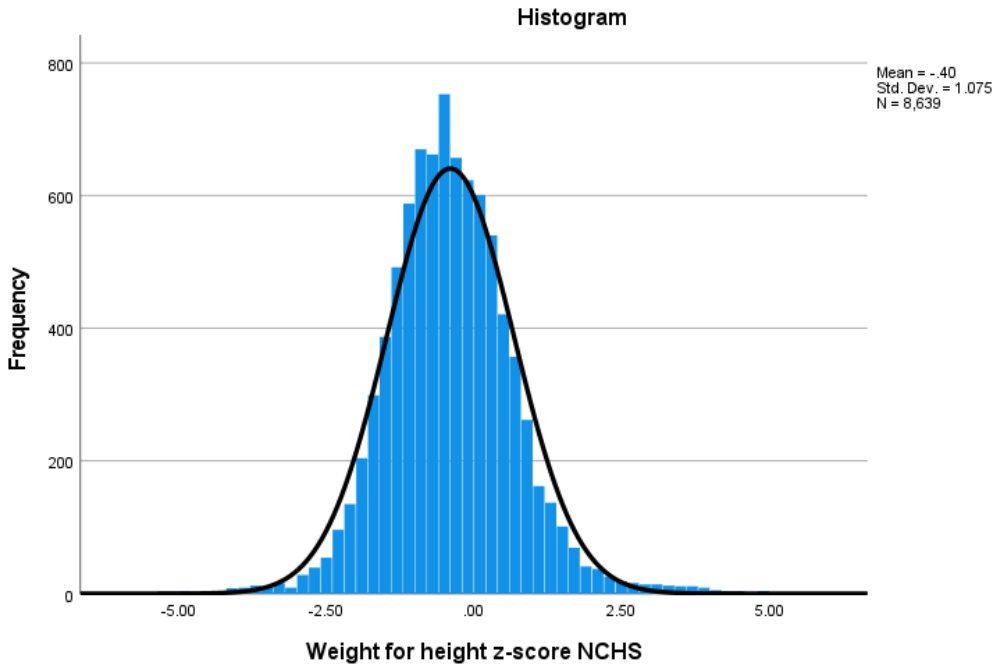
Acute Malnutrition and Displacement Status Crosstabulation

	Displacement status					
	Never displaced		Displaced		Total	
Acute malnutrition	*N*	%	*N*	%	*N*	%
No	2,857	94.8%	4,657	95.1%	7,514	94.9%
Yes	158	5.2%	242	4.9%	400	5.1%
Total	3,015	100.0%	4,899	100.0%	7,914	100.0%

Figure 4 represents the distribution of WHZ scores around the median which is -.450, the mean being -.398 and a standard deviation of 1.075. The range and distribution of z-score values within the sample population influence the shape and position of its distribution curve. The reference population that serves as an international basis for comparison was created by the National Center for Health Statistics (NCHS) and consists of established weight values for a given height. The histogram below slightly skews to the left (negative) of the NCHS reference population.

Figure 4

Distribution of Weight-for-Height Z-Scores



Out of the 8,923 children under 5 years of age, 8,626 (96.7%) had valid WHZ values. The remaining 297 (3.3%) had flagged values (either with values missing or with height-for-age z-scores below -6 SD or above +6 SD) and were subsequently excluded from the data analysis process. The global chronic malnutrition rate (stunting) in the sampled population which is defined as the proportion of children under-5 years of age with a height for age z-score below -2 SD was 33.0%. The chronic malnutrition rates of the 7,902 children of the 8,150 with a known displacement status were 31.9% for the displaced and 34.8% for the never displaced populations. These children are too short for their age. Table 11 presents the chronic malnutrition rates by displacement status.

Table 11

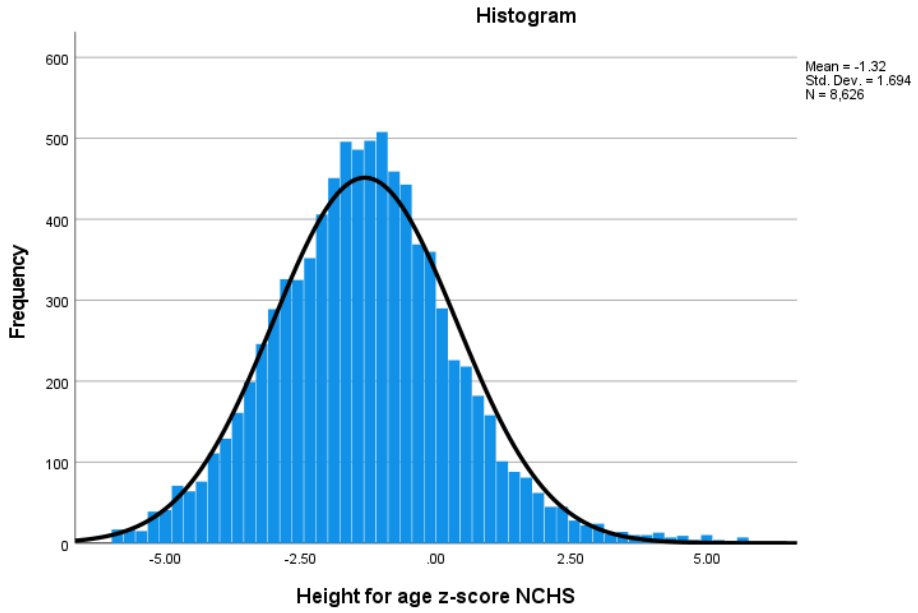
Chronic Malnutrition and Displacement Status Crosstabulation

	Displacement status					
	Never displaced		Displaced		Total	
Chronic malnutrition	*N*	%	*N*	%	*N*	%
No	1,961	65.2%	3,330	68.1%	5,291	67.0%
Yes	1,048	34.8%	1,563	31.9%	2,611	33.0%
Total	3,009	100.0%	4,893	100.0%	7,902	100.0%

Figure 5 represents the distribution of HAZ scores around the median which is -1.3400, with the mean being -1.3161. The distribution curve shifts to the left (negative) of the NCHS reference chart indicating high levels of stunting among the sample population.

