2021

Social Determinants of Maternal and Neonatal Birth Outcomes Among Syrian Refugees in Lebanon

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Walden University
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Abstract

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MA, Saint Joseph University, 2011

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Dissertation Submitted in Partial Fulfillment

Of the Requirements for the Degree of

Doctor of Philosophy

Public Health, Epidemiology 2

Walden University

November 2021

Abstract

Neonatal and maternal health indicators have been impacted due to Syrian refugees' displacement in Lebanon and an increase in child marriage rates from 13% in pre-conflict Syria to 41%. Using the causal continuum framework, the retrospective cross-sectional study's purpose was to examine whether there is a statistically significant association between adverse maternal and birth health outcomes among Syrian refugees in Lebanon and social determinants of health. The sample size drawn from UNHCR database included 48,083 maternal and 4,288 neonatal refugees admitted to the secondary health care in 2018. Pearson chi-square and binomial logistic regression results showed that employed, newcomers mothers aged 18 and above originating from Southwest Syria, residing in rural areas, accessing to cash and food assistance showed higher adverse maternal outcomes, while those educated and residing in Bekaa were protected. Socioeconomic vulnerability, employment, accommodations in collective shelters in the South, and fleeing in 2018 into Lebanon led to adverse neonatal outcomes. Moreover, mothers having access to cash, originating from Southwest Syria, and residing in Baalbeck, Akkar, and North governorates were less likely to experience adverse neonatal outcomes. Finally, employed mothers from the South were less likely to experience neonatal mortality. Further studies are suggested to enroll participants who delivered at noncontracted hospitals and follow up on their health status to monitor risk factors and outcomes. Standardized reporting of reproductive, maternal, newborn, and child health indicators is effective for monitoring and improving health outcomes. Strengthening the accountability framework for age, gender and diversity mainstreaming, and empowering women and girls is key to reach the Sustainable Development Goals to improve the health of women, girls, and children.

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Dedication

My humble effort I dedicate to my loving husband Zahi, my son Martin, my sweet daughter Lynn, my father Charbel, my mother Dolly, my sisters, brother, mother-in-law, and friends whose support, affection, prayers, and encouragement gave me strength to be able to succeed.

Acknowledgments

I would like to express my special thanks of gratitude to my chairperson, Dr. Nancy Rea, the committee member, Dr. Kate L. Callahan-Myrick, and the University Research Reviewer, Dr. Pelagia Melea, for their guidance and advice throughout all the stages of writing my dissertation.

I take the opportunity to thank as well Walden community and the professors who supported me in achieving my degree.

An appreciation to UNHCR Lebanon team, specifically Dr. Jakob Arhem (Public Health Officer) and Dr. Asaad Kadhum (Senior Public Health Officer) who helped in the selection of this important topic and for their regular encouragement and support throughout the different phases of this study.

A special and warm thanks to my husband Zahi, my son Martin, my daughter Lynn, and my family and friends for giving me the motivation and inspiration to keep moving forward during the whole study and research process. Your prayers have sustained me so far.

Finally, I would like to thank God who kept me strong and allowed me to follow and reach my dreams. “Thank you God for everything in my life, for the good and the bad. Some were blessings and some were lessons”.

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Chapter 1: Introduction to the Study

In 2016, the United Nations reported 65.5 million persons displaced worldwide by conflict and persecution. This is the highest level of displacement ever recorded, and about half were women. Many studies have described negative experiences of migrants and refugees in hosting countries, their levels of suffering and disparities fueling health inequalities, and consequently adverse maternal and neonatal birth outcomes. Syrian refugees in Lebanon are impacted by poverty, marginalization, social exclusion, unfair policies, lack of protection, and other concerns. Syrian refugee women and children are vulnerable groups exposed to different stressors related to socio-economic levels, security, and other factors (Inter-Agency Standing Committee, 2016; United Nations High Commissioner for Refugees [UNHCR], 2018b; UNHCR, United Nations Children's Fund [UNICEF], World Food Program [WFP], 2017, 2018).

Social determinants of health and women's life circumstances predict and determine both their and their babies' health. These social determinants include different factors such as education level, racial disparities, age of pregnancy, work conditions and income, social support, perceived need for and use of community resources, physical environment and housing, partner violence, active and passive smoking, and depression. Addressing the social determinants of health related to Syrian refugee women and children in Lebanon through targeted efforts plays a critical role in tackling health disparities to eventually improve maternal health and consequently newborn health (Alizadeh et al., 2014; Kumar & Raker et al., 2017). The study topic aligns with the Healthy Mother, Healthy Newborn initiative, aiming to provide antenatal care services

and any other type support needed for pregnant women to prevent negative health outcomes. These programs and interventions constitute an integral part of Millennium Development Goals (MDGs) developed by the World Health Organization (WHO) to lower global maternal and newborn deaths (World Health Organization [WHO], 2011). This chapter includes an overview of challenges faced by Syrian refugees in Lebanon, specifically the impact on maternal and neonatal health. Presented within the chapter are the purpose of this research, its nature, research questions and hypotheses, and conceptual framework that guided the research. Moreover, the chapter defines main terms that were used and discussed assumptions, limitations, scope and delimitations, and significance of the study.

Background of the Study

Ten years into the Syrian crisis that started in March 2011, Lebanon remains at the forefront of one of the worst humanitarian crises, having embraced more than one and a half million refugees, half of whom are children, and becoming the highest per capita host of refugees in the world (UNHCR, 2018b). Although Lebanon has not signed the 1951 Refugee Convention, it has signed most of the human rights treaties that are relevant to the protection of refugees. Since the beginning of the Syrian crisis, Lebanon's borders have been open to the influx of refugees and enabled their access to the existing systems in place, mainly to health and education. Moreover, the Government of Lebanon facilitated the coordination of the Syrian crisis response (UNHCR, 2013). The office of the UNHCR in Lebanon has developed a strategy to protect and assist Syrian refugees. This strategy is outlined through a close partnership with the Government of Lebanon

and various local and international nongovernmental organizations (NGOs) and partners, focusing on producing sound results and impact-oriented performance through different actors. The UNHCR included interventions to support the Lebanese government, host communities, and local authorities who bear the consequences of the Syrian refugee influx and presence.

The protracted Syrian crisis induced the need to develop a joint plan between the Government of Lebanon and its international and national partners focusing on humanitarian assistance to all vulnerable communities residing in Lebanese territories including the refugees, from which the Lebanon Crisis Response Plan (LCRP) 2017-2020 was created. The LCRP is a joint plan utilizing multi-year planning and yearly needs assessment to aid the population's most vulnerable groups through holistic and integrated approaches (United Nations, 2021). Furthermore, the London and Brussels conferences in 2017 titled "Supporting the Future of Syria and the Region" highlighted the importance of the international community in terms of revisiting the crisis response in order to promote social stability and cohesion between refugees and host communities and enable long-term development strategies (European Union, 2017). Therefore, the LCRP is considered a strategic document expanding the modalities of support through the various sectors to ensure the protection of displaced Syrians, vulnerable Lebanese, and Palestinian refugees while recognizing and committing to support for Lebanon (UNHCR, 2018b).

Despite UNHCR calls for funding various interventions and Syrian refugees' basic needs, Lebanon is experiencing a funding shortfall and unable to cover all growing

costs. Therefore, Syrian refugees in Lebanon are facing security challenges, are prone to vulnerabilities, and are unable to access all types of services to accommodate their basic needs (UNHCR, UNICEF, & WFP, 2017, 2018). 87% of persons displaced from Syria live in the country's 251 most vulnerable cadasters, and have experienced a sharp increase of the socio-economic vulnerability levels; 76% of them live below the poverty line, while 91% of households remain food insecure to some degree. Their vulnerability is correlated with lack of job opportunities and compounded by issues related to legal residency (UNHCR, 2018b; UNHCR, UNICEF, & WFP, 2017).

Child marriage, a less recognized form of gender-based violence, increased from 13% in pre-conflict Syria to 41% due to difficult economic situations, disruption of children's education, insecurity, and uncertainty regarding their future (Cherri et al., 2017; Girls Not Brides, 2018; IASC, 2016; Lari, 2017; UNHCR, 2018b). Only 70% of children aged six to 14 were enrolled in schools at a national level, with disparities between regions. The rates range from 78% in Akkar and Nabatieh to 59% in Bekaa. Costs of education, transportation, supplies, and clothing are considered the biggest barriers to education enrollment. Child labor remains a concern as well, with 4.8% of Syrian refugee children aged five to 17 reporting working (UNHCR, UNICEF, & WFP, 2017).

Maternal and neonatal deaths and morbidities are occurring at a rate that can be preventable. This study involves highlighting determinants predicting maternal and neonatal health burdens and coming up with recommendations that may contribute to improving their health and wellbeing. This topic, which has not been addressed yet,

remains one of the most important areas to study in order to generate interventions and recommendations for the best interests of Syrian refugee women, newborn and children.

Problem Statement

Maternal and neonatal health indicators among Syrian refugees in Lebanon require attention. Preterm deliveries constitute the main contributor to high mortality and morbidity rates among Syrian refugees in Lebanon. In 2015, the infant mortality related to prematurity was estimated at 26% from the total number of under one year of age mortalities; it increased to 52% in 2016 and 58% in 2017. The data captures only the overall admissions supported by UNHCR referral care program (El-Jardali et al., 2017; UNHCR, 2017b). The vital data observatory of the Ministry of Public Health which treats data from all reporting hospitals in Lebanon, highlights that the neonatal mortality rate for non-Lebanese read 6.8 and 6.75 per 1000 live births respectively in 2016 and 2017 (Lebanese Ministry of Public Health, 2018). Syrian refugees' maternal mortality rate is another concern. The vital data observatory showed that the maternal mortality ratio for non-Lebanese including Syrian Refugees was 29,7 per 100,000 in 2016 and 27.1 per 100,000 in 2017 (Lebanese Ministry of Public Health, 2018). Finally, there is an increased financial burden on the UNHCR and Syrian refugees related to adverse maternal health and birth outcomes. Additionally, refugees are becoming more vulnerable and unable to bear costs of their healthcare. Gopalan et al. (2017) recommended a targeted policy approach for vulnerable groups in conflict-affected situations in the Middle East in order to address related barriers and existing inequities involving predicting maternal and neonatal mortality. Many opportunities should be identified to

strengthen institutional and community-based interventions. Joint efforts by UN agencies, humanitarian actors, government, policy makers, should involve the social problem of child marriage from a holistic and comprehensive approach. In Lebanon, there have not been any studies undertaken yet among Syrian refugees that correlate social determinants of health with poor maternal and childbirth health outcomes; my study is original and contributes to filling a gap in knowledge.

Purpose of the Study

The purpose of the quantitative retrospective study is to examine the relationship between adverse maternal health and birth outcomes among Syrian refugees in Lebanon and social determinants of health. Secondary data that includes health outcomes were observed among Syrian refugee mothers and newborns in order to depict differences in terms of socioeconomic vulnerability, age at conception, access to cash and food assistance, educational attainment, geographic distribution, employment, time of arrival from Syria, and type of accommodation. This study addresses an under researched area, and is needed as an advocacy tool for the integration of social determinants of health into planning designed by the health sector and for a comprehensive response to emergent needs of refugees in Lebanon.

Research Questions and Hypotheses

RQ1: Is there a statistically significant difference in terms of neonatal birth outcomes (e.g. prematurity, respiratory distress, cardiac arrest, septicemia, acute respiratory failure, and other morbidities) between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability,

access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon?

$H_0$1: There is no statistically significant difference in terms of neonatal birth outcomes (e.g. prematurity, respiratory distress, cardiac arrest, septicemia, acute respiratory failure, and other morbidities) between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon.

H_a1: There is a statistically significant difference in terms of neonatal birth outcomes (e.g. prematurity, respiratory distress, cardiac arrest, septicemia, acute respiratory failure, and other morbidities) between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon.

RQ2: Is there a statistically significant difference in terms of neonatal mortality between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon?

$H_0$2: There is no statistically significant difference in terms of neonatal mortality between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon.

H_a2: There is a statistically significant difference in terms of neonatal mortality between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon.

RQ3: Is there a statistically significant difference in terms of maternal health outcome complications (e.g. missed abortion, maternal anemia, hemorrhage, premature separation of placenta, hypertension complicating pregnancy, pre-eclampsia, eclampsia, or any other complications involving pregnancy, delivery, and post-natal aggravating conditions) between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon?

$H_0$3: There is no statistically significant difference in terms of maternal health outcome complications (e.g. missed abortion, maternal anemia, hemorrhage, premature separation of placenta, hypertension complicating pregnancy, pre-eclampsia, eclampsia, and any other complications involving pregnancy, delivery, and post-natal aggravating

conditions) between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon.

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Conceptual Framework

Since the 1980s, the ecological model for health promotion has been a popular model for researchers and public health practitioners as a way to enforce individual knowledge and skills and inducing behavioral changes by focusing on interventions based at the individual, interpersonal, organizational, community, and public policy levels which support and maintain unhealthy behaviors. Introducing appropriate changes in the social environment of an individual or a community will influence positive changes in these individuals or in members of this specific community who will have an increased knowledge and influenced key attitudes and decisions. The support of individuals in the community is essential as well to implement and initiate environmental changes. Noting

that health promotion focuses on and take into consideration both individual and social environmental factors as targets for health promotion interventions to lead to life style changes. This model comes as a response to critics accusing life-style change proponents of promoting a victim-blaming ideology and neglecting the social and environmental factors interaction and their influence on health and disease (McLeroy et al., 1988). It ascertains that individuals are embedded within larger social systems which involve dynamics of interaction between the individual's characteristics and the social and environmental elements that underlie and lead to health outcomes (diseases, adverse events) (Golden & Earp, 2012).

Building on the work of Brofenbrenner (1977) who articulated a multilevel framework whereby behavior is affected by environmental influencers, divided between micro-, meso-, exo-, macrosystem levels. McLeroy et al. (1988) said there were five levels of influence within an ecological model of health promotion that determine patterned behaviors: intrapersonal factors, interpersonal processes and primary groups, institutional factors, community factors, and public policy (Golden et al., 2012; McLeroy et al., 1988). Intrapersonal factors are defined as the developmental history of an individual that encompasses elements including knowledge, skills, attitude. Interpersonal processes and primary groups involve formal and informal social networks and support systems as well as friends, work groups, families, and other close connections and groups. Institutional factors constitute characteristics as well as formal and informal rules and regulations for social institutions' operations. Community factors involve relationships between various organizations and groups existing within a specific

individual's network. Public policies are laws, policies, and regulations within a specific state or nation (McLeroy et al., 1988). In front of each health problem or concern, analysis of these five levels helps introduce health promotion interventions and strategies that support the ability to modify a certain health-related behavior (McLeroy et al., 1988).