Figure 5

Distribution of Height-for-Age Z-Scores



ARIs

MICS surveys assess the episodes of ARIs among children under-5 years of age by asking whether the child presented symptoms of ARIs during the two weeks preceding the survey. Out of the 8,923 children under-5 years of age sampled, 1,441 (15.9%) presented symptoms of ARIs during the two weeks preceding the survey. Among the displaced population, 718 (14.3%) presented symptoms of ARIs, while the proportion was 19.3% for the children who were not in a situation of displacement. Table 12 presents ARIs by displacement status.

Table 12

Acute Respiratory Infections and Displacement Status Crosstabulation

	Displacement status				Total	
	Never displaced		Displaced			
Acute respiratory infection	*N*	%	*N*	%	*N*	%
Yes	601	19.3%	718	14.3%	1,319	16.2%
No	2,509	80.4%	4,302	85.5%	6,811	83.6%
DNK	10	0.3%	10	0.2%	20	0.2%
Total	3,120	100.0%	5,030	100.0%	8,150	100.0%

Note. DNK = Does not know.

Results by RQ

RQ1

RQ1: Is there an association between internal displacement and the completion of the recommended vaccinations among children aged 12 to 23 months at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status?

$H_0$1: There is no association between internal displacement and the completion of the recommended vaccinations among children aged 12 to 23 months at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

$H_1$1: There is an association between internal displacement and the completion of the recommended vaccinations among children aged 12 to 23 months at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

The crosstabulation of internal displacement and vaccination status indicated that 65.8% of the children aged 12 to 23 months in situation of displacement were fully vaccinated compared to 63.8% of those who were never displaced. A crosstabulation of each of the three maternal characteristics was performed to gauge the association between vaccination completion among children aged 12 to 23 months and the mother's wealth index, education level, and residence status. The crosstabulation of the mother's wealth index and vaccination completion indicated that 89.7% of the children born from women in the very rich category were fully vaccinated compared to only 53.5% of children born from very poor mothers and 62.7% in the average wealth quintile. The crosstabulation of the mother's educational attainment and vaccination completion indicated that all 41 (100%) children born from mothers with secondary education and higher were fully immunized compared to only 55.6% of those born from mothers with preschool or no education. The proportion was 66.2% of children whose mothers had lower primary education and 84.4% for upper primary. Regarding the residency status and vaccination

completion, the crosstabulation results indicated that 80.2% of the children residing in urban areas were fully vaccinated compared to only 58.3% of those residing in rural areas.

I also performed a binary logistic regression analysis in SPSS to assess the association between the independent variable of internal displacement and the dependent variable of vaccination completion. The model was able to predict the vaccination completion status with accuracy 65.1% of the time. Displacement status was coded as 1 for displaced and 0 for not displaced while vaccination status was coded as 1 for complete vaccination and 0 for incomplete vaccination. The binary regression analysis provided an Exp(B) coefficient of 1.095, 95% CI [.853 - 1.407], p = .476 which was not significant (being greater than .05). Therefore, the odds of a child being fully immunized were not associated with displacement status. I also performed a univariate regression analysis to assess the association between vaccination completion and the maternal characteristics of wealth index, education level, and residence status. The crude odds of a very rich mother having a fully vaccinated child were 7.568, 95% CI [4.381 – 13.071] greater than a very poor mother (p <.001), which is significant. The only non-significant *OR* in this model was 1.041, 95% CI [.739 – 1.466] for mothers with a poor wealth index (p = .817). The richer the mother, the higher the odds of having a fully vaccinated child. The binary logistic regression analysis also indicated an association between mothers' level of education and children's vaccination status with p <.001. The *OR* increased with the education level. Finally, the binary logistic regression analysis results indicated an association between mothers' residence status and children's vaccination status. The

Exp(B) coefficient for rural residence was .346, 95% CI [.260 - .461], p <.001, which is significant. Therefore, the odds of a child born from a mother residing in a rural area being fully vaccinated were 65.4% less than a child residing in an urban area.

The crude *OR* for vaccination completion among displaced children was 1.097, 95% CI [.853 - 1.407], p = .476, which is not significant. After controlling for the confounding factors, table 13 provides an adjusted *OR* for vaccination completion among displaced children of .973, 95% CI [.748 - 1.265], p = .838 which is not significant.

Table 13

Logistic Regression Analysis of Internal Displacement and Vaccination Completion and Maternal Characteristics

							95% C.I. for EXP(B)	
	B	*S.E.*	Wald	*df.*	Sig.	Exp(B)	Lower	Upper
Step 1 (a)								
Displacement status (1)	.091	.128	.508	1	.476	1.095	.853	1.407
Constant	.565	.101	31.366	1	<.001	1.760		
Step 2 (b)								
Displacement status (1)	-.027	.134	.042	1	.838	.973	.748	1.265
Wealth index			21.570	4	<.001			
Wealth index (1)	-.045	.182	.060	1	.807	.956	.669	1.366
Wealth index (2)	.246	.186	1.737	1	.188	1.279	.887	1.842
Wealth index (3)	**.629**	**.208**	**9.200**	**1**	**.002**	**1.877**	**1.249**	**2.818**
Wealth index (4)	**1.253**	**.337**	**13.866**	**1**	**<.001**	**3.501**	**1.810**	**6.771**
Mother's level of education			14.231	3	.003			
Mother's level of education (1)	**.373**	**.136**	**7.552**	**1**	**.006**	**1.452**	**1.113**	**1.894**
Mother's level of education (2)	**.883**	**.272**	**10.520**	**1**	**.001**	**2.418**	**1.418**	**4.122**
Mother's level of education (3)	19.962	6548.8	.000	1	.998	46684934	.000	.
Residence (1)	-.194	.182	1.134	1	.287	.824	.576	1.177
Constant	.198	.233	.725	1	.395	1.219		

(a). Variable(s) entered on step 1: Displacement status.
(b). Variable(s) entered on step 2: Wealth index, Mother's level of education, Residence.

Therefore, I accept the null hypothesis. There is no association between internal displacement and vaccination completion among children aged 12 to 23 months either before or after controlling for the mother's characteristics of wealth index, education attainment, and residence status.

RQ2

RQ2: Is there an association between internal displacement and the malnutrition status of children under 5 years of age at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status?