The causal continuum framework relevant to the social ecology of health model fits my topic of interest and provide support in terms of understanding multilevel determinants of disease. It involves considering the presence of distal, intermediate, and proximate variables or factors that affect differently health outcomes of populations of interest based on degrees of directness of effects (Coreil, 2010). Various risk factors may influence Syrian refugees' maternal and neonatal mortality and morbidity in terms of the causal continuum. Distal determinants may include ecological settings encompassing types of accommodation (shelter, unfinished building, or rented house), the built environments and geographical distribution of refugees that may be unfavorable in terms of health, demographic features including educational level and areas of origin from Syria, discriminative cultural patterns and norms mainly related to early marriage of young Syrian refugee girls, and socioeconomic positions and vulnerabilities of participants. The intermediate determinants include refugees' occupation, social and economic support including access to cash assistance from the UNHCR, and time of arrival from Syria, which may be predictive of the capacity of families to build social networks, ties, and support. Proximate determinants include many factors, but the main variable to be considered in this study is biology, since the earlier onset of adolescence among young girls may be an important health influencer. Using the causal continuum

model lens, determinants of health are reviewed to understand social structure impact on maternal and neonatal health, which would in turn be used to guide multidisciplinary courses of action, policy development, and intervention design.

Nature of the Study

In order to answer the research questions, I used a retrospective cross-sectional quantitative design. Logistic regression analysis was used to predict the effect of Syrian refugees' maternal and neonatal health outcomes after adjusting for diverse confounding variables including socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, time of arrival from Syria, and type of accommodation in Lebanon. Secondary data were requested from the UNHCR through their referral care program, reception center, and assistance database. Significance tests (*OR*, 95% CI) were used to measure of how much greater, or less, the odds for developing maternal and neonatal complications or mortalities are for girls conceiving at an early age in comparison to those conceiving after the age of 18.

Definitions

Asylum seekers: Individuals who seek international protection and whose claims for refugee status have not yet been determined, irrespective of when they may have been lodged (Heslehurst et al., 2018)

Child marriage: Any formal marriage or informal union where one or both of the parties are under 18 years of age (Girls Not Brides, 2014).

Country of asylum: A country taking in refugees fleeing from persecution in a neighboring state (Gil-Bazo, 2015).

Fragile States Index: Data-based policy tool that highlights normal pressures experienced by states and identifies when those pressures are pushing states toward the brink of failure (Fund for Peace, 2018).

Maternal mortality: The death of the mother during pregnancy or within 42 days after the birth or termination of pregnancy, due to any cause related to or aggravated by pregnancy or its management, not including deaths from incidental or accidental causes (National Research Council, 2013; UNHCR, 2015).

Migrants: Those who move temporarily or permanently from one place, area, or country of residence to another for reasons such as work or seeking a better life, family reasons, or study. Migrants are termed refugees and asylum seekers when they migrate to flee conflict or persecution (Heslehurst et al., 2018)

Neonatal mortality rate: The number of neonates dying before reaching 28 days of age per 1,000 live births in a given year (Bhatti et al., 2017).

Nongovernmental organizations (NGOs): Organizations, both national and international, which are separate from government of the country in which they are founded (Sphere Association, 2018).

Persons displaced from Syria: Includes Palestine refugees from Syria and Lebanese returnees as well as registered and unregistered Syrian nationals.

Prematurity: Babies born alive before 37 weeks of pregnancy are completed. There are three subcategories of preterm birth, based on gestational age: extremely preterm (babies born when less than 28 weeks of pregnancy have been completed), very

preterm (babies born between 28 to 32 weeks of pregnancy), and moderate to late preterm (babies born between 32 to 37 weeks of pregnancy) (WHO, 2018).

Referral care program: UNHCR has put in place guidelines for referral health care in Lebanon and standard operating procedures to support access to life saving and obstetric care and to manage the costs of care for refugees (United Nations High Commissioner for Refugees, 2019a).

Refugee: Individuals who live outside the country of their nationality and are unable or unwilling to avail themselves of the protection of that country, or do not have a nationality (UNHCR, 2019b).

Social determinants of health: Conditions in which people are born, grow, live, work, and age (WHO, 2019a).

Stillbirth: Death in utero after 28 weeks of pregnancy (National Research Council, 2013).

Third party administrator (TPA): An organization that handles certain administrative responsibilities for other organizations (Bankrate, 2019). A TPA contracts health care providers for UNHCR's referral care program, confirms eligibility of UNHCR persons of concern to benefit from the program, manages financial and medical audits of care provided as well as payments to health care providers on behalf of the UNHCR.

UNHCR hospital network: TPA-contracted hospitals representing a network of public and private hospitals throughout Lebanon where refugees can access secondary and tertiary healthcare services (UNHCR, 2018a).

Vulnerability: Social and contextual factors involving discrimination and marginalization, social isolation, environmental degradation, climate variability, poverty, lack of land tenure, poor governance, ethnicity, class, caste, and religious or political affiliations (Sphere Association, 2018).

Assumptions

It was assumed that referral care program data captured by UNHCR through a TPA was accurate, reliable, and valid. It represents the information related to the utilization of the secondary health care system by the persons of concerns to UNHCR and incorporates individuals' information (e.g., name, DOB, etc.) and health related information (e.g., diagnosis on admission, admission on discharge, ICD 10 admission date, discharge date, provider name, etc.) The same assumption applies to demographic and assistance databases provided by the UNHCR reception center and assistance programs encompassing on the demographic information and all the entitlements and benefits per refugee household (e.g., cash support, and food support). For observations included in the sample of mothers and their offspring who utilized the referral care system in 2018, data were rigorous, veracious, and credible. I assumed as well that the sample size of Syrian refugee women and newborns admitted to contracted hospitals in Lebanon was representative of the overall Syrian refugee population in Lebanon.

Scope and Delimitations

The study involved examining the relationship between adverse maternal health and birth outcomes among Syrian refugees in Lebanon and social determinants of health. Data were accessed from the UNHCR through its secondary referral care program from

40 UNHCR contracted hospitals all over Lebanon between January until December 2018, noting that UNHCR collects and maintains a database for all Syrian refugee patients admitted to secondary health care programs under their support. Selected refugees included in the study were tracked to include demographic, socioeconomic, and assistance information through the reception center and assistance databases since the UNHCR office registers and keeps refugee information as well as entitlement to assistance programs. Data were cleaned, de-identified, and organized in a way to include refugees' demographic information, vulnerability status, and access to cash and assistance programs. Since I selected a sample of patients admitted to the maternity and obstetrical care, and to the intensive neonatal out of more than 80,000 admissions that happened in 2018, this was considered a delimitation of the study (UNHCR, 2018c). Moreover, as I conducted a quantitative study with a large sample, my study has a strong basis; results were generalized to the whole population of Syrian refugee mothers and newborns.

Limitations

The study included some limitations involving its design. Secondary data used to answer the research question excluded the patients admitted to noncontracted hospitals with UNHCR. Moreover, home deliveries occurring among Syrian refugees and their potential complications are never reported to the Ministry of Health, (UNHCR, 2017a). Since I relied solely on data sets for refugees admitted and covered by the UNHCR through the referral care program and within the contracted hospitals network, maternal mortality happening in any noncontracted hospital not covered by UNHCR TPA or

occurring in a private clinic or at home were difficult to address. Moreover, pregnant women who died from causes not directly related to pregnancy (e.g., various acute and chronic illnesses, accidents,…) are not necessarily captured through the data-base since they would get a non-obstetric diagnosis. Based on this, I refrained from studying maternal mortality and its association with social determinants of health and instead focused on maternal and neonatal morbidities as well as neonatal mortality. Moreover, among the potential limitations I can cite is the reliance on secondary data for which the quality of the information may be questionable, specifically in reference to the accuracy of the data collected by others than the researcher (Creswell, 2014).

Significance of the Study

The study's results may bring an original contribution to the literature and will fill a gap since there is no other study published yet that comprehensively evaluates the role of social determinants of health on Syrian refugee adolescent pregnancy.

Significance to Theory

This study will lead to potential contributions involving the advancement of knowledge related to the protracted Syrian crisis. It will allow for dissection of factors and social determinants that mostly contribute to negative and adverse maternal and birth outcomes among Syrian refugee women and newborns who fled into Lebanon, especially the relationship between specific selected social determinants of health and adverse maternal health and birth outcomes.

Significance to Practice

In terms of practice and policy, results will lead to substantial efforts that may improve Syrian refugees' maternal and neonatal health indicators. I highlighted the importance of delivering a comprehensive, aligned, and sound impact on health and community health programs in order to mitigate difficult socioeconomic living conditions affecting vulnerable refugees, specifically women, girls, newborns, and children.

Significance to Social Change

Ending child marriage is one of the main societal problems to be addressed, but this requires long-term and collective efforts at family, community, national, and international levels and should start through advocacy and community mobilization to change attitudes related to child marriage in addition to law enforcement. Girls' empowerment via different programs will lead to increased awareness about their rights and strengthen their social and economic roles and security (Girls Not Brides, 2014). Delivery programs to Syrian refugees should be evaluated and reviewed in order to prevent early marriage with specific attention on girls' access to education. The needs of married girls should not be neglected as well in order to mitigate early marriage and its impact on their and their newborns' health.

Summary and Transition

This chapter included a general overview of the Syrian crisis in Lebanon and challenges faced by Syrian refugees following the protracted crisis. I highlighted the impact of various determinants of health on child marriage and the related problem of increased maternal and neonatal mortality and morbidity. Chapter 2 includes an academic

literature review focusing on the humanitarian crisis, early marriage, determinants of health, and impact on mothers' and newborns' health.

Chapter 2: Literature Review

Introduction

The conflict in Syria has led to a massive displacement of refugees into Lebanon, and funding from international communities has kept them afloat. Syrian refugees endure many challenges that affect vulnerable groups and impact mainly the health of mothers, newborns, and infants.

In low and middle income regions, neonatal deaths represent around 44% of all deaths of children under 5 years of age. Prematurity and its related intrapartum and postpartum complications represent one of the main predictors and direct causes of these neonatal deaths, leading to around one million newborn deaths per year globally. 60% of premature births occur in Africa and South Asia, and this risk is increased due to poverty, recent conflict, humanitarian emergencies, and refugee operations (UNHCR, 2015; WHO, 2018). Financial repercussion and high burdens on the healthcare system is attributed to prolonged hospitalization and care of premature newborns, in addition to increased risk factors for complications and disability for those who survive the neonatal period (El-Jardali et al., 2017; WHO, 2018). Globally, prematurity survival inequalities are stark between middle-income and low-income countries due to failures and challenges of the latter's healthcare system to prevent at least three quarters of these deaths through feasible and cost-effective care of newborns. These findings highlight the importance of healthy pregnancies and recommendations for proper follow-up as key for preventing prematurity and consequently shrinking the toll of related newborn deaths and complications.

Maternal health, a global challenge and one of the drivers of existing inequities, requires an international commitment. Poor and vulnerable communities are responsible for most of the 385,000 maternal deaths, and on a daily basis, 1,000 woman die as a consequence of childbirth and pregnancy complications, most of which are preventable or treatable (Alizadeh et al., 2014; WHO, n.d.). Child marriage is one of the recurrent social events that rises among zones of conflict, regions affected by disasters or epidemics, and displaced populations. It has a negative repercussion on child brides' health since it exposes them to dangerous complications in pregnancy and childbirth that represent the second leading cause of death among 15 to 19-year-olds, in addition to elevated risks for domestic violence, leaving them physically and emotionally harmed (Girls Not Brides, 2019; Women's Refugee Commission, 2016). In conflict settings, child marriage is exacerbated by increased vulnerabilities of families, lost livelihood opportunities, and very essentially the lack of access to education. Moreover, it is associated with refugees' insecurities and need for parents to protect their girls by forcing them to get married.

Chapter 2 includes a summary of articles relevant to the study topic. It begins with a description of the causal continuum framework related to the study and its use in literature. Following this, the chapter provides an overview and definition of maternal and neonatal morbidities and mortalities globally in the context of displacement and refugees, and more specifically Syrian refugees. It also addresses social determinants of maternal and neonatal birth outcomes, differentiating between proximate, intermediate,

and distal factors. Finally, it provides general recommendations to improve maternal and neonatal health outcomes.

Literature Search Strategy

In order to select articles related to social determinants of maternal health and adverse birth outcomes among Syrian refugees, CINAHL Plus with full text and MEDLINE with full text were used, as well in ProQuest Health and Medical Collection and CINAHL and MEDLINE combined search. Keywords searched were *social determinants of health, maternal health, adverse birth outcomes, refugees, asylum seekers, displaced population, neonatal mortality, maternal mortality, prematurity, global migration, millennium development goals, child marriage, early marriage, early conception, sexual and reproductive health, antenatal care, post-natal care, socio-economic situation, vulnerability, girls education, disparity, health inequity, social policies, healthcare system in Lebanon, healthcare system and policies, governance, sexual and gender based violence, social isolation, women occupation, social capital, social support, neighbourhood deprivation, built environment, social norms and attitudes, discrimination, racism,* and *religion*. Studies, reports, documents, surveys, and assessments related to Syrian refugees' situations in Lebanon were searched with help from the UNHCR database, and interagency humanitarian organizations such as the United Nations Children's Fund, World Food Program, and Medair from 2015 to 2019. The latest United Nations General Assembly that was held in New York in late 2019 was addressed. The search also included studies from the WHO and Centers for Disease Control and Prevention (CDC).

Conceptual Framework

The social ecological model of health is rooted within the traditional public health model of host-agent-environment that served to study the relationship between the population, their surrounding environment, and the agents and diseases' pathogens. As an example of morbidities that can be explained concretely through that traditional model, one can cite waterborne diseases through which the humans who are the hosts use contaminated water that exposes them to an agent causing illness. This traditional model was expanded towards a social ecology of health model and incorporated social and environmental predictors for being fundamental contributors to health events and public health concerns (Coreil, 2010).

Brofenbrenner proposed a conceptual framework in 1977 that correlates individual behavior with environmental determinants, therefore creating an ecological perspective that accentuates individual health influences through different layers and level of influences at the micro-, meso-, exo-, and macrosystem levels. On the other hand, Belsky (as cited in McLeroy et al., 1988) built on the work of Brofenbrenner and succeeded in developing a model to address the child abuse social problematic taking into account the theory of individual development coupled with Brofenbrenner's ecological model while analyzing the individual, social, family, and cultural influences. Other theorists linked or relied on Brofenbrenner's model to develop their own work or models: Jackson developed a behavioral-environment model of health problems applied on health promotion activities. Seidman (as cited in McLeroy et al., 1988) used the ecological

model in community psychology problems, while Kersell and Milsum (as cited in McLeroy et al., 1988) used it to study human behaviors (McLeroy et al., 1988).