$H_0$2: There is no association between internal displacement and the malnutrition status of children under 5 years of age at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

$H_1$2: There is an association between internal displacement and the malnutrition status of children under 5 years of age at the time of the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

Acute Malnutrition. The crosstabulation of acute malnutrition and internal displacement indicated that 4.9% of the displaced children suffered from acute malnutrition while the proportion of nondisplaced children with acute malnutrition was 5.2%. Crosstabulations did not yield any significant difference in acute malnutrition with the three maternal characteristics of wealth index, education level, and residence status. A univariate binary logistic regression analysis was performed to assess the association between the independent variable of internal displacement and the dependent variable of acute malnutrition. The binary logistic regression analysis provided an Exp(B) coefficient

of .940, 95% CI [.765 – 1.154], p =.553 which is not significant (being greater than .05). Therefore, the odds of a child being acutely malnourished were not associated with the displacement status. Univariate logistic regression analysis tests did not yield significant test results between acute malnutrition and women's wealth index, education level, or residence status. For example, the *p*-values of the mother's education level ranged from .130 for no education to .394 for secondary education and higher. The Exp(B) coefficient of women's residence status and acute malnutrition was .936, 95% CI [.765 – 1.146], p =.523 which is not significant. Table 14 provides crude and adjusted *OR* of the association between internal displacement and acute malnutrition.

Table 14

Logistic Regression Analysis of Internal Displacement and Acute Malnutrition and Material Characteristics

							95% C.I. for EXP(B)	
	B	*S.E.*	Wald	*df*	Sig.	Exp(B)	Lower	Upper
Step 1 (a)								
Displacement status (1)	-.062	.105	.352	1	.553	.940	.765	1.154
Constant	-2.895	.082	1254.749	1	<.001	.055		
Step 2 (b)								
Displacement status (1)	-.058	.107	.296	1	.586	.944	.766	1.163
Mother's level of education			6.223	3	.101			
Mother's level of education (1)	**-.239**	**.116**	**4.212**	**1**	**.040**	**.788**	**.627**	**.989**
Mother's level of education (2)	-.183	.180	1.030	1	.310	.833	.585	1.186
Mother's level of education (3)	-.546	.286	3.643	1	.056	.579	.330	1.015
Wealth index			5.937	4	.204			
Wealth index (1)	.177	.161	1.217	1	.270	1.194	.871	1.636
Wealth index (2)	.016	.165	.010	1	.922	1.016	.735	1.405
Wealth index (3)	-.161	.181	.796	1	.372	.851	.597	1.213
Wealth index (4)	.188	.215	.760	1	.383	1.206	.791	1.839
Residence (1)	-.157	.147	1.135	1	.287	.855	.641	1.141
Constant	-2.694	.192	197.427	1	<.001	.068		

(a). Variable(s) entered on step 1: Displacement status.
(b). Variable(s) entered on step 2: Mother's level of education, Wealth index, Residence.

The crude *OR* for acute malnutrition among displaced children was .940, 95% CI [.765 - 1.154], p =.553 which is not significant. After controlling for the confounding factors, the adjusted *OR* for acute malnutrition among displaced children was .944, 95% CI [.766 - 1.163], p = .586 which is not significant. Logistic regression analysis results for displacement and acute malnutrition indicate that there is no association between

displacement and acute malnutrition either before and after controlling for mothers' characteristics of wealth index, education level, and residence. Therefore, I accept the null hypothesis. There is no association between population displacement and acute malnutrition.

Chronic Malnutrition. Crosstabulation results indicated that only 19.4% of the children whose mothers were classified as very rich were chronically malnourished compared to 39.7% of the children whose mothers were classified as very poor. Moreover, only 12.9% of the children whose mothers had secondary education levels or higher were chronically malnourished compared to 39.0% of the children whose mothers had preschool or no education. As for the residence status, 38.6% of the children from rural areas were chronically malnourished compared to only 24.1% from urban areas. The Odds of a very rich woman having a chronically malnourished child were .364, 95% CI [.311 - .427] or 65.6% less compared to .682, 95% CI [.594 - .784] or 31.8% and .854, 95% CI [.744 - .980] or 14.6% for the rich and average quintile groups respectively (p <.001). The higher the mother's wealth index, the lower the odds of having a chronically malnourished child. The results of the binary logistic regression also indicated an association between chronic malnutrition and the mother's level of education. In a univariate logistic regression analysis model, the odds of a mother having a chronically malnourished child decreased as the education level increased; from .822, 95% CI [.745 - .906] for lower primary, .463, 95% CI [.398 - .540] for upper primary, .232, 95% CI [.177 - .305], p <.001 for secondary and higher. The odds of a mother from a rural area having a chronically malnourished child were 1.981, 95% CI [1.794 – 2.187] greater than

a mother from an urban area (p <.001). Table 15 presents crude and adjusted *OR* of internal displacement and chronic malnutrition.

Table 15

Logistic Regression Analysis of Internal Displacement and Chronic Malnutrition and Maternal Characteristics

							95% C.I. for EXP(B)	
	B	*S.E.*	Wald	*Df*	Sig.	Exp(B)	Lower	Upper
Step 1 (a)								
Displacement status (1)	**-.130**	**.049**	**7.007**	**1**	**.008**	**.878**	**.798**	**.967**
Constant	-.627	.038	268.137	1	<.001	.534		
Step 2 (b)								
Displacement status (1)	-.005	.050	.009	1	.924	.995	.902	1.098
Mother's level of education			45.356	3	<.001			
Mother's level of education (1)	**-.133**	**.053**	**6.224**	**1**	**.013**	**.876***	**.789**	**.972**
Mother's level of education (2)	**-.453**	**.091**	**25.022**	**1**	**<.001**	**.636**	**.532**	**.759**
Mother's level of education (3)	**-.924**	**.164**	**31.779**	**1**	**<.001**	**.397**	**.288**	**.547**
Wealth index			25.135	4	<.001			
Wealth index (1)	.000	.074	.000	1	.998	1.000	.866	1.156
Wealth index (2)	-.129	.074	3.016	1	.082	.879	.760	1.017
Wealth index (3)	**-.222**	**.080**	**7.738**	**1**	**.005**	**.801**	**.685**	**.937**
Wealth index (4)	**-.492**	**.108**	**20.800**	**1**	**<.001**	**.611**	**.495**	**.755**
Residence (1)	**.244**	**.069**	**12.417**	**1**	**<.001**	**1.277**	**1.114**	**1.462**
Constant	-.565	.090	39.341	1	<.001	.568		

(a). Variable(s) entered on step 1: Displacement status.
(b). Variable(s) entered on step 2: Mother's level of education, Wealth index, Residence.