The causal continuum framework relevant to the social ecology of health model will be used in the current study to address the social determinants of maternal and neonatal mortality and morbidity of Syrian refugees. Through this model, the various categories of risk factors are positioned at different points along the continuum depending on the directness and indirectness of their influence or impact on the health concern under study. First, the distal determinants called up-stream forces, which are recognized as structural and fundamental causes because they operate through large social structures, complexly affect large groups in a certain community; as example of distal factors we cite the refugees' residencies, educational levels, poverty, and socio-economic vulnerabilities. Second, the intermediate determinants of ill health are defined as community-level risk factors such as social support, health care system and resources, family organization, and occupation. Finally, the proximate factors fall under the realm of behavior epidemiology and are linked to biological mechanisms like eating behavior, sleep patterns, use of certain drugs, physical activity, and others. It is important, in order to make a change in the health outcomes, to intervene in the chain of causality between these factors which is not easy in all circumstances, especially within the context of refugees and their living conditions in the country of asylum (McLeroy et al., 1988). This model was used in the literature to plan prevention programs; it was applied in the United States to address the increased problem of breast cancer that was rising at a rate of nearly

2% per year since 1973 whereby the policy and decision makers addressed properly the distal, intermediate and proximate factors to decrease the risk (McLeroy et al., 1988).

Capturing framework applications thorough the literature review process, Shahabuddin et al. (2017) explored the maternal health care-seeking behavior of married adolescent girls in Bangladesh through a social-ecological approach considering the complex interplay between the individuals, social system, and the environment. They were able to explore the adolescent girls' experiences through the integration of the socio-cultural and community context, their family and partner support, and their intrapersonal characteristics. Taylor and Haintz (2018) studied the influence of the social determinants of health on the refugees' access and utilization of the health care services in Australia. The authors conceptualized the factors within a socio-ecological model of health and emphasized the person–environment interactions which was perceived as an important determinant of health that influenced the individual agency; their recommendations called for interventions to addressing the multi-layered barriers that prevent the refugees to be enrolled in the health care system.

The causal continuum framework was applied by Scott et al. (2012) to address the overweight and obesity morbidity in sub-Saharan Africa that was on the rise. Considering distant, intermediate and proximate influences, the researchers dissected the multiple factors that predicted the obesity prevalence; they discussed globalization and urbanization to being distant factors; the built environment, the social relation and support, occupation, and cultural perceptions of weight as intermediate factors; and the eating behavior, physical inactivity and genetics as proximate factors. The overall model

supported the illustration of the interaction of factors along a continuum which was imperative to gaining an advanced understanding of the global epidemic of overweight and obesity, and to ultimately designate the appropriate interventions.

Literature Review

Maternal Mortality: Epidemiology and Trends

Maternal mortality, defined as the death of the mother during pregnancy or within 42 days of the birth, constitutes a major public health concern and a global health burden in many industrialized and developing countries (National Research Council, 2013). In 2017, around 300,000 women died worldwide due to complicated childbirth and pregnancies. The low-and middle-income countries account for 90% of these deaths, the majority of which could have been prevented. The global maternal mortality ratio (MMR) average read 216 deaths per 100,000 live births in 2015 with Sierra Leone being in the first rank followed by Central African Republic and Chad with respectively 1,360, 882, and 856 deaths per 100,000 live births. According to the Fragile States Index in 2017, 15 countries were identified for being very high alert or high alert being a fragile state whereby the MMR had a range from 31 in Syria to 1,150 in South Soudan per 100,000 live birth. In comparison between high and low-income countries, in 2017 the MMR was 462 per 100,000 live births in low-income countries versus 11 per 100,000 live births in high-income countries (UNHCR, 2015; WHO, 2019c). The obstetrical complications during pregnancy, within delivery, and in the puerperium period represent the leading cause of women mortality aged between 15 and 19 years old, noting that yearly about 17 million adolescents give birth which accentuates the problem. The risk of

complications and death is even worse among young adolescents between 10 and 14 years old (Amjad et al., 2019; WHO, 2019c). According to the World Health Organization (2019c), a woman's lifetime risk of maternal death is defined as 1 in 5,400 in high-income countries, versus 1 in 45 in low-income countries. Moreover, the literature includes wide-documented studies correlating the adolescent pregnancy with increased risk for the mother and the newborn that can be in many circumstances life-threatening (Amjad et al., 2019).

The major complications that arise and account for about 75% of all maternal deaths are mainly related to eclampsia, obstetric hemorrhage, placental abruption, infections and sepsis, preterm birth, and low birthweight. The other remaining causes are associated with malaria or related to chronic conditions like cardiac diseases or diabetes, or complications from deliveries (e.g. obstructed labour, anaemia, and embolism) (UNHCR, 2015; WHO, 2019c).

Postpartum Haemorrhage

Being the leading cause of maternal mortality in low-income countries, postpartum hemorrhage is defined as a blood loss of 500 ml or more occurring mainly within 24 hours after birth. A severe postpartum hemorrhage is manifested as a blood loss of 1,000 ml or more within the same timeframe (WHO, 2012). The main causes are uterine atony, uterine rupture, vaginal or cervical lacerations, coagulation disorders, and retained placental tissue. It is aggravated by anemia, grand multiparity, and multiple gestation. Postpartum hemorrhage affects mainly 2% of women giving birth and significantly contributes to severe morbidities including shock and organ dysfunction.

Accounting for around one quarter of maternal death, it could be avoided through a timely and appropriate management of conditions (WHO, 2012).

High Blood Pressure During Pregnancy: Pre-eclampsia and Eclampsia

Gestational hypertension is typically diagnosed after 20 weeks of pregnancy or close to delivery. Usually it is reversible after birth, but it puts women at a risk of developing chronic hypertension in the future. Pre-eclampsia occurs when a pregnant woman suddenly develops hypertension and protein in her urine or other problems after 20 weeks of pregnancy, noting that women who are pregnant and suffer from chronic hypertension may also develop preeclampsia. This situation may worsen and lead to a medical emergency situation called eclampsia where the women has seizures (CDC, 2019). Risk factors for pre-eclampsia include a personal or family history of pre-eclampsia, obesity, diabetes type 1 and 2, pregnancy with twins or triplets, history of thrombophilia, chronic high blood pressure, chronic kidney disorder, and pregnancy using in vitro fertilization. The main maternal and perinatal health outcomes that may manifest are placental abruption, cesarean delivery, fetal growth restriction, and oligohydramnios (CDC, 2019; Kongwattanakul et al., 2018). Pre-eclampsia is responsible for 10 to 15% of maternal complications, morbidities, and mortalities. The global incidence of hypertensive disorders among pregnant women read 4.6% between 2002 and 2012. The world incidence rate of pre-eclampsia was 2.16%. In the United States, one pregnancy out of 25 develops preeclampsia. In Thailand, pre-eclampsia incidence was 2.2% and the severe preeclampsia read 10.1 per 1,000 deliveries. A good antenatal care follow-up supports in the early detection and management of hypertensive disorders

among pregnant women, therefore lowering the risk of adverse health outcomes for both the mothers and their newborn (CDC, 2019; Kongwattanakul et al., 2018).

Sepsis During Pregnancy and the Puerperium

Septic shock, or sepsis, is defined as a life-threatening organ dysfunction caused by a dysregulated host response to infection. An organ dysfunction is explained as an acute increase of two or more points in the Sequential Organ Failure Assessment (SOFA) score; with no baseline disease, the SOFA score should read zero. Therefore, a subset of sepsis underlines circulation and cellular/metabolic abnormalities that are profound enough to substantially increase mortality (Society for Maternal and Fetal Medicine, 2019). Maternal sepsis is an important predictor of maternal mortality and morbidity that appears to be increasing. It is considered as an underlying cause of 11% of all maternal deaths and the third most common direct cause of maternal deaths (Bonet et al., 2018). There was a 10% annual increase in severe sepsis and sepsis-related deaths in the United States from 1998 to 2008, whereby maternal sepsis complicates four to 10 per 10,000 live births in the United States. The risk factors include cesarean delivery, race disparity (Black) and ethnic minorities, constraints to safe births by skilled birth attendants, lack of insurance, limited access to water and sanitation, substandard quality of care including infrastructure challenges, nulliparity, multiple gestation, and assisted reproductive technologies. Presence of comorbidity (e.g. chronic renal or liver disease, and congestive heart failure) is responsible for more than 50% of sepsis mortality (Bonet et al., 2018; Society for Maternal and Fetal Medicine, 2019). There is also an increased risk of mother-to-child transmission of infections and early onset neonatal sepsis (EOS) (Bonet

et al., 2018). Substandard care including a delay in the detection and management most often in the obstetric unit accounts for 63% of maternal sepsis deaths (Society for Maternal and Fetal Medicine, 2019).

Unsafe Abortion

Unsafe abortions represent a serious health threat as they lead to serious consequences affecting women and girls. Worldwide between the years 2010 and 2014, it was estimated that 25 million unsafe abortions occurred yearly, 97% of which took place in developing countries such as Africa, Asia, and Latin America (WHO, 2019d). Unsafe abortions represent 45% of all abortions and are classified into two categories: less safe abortions, and least safe abortions.

Less safe abortions, representing 31% of unsafe abortion practices, are either performed by a trained health care provider using outdated or unsafe methods (e.g. sharp curettage) or by a non-trained provider using a safe method (e.g. misoprostol to induce abortion) (WHO, 2019d).

Least safe abortions account for around 14% of unsafe abortion practices and are responsible for the majority of the complications and related deaths. They are performed by non-trained providers using dangerous methods (e.g. use of herbal concoctions or introduction of foreign objects). The adverse health consequences include incomplete abortion, infections, vaginal, cervical and uterine injury, and related hemorrhage (WHO, 2019d).

Seeking unsafe abortion methods is the result of countries' laws and policies on abortion, the societal attitudes towards abortion, and gender inequality. It is also

influenced by the availability of safe abortion services and the financial capacity to access it. Therefore, disparities exist worldwide; in countries where abortion is legal nearly nine out of 10 abortions are safe, while one in four abortions are safe in countries banning abortions or only accepting it based on medical ground to save the mother's life. Moreover, in high income countries having strong health care systems, the incidence of unsafe abortions is very low; North America and Western and Northern Europe have the lowest unsafe abortion practice globally (WHO, 2019d). On the contrary, in developing countries, the situation differs and the majority of abortions are least safe; in Africa, outside of South Africa, less than one in four abortions are safe, while in South-Central Asia, less than one in two abortions were safe. Therefore, concerted efforts are needed to ensure access of women and girls at childbearing age to contraception and safe abortion services (WHO, 2019d).

Neonatal Mortality: Epidemiology and Trends

The neonatal period represents the most sensitive and vulnerable time for a child's survival. 46% of all under-five deaths happen in the first 28 days of a newborn's life, concentrated in the first day and week, and accounting for around 2.6 million deaths in 2016, or 7,000 newborn deaths every day (WHO, 2019e). According to Bhatti et al., (2017), 14 million adolescent girls give birth annually worldwide, putting their neonates at a high risk of mortality which accentuates the problem. Moreover, literature shows that four million infants die during their neonatal age out of 130 million born each year. According to the World Health Organization (2019e), 60 countries carried about 80% of the burden of neonatal deaths in 2016, making it hard to reach the Sustainable

Development Goal to reduce the neonatal mortality to at least as low as 12 deaths per 1000 live births by 2030.

Preterm birth is an important and major determinant of neonatal mortality and morbidity. 28% of neonatal deaths occurring within the first week of age are due to prematurity. Preterm birth rates are on the rise, ranging from 5 to 7% in some developed countries, but are substantially higher in developing countries (Beck et al., 2010). In addition to high mortality risks, premature children are exposed to health, psychological, and economic costs later on in life. They have higher rates of sensory deficits, respiratory illnesses, cerebral palsy, and learning disabilities in comparison to children born at term. The main causal factors related to prematurity include medical condition of the mother or her fetus, environmental exposure, socio-economic factors, behavioral patterns, genetic influences, infertility treatments, and other iatrogenic prematurity (Beck et al., 2010).

Reducing neonatal mortality is gaining importance, and understanding the related factors is pertinent to address it through targeted interventions. (Bhatti et al., 2017, WHO, 2019e). The health indicators related to the neonatal and infants health is deteriorating in conflict settings and there is a need for a call of action in order to reach the Millennium Development Goals to improve the health situations of the most vulnerable (DeJong et al., 2017).

Maternal and Neonatal Health Outcomes in Refugee Settings

There are extensive studies in the literature describing the maternal and neonatal health outcomes in refugee's settings.

Through a qualitative systematic review undertaken by Taylor et al. (2018) that analyzed the varying constructs among the captured studies, the authors were able to describe the obstacles faced by the refugees in Australia to satisfying their health needs through the lens of the social ecological model of health. Australia is among the countries accepting an allocated number of refugees annually through the Commonwealth Government's Humanitarian Program. These refugees have specific and complex health and wellbeing needs accentuated by factors experienced in transit to a country of resettlement including malnutrition and starvation, risk of gender and sexual violence, non-communicable diseases, and other diseases. Likewise, many refugees resettled to different countries, their health issues exacerbated by their social exclusion including their limited access and utilization of the health care system and the multilayered barriers they are facing. This is due to the Australian health care policy for refugees that eliminates those who enter through the onshore humanitarian program in comparison to those who are admitted through the offshore program and are entitled to utilize Medicare, and the overall health services and programs benefits (Taylor et al., 2018).

Through a systematic review study done by Heslehurst et al. (2018) including quantitative and qualitative articles focusing on the maternal and neonatal care and health outcomes of asylum seekers and refugees, the findings outlined adverse alerting health events, particularly obstetrical complications, prematurity birth, congenital malformations, offspring maternal mortality, as well as issues related to the maternal mental health wellness. Inequality in access to and use of health care is a persistent factor that dominates the experience of these vulnerable groups. Multiple barriers undermine the

women's health situations including personal (e.g. unwanted pregnancy, poverty), social (e.g. isolation, sexual assault), structural and organizational (e.g. bad communication and negative past experiences with health professionals and clinical interventions), and cultural factors (e.g. stereotype, prejudice, racism)

Villalonga-Olives et al. (2017) also conducted a systematic review of published literature of researches concentrated on migration and health with specific centering on reproductive health outcomes of migrants in Europe and the United States. The results informed that in comparison to native-born populations, the migrants had low birth weight. The findings showed as well a correlation between migrants' reproductive health outcomes and the host countries characteristics and their regimes in term of policies related to protection of migrants, institutions, and their health systems.