The crude *OR* for chronic malnutrition among displaced children was .878, 95% CI [.798 - .967], p =.008 which is significant, indicating a close association between displacement and chronic malnutrition. After controlling for the confounding factors, the adjusted *OR* for acute malnutrition among displaced children was .995, 95% CI [.902 - 1.098], p =.924 which is not significant. The multiple logistic regression analysis results for displacement and chronic malnutrition indicate a lack of association between displacement and chronic malnutrition after controlling for mothers' characteristics of wealth index, education level, and residence. Therefore, I accept the null hypothesis. There is no association between population displacement and chronic malnutrition.

RQ3

RQ3: Is there an association between internal displacement and symptoms of ARIs among under-5 children during the 2 weeks preceding the survey while controlling for mother's characteristics of wealth index, education attainment, and residence status?

$H_0$3: There is no association between internal displacement and symptoms of ARIs among under-5 children during the 2 weeks preceding the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

$H_1$3: There is an association between internal displacement and symptoms of ARIs among under-5 children during the 2 weeks preceding the survey while controlling for the mother's characteristics of wealth index, education attainment, and residence status.

Crosstabulation results of internal displacement and residence status indicated that 14.3% of the children in the situation of displacement presented symptoms of ARIs, compared to 19.3% of the children who were not in a situation of displacement. The crosstabulations results of ARIs and the maternal characteristics of wealth index, education, and residence status were virtually identical between displaced and non-displaced children. The binary logistic regression analysis to assess the association between the independent variable of internal displacement and the dependent variable of ARIs yielded an Exp(B) coefficient of .697, 95% CI [.619 - .785], p <.001. Therefore, the odds of a child suffering from ARIs were closely associated with displacement status. The Odds of a displaced child suffering from an acute respiratory infection were 69.7% higher than a non-displaced one. Univariate binary logistic analysis between ARIs and the three maternal characteristics of wealth index, education level, and residence status did not yield statistically significant test results ($p > .05$). Table 16 below presents crude and adjusted *OR* of internal displacement and ARIs.

Table 16

Logistic Regression Analysis of Internal Displacement and Acute Respiratory Infections and Maternal Characteristics

							95% C.I. for EXP(B)	
	B	*S.E.*	Wald	*df*	Sig.	Exp(B)	Lower	Upper
Step 1 (a)								
Displacement status (1)	**-.361**	**.061**	**35.403**	**1**	**<.001**	**.697**	**.619**	**.785**
Constant	-1.429	.045	990.162	1	<.001	.240		
Step 2 (b)								
Displacement status (1)	**-.374**	**.062**	**36.636**	**1**	**<.001**	**.688**	**.610**	**.777**
Mother's level of education			16.226	3	.001			
Mother's level of education (1)	**.232**	**.069**	**11.285**	**1**	**<.001**	**1.261**	**1.102**	**1.444**
Mother's level of education (2)	**.347**	**.107**	**10.548**	**1**	**.001**	**1.415**	**1.147**	**1.744**
Mother's level of education (3)	**.391**	**.159**	**6.074**	**1**	**.014**	**1.479**	**1.083**	**2.018**
Wealth index			9.671	4	.046			
Wealth index (1)	**-.223**	**.094**	**5.580**	**1**	**.018**	**.800**	**.665**	**.963**
Wealth index (2)	**-.261**	**.095**	**7.579**	**1**	**.006**	**.770**	**.640**	**.928**
Wealth index (3)	**-.231**	**.101**	**5.284**	**1**	**.022**	**.794**	**.652**	**.967**
Wealth index (4)	-.185	.128	2.079	1	.149	.831	.646	1.069
Residence (1)	.123	.088	1.974	1	.160	1.131	.952	1.344
Constant	-1.492	.113	174.391	1	<.001	.225		

(a). Variable(s) entered on step 1: Displacement status.
(b). Variable(s) entered on step 2: Mother's level of education, Wealth index, Residence.

The unadjusted *OR* for ARIs among displaced children was .697, 95% CI [.619 - .785], p <.001 which is significant. After controlling for the confounding factors, the adjusted *OR* for acute malnutrition among displaced children was .688, 95% CI [.610 - .777], p <.001 which is still significant. Logistic regression analysis results for displacement and ARIs indicate a close association between displacement and ARIs

among children under-5 years of age both before and after controlling for mothers' characteristics of wealth index, education level, and residence. Therefore, I reject the null hypothesis. There is an association between population displacement and ARIs. After controlling for maternal characteristics, the odds of a non-displaced child suffering from acute malnutrition were 68.8% less than a displaced one.

Statistical Analysis Assumptions

I used the binary logistic regression test to address the three RQs in this study. This statistical analysis test assesses whether there is an association between each variable in the three RQs. Logistic Regression was used to determine and test whether the independent variable of internal displacement had any association with the dependent variables of vaccination completion, malnutrition (acute and chronic), and ARIs. Binary logistic regression was also used to determine whether the confounding factors of the mother's wealth index, educational attainment, and residence had any association with the dependent variables. According to Warner (2021), a logistic regression analysis model must meet the following rules to be considered accurate: (1) the outcome variable must be dichotomous or binary; (2) the observations must be independent or mutually exclusive; (3) the desired outcome is the factor of one; and (4) the sample size must be sufficiently large. All these assumptions were met in this logistic regression analysis.

Given the fact that 31.7% of the children 12 to 23 months had an unknown vaccination status due to missing data, I conducted a sensitivity to assess the robustness or consistency of the results because missing data have implications on reliability, validity, and generalizability of the research findings (Thabane, et al., 2013). Using all

the variables in the equation (age of the children, vaccination status, displacement status, and maternal characteristics of wealth index, education level, and residence), I conducted a missing completely at random test which gave the expectation-maximization (EM) output table 17.

Table 17

EM Means

UB2	HH6	Melevel	Windex5
1.00	1.69	.77	2.83

a. Little's MCAR test: Chi-Square = 8.472, DF = 4, Sig. = .076

Note. UB2 = Under-5 children; HH6 = Household residence; Melevel = Education level; Windex5 = Wealth index.

The EM estimate table above indicates that the test is not significant (p=.076), and I concluded that the data were missing completely at random because the pattern of missing values did not depend on the data values. Therefore, it was safe to ignore the missing values.

Summary

In this section, I presented the results from the analysis of the MICS6-RCA dataset of 2018-2019. The section included the purpose of the study, the baseline descriptive and demographic characteristics of the sample, the results of the descriptive statistics that appropriately characterize the sample, the RQs and hypotheses tested, and the key findings. I examined one key categorical independent variable of population displacement and 3 categorical dependent variables of vaccination completion, malnutrition (acute and chronic), and ARIs. I used the binary logistic regression statistical

test to analyze the variables under study. In RQ1, I tested whether there was an association between internal displacement and vaccination completion. Logistic regression analysis, including *p*-values, *OR*, and confidence interval demonstrated a lack of association both before and after controlling for children's mothers' characteristics of wealth index, education level, and residence status as the *p*-values were not statistically significant. Therefore, I accepted the null hypothesis and concluded that there was no association between internal displacement and vaccination completion among children aged 12 to 23 months in the CAR. In RQ2, I examined the association between internal displacement and malnutrition. Again, the logistic regression analysis results showed a lack of association between internal displacement and malnutrition (both acute malnutrition and chronic malnutrition) before and after controlling for the mothers' characteristics of wealth index, education level, and residence status. I accepted the null hypothesis and concluded that there was no association between internal displacement and malnutrition among children under 5 years of age in the CAR. For RQ3, I examined the association between internal displacement and ARIs. The logistic regression analysis results showed a significant association between displacement and ARIs both before and after controlling for the mother's characteristics of wealth index, education level, and residence status. I rejected the null hypothesis as the results supported the alternative hypothesis of an association between internal displacement and ARIs among children under 5 years of age in the CAR. The odds of a displaced child suffering from ARIs were 68.8% higher than those of a nondisplaced one (95% CI [.610 – .777], $p < .001$).

In the last section of this quantitative doctoral study, I provide an interpretation of the findings based on peer-reviewed research articles consulted during the literature review process. I will also analyze the findings of the study in the context of the socioecological theoretical framework. Finally, the limitations of the study will be described, recommendations presented, and potential implications for professional practice and positive social change discussed.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The purpose of this quantitative doctoral study was to assess the association between internal population displacement and some of the factors that contribute to under-5 mortality in complex humanitarian emergencies such as the CAR. For this cross-sectional study design, I used a secondary dataset collected by the government of the CAR and its partners and maintained by UNICEF. I examined the association between the independent variable of internal population displacement and the dependent variables of vaccination completion among children aged 12 to 23 months, malnutrition, and ARIs among children under 5 years of age while controlling for maternal characteristics of wealth index, education level, and residence status. The findings of this study can be used by the government and international organizations operating in the CAR in the design and implementation of evidence-based context-specific interventions for a reduction of preventable child deaths in line with the SDGs' goals, objectives, and targets. Although several researchers such as Roth (2018), Bendavid et al. (2019), and Schedwin et al. (2022) extensively studied the key factors that contribute to the high under-5 mortality burden in sub-Saharan Africa, to the best of my knowledge, an association between internal population displacement and these factors of under-5 mortality has not yet been documented in a context as fragile the CAR where an estimated 25% of the citizens are internally displaced.

The secondary dataset I examined had 8,923 valid records of children under 5 years of age, with a mean age of 2.03 years (24.36 months), a median of 2.0 years (24

months), and a mode of 3 years (36 months). The total number of children aged 12 to 23 months was 1,685 (18.9% of the sample). Only 38.3% of the children under 5 years of age were born to mothers who never experienced displacement while the remaining 61.7% were born either in a situation of displacement or were displaced after birth. The total number of children aged 12 to 23 months who were fully immunized was 749 (65.1%) while the remaining 402 (34.9%) had an incomplete immunization status. Out of the 1,151 children with a known vaccination completion status, 425 children (36.9%) were never displaced while the remaining 726 children (63.1%) were in a situation of internal displacement. The results of the sensitivity analysis test indicated that the EM test estimates were not significant (p = .076), and I concluded that the data were missing completely at random because the pattern of missing values did not depend on the data values. Both the unadjusted and adjusted *OR* for vaccination completion among displaced children were not significant with p = 1.097 and p = .973 respectively. The null hypothesis was subsequently accepted, and I concluded that there was no association between internal displacement and vaccination completion among children aged 12 to 23 months.

The rate of acute malnutrition in the sample population was low, only 5.1% with a 95% CI [5.073 – 5.127]. However, 33.0%, 95% CI [32.964 – 33.036] of the sampled children suffered from chronic malnutrition even though the difference was not statistically different between displaced and nondisplaced children. Nevertheless, neither acute nor chronic malnutrition had significant test results in regression analysis with a respective adjusted *OR* = .944, 95% CI [.766 – 1.163], p = .586 and adjusted *OR* = .995,

95% CI [.902 – 1.098], $p = .924$. The null hypothesis was accepted, and I concluded that there was no association between internal displacement and malnutrition.

Finally, 16.2% of the children sampled were affected by at least one episode of ARIs during the 2 weeks preceding the surveys. The unadjusted and adjusted *OR* for ARIs among displaced children were significant ($p < .001$). The null hypothesis was rejected, and I concluded that there was an association between internal displacement and ARIs. Displaced children had a better chance of not suffering from ARIs because the odds of displaced children suffering from ARIs were 68.8% less than the nondisplaced ones ($p < .001$).

Interpretation of Findings

The purpose of this study was to examine whether internal displacement was associated with vaccination completion, malnutrition, and ARIs in the CAR. In this study, I examined and tested 3 RQs and hypotheses. In the first RQ, I hypothesized that there was no association between internal displacement and vaccination completion. SPSS logistic regression analysis results indicated that there was no statistically significant difference between internal displacement and vaccination completion both before or after controlling for maternal characteristics of wealth index, education level, and residence status. In the second RQ, I hypothesized an association between internal displacement and malnutrition. Logistic regression analysis results showed no statistically significant association between internal displacement and malnutrition. In RQ3, I hypothesized that internal displacement was associated with ARIs. Logistic regression analysis results

showed a statistically significant association between internal displacement and ARIs with nondisplaced children being more at risk of ARIs than displaced ones ($p < 0.001$).