Murphy (2015) discussed the key issues faced by the refugees and asylum seekers fleeing to Europe and the United Kingdom from Syria. These refugees, specifically pregnant women, experience many impediments to accessing the needed health care services including but not limited to cultural differences, lack of understanding of the health system, and language barriers. All these obstacles affect their physical and mental health and expose them to a range of morbidities at the puerperium, increasing their maternal and perinatal mortality risk. 20.4% of surveyed refugees in 10 European countries stated that they had given up trying to access their needed health services in the past 12 months. Another concern was reported in terms of financial barrier and the inability of the undocumented pregnant women to pay the health services fees in the United Kingdom, which is provided at a specified fee. Murphy (2015) ascertained that

improved communication between pregnant asylum seekers and refugees and the health professionals is necessary in order to improve the maternal and neonatal outcomes, recommending that the health care service providers acquire cultural competency in order to better serve the vulnerable groups through high-quality, compassionate care.

Maternal and Neonatal Health Outcomes in the Syrian Refugee Context

The literature review includes a wide range of studies focusing on the maternal and neonatal health of the Syrian refugees in Lebanon, highlighting the challenges and complexities they face.

DeJong et al. (2017) said in conflict settings, women and children's health is disproportionately affected due to their increased economic and social vulnerability, as well as their heavy reliance on functioning health systems. Putting the conflict-affected populations on the Millennium Development Goals' agenda and creating accountability frameworks is key in order to reach the Sustainable Development Goals to improve the health of women and children. The authors shed light on Syria's situation in the post-conflict period where the disruption of the health system and the exodus of health professionals made it hard for women to reach the health care they needed. The population movements coupled with an increased poverty experienced by half of the population predicted the increased risk for outbreaks and put them at risk for more morbidities and mortalities.

Many studies highlighted to which extent the Syrian refugee's health indicators were impacted in Lebanon. DeJong et al. (2017) study findings showed that 26% of Syrian refugee births were preterm, the coverage of at least four antenatal care is lower in

comparison to the situation in Syria in pre-war era, and the caesarian section rate is high in UNHCR-contracted hospitals with rates being 35.3% in 2013, 36% in 2014 and 33.7% in 2015. Some of these figures align with Medair study findings conducted in 2017 that showed that only 68.8% of the pregnant women included in their sample received four or more antenatal care services. UNHCR study showed as well that only 74% of the study sample received antenatal care, and 41% received four or more antenatal care services. Another study by Benage et al. (2015) reported that the standards of antenatal care through a comprehensive package are not met for the Syrian refugees in Lebanon; 17.1% of those surveyed had never received any type of antenatal care. Moreover, 4.3% of those who received some antenatal care had never received it through a skilled professional, and only 31.9% had access to a comprehensive package defined by vital signs measurement (specifically blood pressure), and urine and blood tests. The reasons were related to financial obstacles and lack of awareness about the importance of seeking care (Benage et al. (2015); Medair Lebanon, 2017; UNHCR, 2017 a).

Home delivery was another concern among the Syrian refugees in Lebanon whereby 2.2% of Medair study participants reported no skilled birth attendant at the time of their delivery, putting their and their newborn's lives at risk (Medair Lebanon, 2017). In addition, UNHCR health utilization survey showed 4% of home delivery and the reasons reported by the surveyed participants were lack of social support to care for the existing children at home and the presence of a midwife during labor (UNHCR, 2017 a).

The maternal and reproductive health indicators showed many non-conformities as well in Medair study; the length of stay at the hospital following a normal vaginal or a

caesarean-section delivery was not meeting the 24-hour requirements as per WHO recommendations, the contraceptive use prevalence was around half noting that less than a third of respondents reported using modern methods, and adherence to the postnatal care was another challenge evaluated by Medair study (Medair Lebanon, 2017).

Social Determinants of Maternal and Neonatal Birth Outcomes

The World Health Organization (2019a) defines the social determinants of health as conditions in which people are born, grow, work, live, and age. The Ottawa Charter in 1986 was the first international conference that acknowledged the role of broad societal conditions on a population's health. It ascertained that health promotion is not only the responsibility of the health sector itself; it goes beyond healthy lifestyles, to the interaction and coping with the environment, as well as the influence of social and personal resources and other determinants of health that affect the individual's health. Therefore, the Ottawa Charter defined peace, education, shelter, food, income, social justice, equity, sustainable resources, and a stable ecosystem as fundamental conditions, secure foundations, and prerequisites for health and health promotion (WHO, 2019a).

Throughout this section, the study moves on to discussion of the social determinants of health that were examined in the literature review and found to be predictors of adverse neonatal and maternal birth outcomes through the lens of the causal continuum framework relevant to the social ecology model of health.

Proximate Factors

Early Conception (Adolescent Pregnancy)

Globally, adolescent pregnancies are considered as a big concern; it is estimated that around 16 million girls aged between 15 and 19 years of age are giving birth mainly in low-income countries, out of whom 70,000 die of complications related to childbirth and pregnancy. This public health concern is not only affecting the young mothers and their children but also constitutes a vital development issue for any society (Shahabuddin et al., 2017). The literature includes a well-documented association between adolescent childbearing and adverse pregnancy outcomes.

Amjad et al. (2019) had the primary objective of evaluating the evidence of association between the social determinants of health and the adverse maternal and birth outcomes among adolescent mothers using a calculated pooled odds ratios (*pOR*) with 95% confidence intervals (95% CI). 31 studies meeting the inclusion criteria through a comprehensive literature review performed by two independent reviewers were considered. The conducted meta-analysis was of fair quality on the Newcastle-Ottawa scale. The main stated maternal and birth outcomes were preterm birth and caesarian section, while the most frequent social determinant of health evaluated was race. In addition to this, the adolescent mothers' rural residency was linked to prematurity, while illiteracy and low socio-economic status contributed to an increased risk of adolescent maternal mortality and low infant birth weight. The researchers highlighted the need for further studies to understand the underlying causal pathways to inequalities that result in adverse maternal and birth outcomes. Some of said inequalities were studied by Kumar et al. (2017) who carried out a survey among Latina adolescent mothers in the United States in order to understand the social determinants of health drivers of pregnancy and

maternal and child health outcomes. Racial disparities, high rates of residential mobility, and reliance on public assistance because of poor financial situation are predictors of early marriage and consequently to maternal and children health risks and poor health outcomes. The authors recommended addressing the disparities through an established systemic support in order to improve the maternal and neonatal health outcomes.

In a descriptive study by Bhatti et al. (2017) conducted in Faisalabad, Pakistan using a detailed questionnaire to assess the risk factor of neonatal mortality where the increased rate is alerting, the findings correlated the marriages at very young age and very old age to be risky for neonate's survival. On this note, Efevbera et al. (2017) illustrated the intergenerational effects of girl child marriage in sub-Saharan Africa using mother-child pairs data identified through 16 national and sub-national cross-sectional surveys conducted between 2010 and 2014. The results were alerting and highlighted that the odds of having stunted growth and being off-track for development were 25% and 29% higher, respectively, for children born to girls married before the age of 18 compared to those whose mothers married later ($p < .001$) coupled with disparities in maternal education and wealth. Moreover, Marphatia et al. (2017) explained that little attention had been given to the broader health and social implications of variability in women's marriage, independent of age, at their first childbirth which is a crucial issue from a public health perspective. Observations from four South Asian countries, Bangladesh, India, Nepal, and Pakistan, where a large proportion of girls marry below the age of 18, noted that early marriage and childbearing at young age have adverse health consequences to mothers and to their offspring including high morbidity and mortality

rates and malnutrition. From a social perspective, early marriage is associated with low educational attainment and consequently low societal status of women and girls. The authors suggested that factors shaping at which age women marry should be considered in order to maximize the health of women and their offspring.