Interpretation of Findings with Relation to the Peer-Reviewed Literature

Internal Displacement and Vaccination Completion

In the first RQ, I assessed the association between internal population displacement and vaccination completion. I hypothesized that internal displacement was associated with vaccination completion. Even though the childhood immunization coverage rates in the sampled population were relatively low and confirmed the studies by Farra et al. (2019) and Martin et al. (2021), who demonstrated how low, falling, and stagnant vaccination coverage rates were the key drivers of vaccine-preventable diseases in sub-Saharan Africa, there was no statistical difference between the displaced and nondisplaced children. The logistic regression odds ratios were not associated with vaccination completion after controlling for maternal characteristics of wealth index, education level, and residence status ($p = .973$). Childhood immunization is one of key primary healthcare interventions priorities of humanitarian organizations operating in the CAR. Children are vaccinated regardless of the displacement status. One key possible explanation of the low vaccination rates is the possession of a vaccination card, which is a good predictor of vaccination completion (Okello et al., 2022). A fully immunized child is the one who has received all the required doses of the six mandatory vaccines: BCG, polio, pentavalent, pneumococcal conjugate, measles, and yellow fever. Without a vaccination card, it is difficult to ascertain beyond any reasonable doubt a child vaccination completion status. Furthermore, lack of access to hard-to-reach areas due to

insecurity and other logistical constraints and traditional beliefs are some of the key hindrances to a successful implementation of the EPI in the CAR. Forced displacement may lead to a temporary disruption of childhood services as documented by Adamu et al. (2019) in the areas affected by the Boko Haram insurgency in northern Nigeria and the loss of vital documents including vaccination cards. However, this study demonstrated that internal displacement alone does not have any association with long-term vaccination completion, particularly for a population that has been displaced for several months, if not years. An overwhelming 92.7% of the displaced sampled population has been living in a situation of displacement for a year or more. Nevertheless, this study confirmed the role played by maternal factors of education attainment, financial dependency, and residence status in vaccination completion and reaffirmed the results of studies by Okello et al. (2022) in Uganda and Gonzales et al. (2022) among Spanish and non-Spanish speaking indigenous women of Peru ($p < .001$). This study in the CAR revealed that a mother's secondary education level and higher was a predictor of a perfect childhood immunization completion within the recommended age window, affirming the results of the study by Gonzales et al. as well as Janusz et al.'s (2021) cross-sectional study, which found that the proportion of delayed vaccination was substantially lower for children born to mothers with higher levels of educational attainment and household wealth in sub-Saharan Africa ($p < .001$). A mother's education leads to increased awareness, change of attitude, and positive decision making because an educated woman can comprehend the information received.

Internal Displacement and Malnutrition

In the second RQ, I assessed the association between internal population displacement and malnutrition. I hypothesized that internal displacement was not associated with malnutrition. Even though the rates of acute malnutrition (wasting) were relatively low at 5.1%, 95% CI [5.073 – 5.127], chronic malnutrition (stunting) is a major public health issue among children under 5 years of age in the CAR with a rate of 33.0%, 95% CI [32.964 – 33.036]. Nevertheless, there was no statistical difference between displaced and nondisplaced children. The logistic regression odds ratios were not associated with acute malnutrition (p = .586) or chronic malnutrition (p = .924) after controlling for the mother's characteristics of wealth index, education level, and residence status. Therefore, there was no association between internal displacement and malnutrition among children under 5 years of age. The results of this study corroborate the findings of cross-sectional surveys conducted by Hossain et al. (2018) among Syrian refugees in Lebanon, Jordan, and Iraq in 2013 – 2014, which found relatively low rates of global acute malnutrition even though approximately half of the population of Syria has been displaced in addition to the millions living in refugee camps in neighboring countries. However, the results of this study contradict the findings of a research study conducted by Cumber et al. (2018) among IDPs in northern Cameroun and a cross-sectional analysis conducted by Iacoella and Tirivayi (2020) among children affected by the Boko Haram insurgency in Nigeria. Both research studies revealed increased rates of severe acute malnutrition among displaced and refugee populations in the two countries following forced displacement. Finally, the high rate of chronic malnutrition in the CAR

reaffirms the findings of a study conducted in Burkina Faso by Bougma et al. (2022), which documented high rates of undernutrition in contexts of internal population displacement due to inadequate feeding practices. There are two possible reasons for the low acute malnutrition rates in the CAR. First, the country's soil is fertile, and local agricultural outputs have always been good, albeit insecurity caused by armed groups. Second, the UN WFP and its partners implement a general food distribution targeting all people in need whether displaced or not. In addition, UNICEF complements the WFP's program with selective therapeutic and supplementary feeding interventions targeting malnourished children and pregnant and lactating mothers. Nevertheless, the high human development inequalities, low maternal education, and poor feeding practices lead to the high rates of chronic malnutrition (stunting) observed among displaced or nondisplaced children. Stunting is associated with poor brain development that affects a child's cognitive development, educational attainment, and productivity in adulthood. In other words, stunting decreases lifelong income-earning potential and labor force productivity, resulting in a vicious cycle of poverty and ill health.

Internal Displacement and ARIs

In the third RQ, I assessed the association between internal population displacement and ARIs. I hypothesized that internal displacement was associated with ARIs. The logistic regression odds ratio indicated a close association between displacement and ARIs ($p < .001$). None of the mother's characteristics of wealth index, education level, and residence status appeared to be statistically associated with ARIs. Thus, the rejection of the null hypothesis. There is an association between internal

displacement and ARIs among children under 5 years of age. ARIs may be a major cause of mortality burden in sub-Saharan Africa as documented by Chen et al. (2022) and Roth (2018); however, the results of this study indicated unexpectedly that displaced children in the CAR may be at an advantage because the odds of displaced children suffering from ARIs were .688 less than the nondisplaced ones (95% CI [.610 – .777], $p < .001$). ARI symptoms were collected during the 2018-2019 MICS6-RCA survey to capture symptoms related to pneumonia, the leading cause of death in children under 5 years of age. Once diagnosed, pneumonia cases are effectively treated with antibiotics. There are three possible explanations of this inverse association between internal displacement and ARIs. First, studies have shown a limitation in the survey approach to measuring pneumonia symptoms because many of the cases reported by mothers or caregivers are in fact not real cases of pneumonia (Dharel et al., 2023). Second, the high concentration of health facilities in IDP settlement areas that provide free diagnosis and treatment of childhood illnesses may be the reason why displaced children report fewer cases of ARIs compared to nondisplaced ones. Nondisplaced populations do not have easy access to health services as displacement populations due to physical barriers imposed by non-state armed groups (checkpoints) and distance. This limitation affects the level and patterns of seeking care for symptoms of ARIs among nondisplaced populations, hence the report of a higher rate of ARI cases during the surveys. The third explanation is the length of displacement. The degree of disorganization that reigns during the initial stages of forced displacement makes it difficult to provide health services to displaced populations, which leads to poor health outcomes. However, as documented among the Rohingya

populations in Bangladesh (Leidman et al., 2020), the living conditions and access to basic services improve as the situation stabilizes with the length of displacement and subsequent reduction of childhood infections, including ARIs.

Interpretations of the Findings in the Context of the Theoretical Framework

The SEM served as the foundational framework of this capstone. The SEM was first employed by Bronfenbrenner in 1979 and later modified by McLeroy et al. (1988) for health promotion purposes. SEM addresses the importance of interventions directed at changing behaviors at personal, interpersonal, community, organizational, and policy levels to prevent unhealthy behaviors and maintain and promote a healthy living style. The model can be adapted to contextualize and understand the association between internal displacement and the factors that influence a child's well-being at the five levels of influence and their relationships with one another.

Individual Level

Even though the results of this study did not find a statistically significant association between internal displacement and vaccination completion, malnutrition, and ARIs, these factors play a major role in ensuring children's good health and well-being. Several researchers such as Peyraud et al. (2018), Bendavid et al. (2019), and Schedwin et al. (2022) extensively documented the influence of vaccine-preventable diseases, nutrient deficiencies, and childhood illnesses such as ARIs on children's health outcomes, whether in a situation of displacement or not.

Intrapersonal Level

Factors of influence on child health and well-being at this level are mainly mother-related and may include age, parity, birth interval, prenatal and postnatal care, institutional delivery, breastfeeding, complementary feeding and weaning practices, maternal perception about child health, mother's socioeconomic status, and maternal decision-making status. Most of these maternal factors were not the subject of this study. However, the results of this study demonstrated the irrefutable association between the three dependent variables of vaccination completion, malnutrition, and ARIs, and maternal characteristics of wealth index, education attainment, and residency status and reconfirmed the findings of studies conducted by Janusz et al. (2021) in sub-Saharan Africa, Okello et al. (2022) in Uganda, and Gonzales et al. (2022) in Peru, who found that maternal education was the best predictor of childhood immunization completion in all regions studied followed by financial dependency.

Community Level

The community in which children live has an undeniable influence on their well-being. Poor living conditions facilitate the transmission of infectious diseases such as ARIs. The results of this study demonstrated the association between internal displacement and ARIs even though the association with maternal characteristics of wealth index, education attainment, and residency status was not statistically significant. This indicates that there were other factors in play such as access to health facilities, roads, electricity, water and sanitation system, information technology, etc.

Organizational Level

In addition to the maternal characteristics documented in this study, there are several other factors that play a major role in the association between internal displacement and vaccination completion, malnutrition, and ARIs. Such factors of influence may include local formal and informal rules, norms, and regulations that constrain access to preventive services such as immunizations. growth monitoring and integrated management of childhood illnesses. According to de Vries (2020), insecurity and taxation imposed by armed groups that control nearly 70% of the territory in the CAR prevent about a quarter of under-5 children from accessing health services including childhood immunization. These armed groups did not even facilitate the implementation of the MICS6-RCA survey in these hard-to-reach areas, a key factor that was not assessed in this study.

Policy Level

The adoption and adaptation of the SEM model at the policy level help understand national and local laws and policies that support and influence the association between internal displacement and vaccination completion, malnutrition, and ARIs. In the CAR, there are clear policies and guidelines on Integrated management of childhood illnesses and immunization for instance which unfortunately are not monitored due to the government's loss of control of nearly 70% of the territory to non-state armed groups.

Study Limitations

The data used for this study was collected in 2018 – 2019 by the National Institute of Statistics and Social and Economic Studies of the Ministry of Economy, Planning and

Cooperation and maintained by UNICEF. I analyzed a secondary dataset that was compiled for a purpose other than the one of this study which was to assess the association between the independent variable of internal displacement and the dependent variables of vaccination completion, malnutrition, and ARIs. During the data collection process, interviewers were unable to visit 99 (18%) of the 550 enumeration zones selected due to insecurity caused by non-State armed groups, thus excluding a sizeable proportion of the population, and limiting the representativity of the sample. The dataset was analyzed using the IBM SPSS version 28 to ensure the quality and address discrepancies in the data. Manipulation of the dataset was required to avoid errors caused by missing and invalid records and therefore jeopardize the validity and reliability of the dataset. I performed a transformation of the variables to account for missing and invalid records and to create categorical variables. Even though the results of the sensitivity analysis test indicated that the EM test estimates were not significant (p=.076), and that data were missing completely at random, the results of this study may not be representative of the entire population and may pose a threat to validity and reliability. Finally, in this study there was no disaggregation of data based on the reasons for displacement, length of displacement, or settlement sites. These three factors could have provided a contextual explanation for some of the findings of this study. Over 80% of the citizens of the CAR experienced some form of security-related displacement over the past 20 years (de Vries, 2020) leading to forced displacement of 50% of the total population of the country at the height of the crisis in 2013, but there are other people who chose to migrate voluntarily, and this could impact the three dependent variables under

consideration. Furthermore, according to the United Nations, nearly a third of the displaced persons live in informal settlement sites for IDPs managed by international NGOs, while the remaining two-thirds live with host families either within or outside areas under the control of the non-state armed groups. These factors were not taken into consideration in the data analysis process. Finally, for how long does one is considered as internally displaced? Nearly a quarter of the sampled population (24.6%) had been displaced for 10 years or more; a time long enough to settle and rebuild livelihoods.

Recommendations

Kohrt et al. (2019) writes that fragile contexts are often treated like outliers in global public health with little to no evidence base to inform governments and humanitarian organizations on the best strategies and approaches to achieve sustainable development. This quantitative research study assessed the association between internal population displacement and vaccination completion, malnutrition, and ARIs in a context as complex as the CAR with the aim of providing humanitarian practitioners the evidence base needed in the design of context-specific interventions required to minimize preventable childhood deaths. The first recommendation is to extend the surveys to the areas that were left out if security conditions allow. Otherwise, the status quo may lead to incomplete and/or erroneous interpretations. Three key variables that were not in consideration in this study were the length of displacement, settlement site, and the reason for displacement, whether forced or voluntary. Further research is needed to explore the potential influence of the length of displacement, settlement site, and reason for displacement on vaccination completion, malnutrition, and ARIs. Childbirth order,

possession of a health card, place of delivery, and religion are some other predictors of vaccination completion that were not explored in this study, and which should be considered for further research (Okello et al., 2022). In a context of frequent population movement such as the CAR, the possession of a vaccination card is the best proof of vaccination completion status and a reminder of the vaccination schedule. While maternal education implies that the mother can comprehend information received, which in turn may lead to increased awareness and change of attitude, possession of a child vaccination card enables the mother (or the other principal caregiver) to remember the child's immunization schedule. The findings of this study also demonstrate the need for a continued investment in educational attainment for both boys and girls and women empowerment and wealth creation that lead to autonomy, control and decision making. The rates of global acute malnutrition rates were encouraging and are in line with the results of a study conducted by Leidman et al. (2020) among the forcefully displaced Rohingya populations in Bangladesh which indicated that malnutrition rates increase during the early days of displacement but stabilize thereafter. However, high chronic malnutrition rates are of concern because stunting during the early years of life has serious and long-lasting effects on individuals, families, and communities. The higher odds of nondisplaced populations contracting ARIs compared to displaced were unexpected and this requires further investigation. However, one potential explanation is the length of displacement and the settlement site. As documented in Bangladesh, the living conditions in the environment in which displaced populations settle improve with the length of displacement (Leidman et al., 2020). Hence statistically significant lower

odds of ARIs among displaced populations compared to nondisplaced. Another recommendation is to replicate this study in another context of population displacement in sub-Saharan Africa such as the Great Lakes region, the Horn of Africa, the Lake Chad Basin, or the Sahel region of West Africa.

Implications for Professional Practice and Social Change

Professional Practice

The levels of vaccination coverage rates either among displaced or non-displaced populations are not sufficient for children to maintain lifelong immunity against vaccine-preventable childhood diseases. The government of the CAR, in partnership with the international organizations operating in the country, must adopt and implement new strategies to increase and maintain the immunization coverage rate to over 80% as recommended by the WHO. The second target of the second SDG on ending hunger, achieving food security, improving nutrition, and promoting sustainable agriculture calls for ending all forms of malnutrition, including achieving the internationally agreed targets on stunting and wasting in children under 5 years of age by 2030 (United Nations, n.d.). It is important to reduce and maintain the rate of acute malnutrition among children under 5 years of age to less than 5% as recommended by the 2012 World Health Assembly (WHO, n.d.). Stunted children fail to reach their physical and cognitive potential. Therefore, long-term development initiatives and poverty reduction strategies must be adopted to reduce child stunting by 40% as recommended by the WHO because stunting is not only a contributing risk factor to child mortality but also a marker of inequalities in human development. A key strategy for accelerating progress towards

SDG 3.2 of ending preventable deaths of newborns and children by 2030, is to tackle diseases such as pneumonia which are among the leading causes of death among children under 5 years of age. The high prevalence rate of ARIs in the sample population requires an improvement in living conditions and access to timely quality healthcare services for both displaced and non-displaced populations. Finally, the findings of this study demonstrate a need for continued and increased investment in girls' and boys' education as well as women empowerment for wealth creation as these two maternal characteristics have a close association with the three dependent variables of vaccination completion, malnutrition and ARIs.

Positive Social Change

The narrative has always been that displaced populations have worse health outcomes compared to non-displaced persons. Even though this study did not consider the length and reason of displacement, the results of this study indicate unexpectedly that non-displaced populations may be more prone to diseases such as ARIs, a finding which requires further investigation. Moreover, while the SDGs call for leaving no one behind, staying behind in the CAR is tantamount to being forgotten. MICS6-RCA survey interviewers were unable to visit 18% of the 550 enumeration zones due to insecurity caused by non-state armed groups and impassable roads. People in these hard-to-reach areas are forgotten, cut off from civilization, with no access to primary healthcare services. Unless the conflict and cycles of violence end, the CAR will never achieve the SDGs while leaving no one behind. In addition, most of the funding allocations for humanitarian organizations that provide over 80% of the health services in the CAR are

meant for catering to the health needs of the most vulnerable populations such as IDPs. The findings of this study demonstrate that nondisplaced populations are equally, if not more vulnerable to preventive infectious diseases such as pneumonia. Hence the need to increase funding allocations for international organizations operating in the CAR, negotiate humanitarian access to these hard-to-reach areas, and ensure equitable availability and access to quality primary healthcare services notwithstanding people's displacement status.

Conclusion

Most advocates of a principled humanitarian action push for improved and equitable access to curative, preventive, and promotional health services for forcibly displaced persons, particularly children under-5 years of age and pregnant and lactating women. Nondisplaced persons benefit from public health interventions only as part of the "do no harm" humanitarian mandate and not as priority target population of humanitarian organizations and their public and private donors. The results of this study demonstrate that nondisplaced populations are equally, if not more vulnerable to vaccine-preventable diseases, malnutrition, and ARIs than displaced persons. To accelerate the achievement of the United Nations Agenda 2030 for sustainable development, a paradigm shift is required to tackle human development inequalities and specifically reduce preventable deaths among children under-5 years of age regardless of the displacement status.

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