Shahabuddin et al. (2017) ran an in depth qualitative study aiming at exploring the maternal health care-seeking behavior of 30 married pregnant and non-pregnant adolescent girls in Bangladesh. In its prospective follow up study, the study design included interviews with key informants and focus group discussions with stakeholders to triangulate and validate the collected data. The researchers used the socio-ecological model to frame their data analysis; they concluded that many factors at individual, interpersonal, community, and social levels influenced the maternal health seeking behaviors of adolescent girls. Even though the results cannot be generalized to urban settings, the gathered information was rich enough to produce a thorough understanding of the maternal health care-seeking behavior of adolescent girls in the three subdistricts of the Rangpur district. The main important findings were at the personal level related to the girl's perception of the non-importance of skilled maternal health services and hospital delivery unless complications arise. Hospital delivery was not a preference because of the presence of male doctors and the feeling of lack of privacy. Moreover, at the interpersonal level and community and social levels, adolescent girls expressed their little decision-making autonomy in regards to seeking maternal health care with the decision mainly being taken by the husband or parents-in-law. Furthermore, home delivery is a tradition and is performed with the support of traditional birth attendants and

relatives. Also, it is affected by poverty, religion, and cultural and spiritual beliefs. Finally, at the organizational level, adolescent girls expressed their demotivation to seeking maternal care at community clinics because they are not equipped with basic instruments. As for the study of the present reproductive understandings and perceptions of Syrian refugees in Lebanon, Cherri et al. (2017) conducted 11 focus group discussions in four regions in Lebanon with Syrian refugee women of reproductive age aiming to understand their sexual and reproductive health needs, and to therefore provide recommendations that would help improve the existing reproductive health services and consequently produce positive health outcomes. The qualitative study included some limitations specifically because of the convenience sampling methodology and the inability of the researchers to generalize the findings to the whole population. However, it was able to project a rich understanding of the women's experiences in the hosting country. They acknowledged that early marriage practice increased in their refugee situation in contrary to their norms in Syria due to uncertainty about the future and the unstable financial situation, in addition to the lost opportunities for schooling. Moreover, the results showed that the barriers for not using contraceptive methods were mainly due to lack of knowledge of free available services, the misconception about the harmful effects of using family planning commodities, the lack of knowledge about the different types of family planning, and the dominating male position who are usually the ones to make the decision to have children. The authors recommended the needs for increasing awareness for males and females of subsidized sexual and reproductive health services, including contraceptive commodities at primary health care centers. They ascertained that

the need for protection of adolescent and young girls should be centered on domains including increasing education opportunities for Syrian refugee children, and supporting their households to be economically independent and able to satisfy their basic needs.

Intermediate Factors

Occupation

The adolescent mother's occupation is one the main predictors of social marginalization. This factor was analyzed in Amjad et al. (2018) through five retrospective and prospective cohort studies included in their systematic review article. A significant association was found between unemployed teen mothers and the increased risk of caesarean section in comparison to the employed adolescent mothers. Moreover, minimum wage employment predicted the risk of low birth weight; adolescent mothers working for more than 15 hours per week during pregnancy informed around a four times higher risk of having a small for their gestational age infant when compared to unemployed teen mothers. Kapaya et al. (2015) concluded that being unemployed increased anxiety among pregnant women (*OR* = 6.581, 95 % CI [1.642, 26.383], p = .008) and was seen to be associated with delayed access to antenatal services and hence to poor fetal outcomes.

Time of Arrival and Integration in the Hosting Country/Community

Social isolation and the inability to be integrated in the hosting communities may be considered as one of the critical determinants of health that is continuing to affect mainly the migrant and refugee stream. The inability of these vulnerable groups to rely on someone for support remains an important obstacle to reaching the needed health care

services as described by Murphy (2015). Murphy (2015) said language and communication to be another barrier that denies them to access to their basic needed services. Heslehurst et al. (2018) discussed as well the problem of language barriers and the major concern of refugees and migrants for not being familiar with the hosting countries local life. The study included reports that shorter duration of residency in the hosting country was evaluated as a risk factor for adverse mental health perinatal outcomes.

Healthcare System and Policies

The social exclusion of migrants and refugees has been documented in the literature as one of the social determinants of health that lead to adverse health consequences. Murphy (2015) highlighted that some migrant women fear accessing health services because they do not trust that their illegal status won't be disclosed to the government through the health care professionals. Also, the communication with health care professionals and within the wider health system is a consistent problem faced by refugees and migrant populations. Amjad et al. (2018) recommended that in order to improve perinatal outcomes for adolescent groups, any adolescent perinatal health program should incorporate and consider the social determinants of health within the related policies and practices, thus to be harmonized with the needs of the populations of concern. In Lebanon, the health system is saturated and not able to provide services to all Syrian refugees at primary health care centers. The latter cannot benefit from comprehensive health care services even though the UNHCR and partners do support packages at many of the supported centers. Moreover, a lack of a robust referral system

exposes the refugees and mainly pregnant women to potential health risks. Additionally, the authors highlighted that the lack of trained health workers, specifically the midwives, to meet the health needs of the refugees is affecting the quality of care delivered (El-Jardali et al., 2017). These findings align with Gopalan et al. (2017) paper that reported the lack of governance and infrastructure capacity as being one of the main obstacles to addressing maternal and neonatal health needs; this situation prevents the provision of skilled birth services, emergency obstetric and newborn care (EmONC), in addition to contraception services in conflict-affected areas and entails on ill health for the mothers and their newborns.

Social Capital/Social Support

Social support has been studied by researchers for being an important predictor of maternal and neonatal health. Amjad et al. (2018) introduced five retrospective cohort and cross-sectional studies analyzing the role of social capital in adverse adolescent pregnancy outcomes. The findings showed that the social and particularly the partner support had a great effect in decreasing the risk of low birth weight in adolescent mothers, especially among Black teens. Harper-Hanigan et al. (2017) said marginalized African American women who had high rates of adverse maternal and neonatal outcomes in comparison to their peers of other ethnic groups reported a lack of sense of community responsibility, cohesiveness, togetherness, coupled with lack of family and partner support and their past experiences of intimate and social violence. In addition, many did not perceive any community strength emanating from churches, nor through strong community leaders. Kapaya et al. (2015) did a retrospective and prospective study using

socio-demographic and clinical outcomes data between 2002 and 2010 at the Jessop Wing Hospital, Sheffield UK to understand the inadequate engagement with antenatal care that lead to adverse pregnancy outcomes including maternal death. The results showed that poor social support represents a key factor for late antenatal presentation at the health facilities. Their findings align with other studies' results that correlate social exclusion with poor fetal outcomes, associated with women facing difficulties in accessing antenatal care services because of their vulnerable socio-demographic status. Furthermore, the lack of social and family support correlates for being a risk factor for perinatal mental health disorders (Heslehurst et al., 2018). Finally, the women's autonomy and the capacity to make decisions and choices related to health is another obstacle for seeking skilled birth attendant services. Therefore, family and partner support is essential to meet the pregnant perinatal health needs (Gopalan et al., 2017). The authors concluded that it is required, in order to improve access to prenatal care, to have an in-depth understanding of the maternal psychosocial health indices, and the reliance of existing social support mechanisms in order to outline the proper interventions leading to the amelioration of the maternal and neonatal health outcome indicators (Kapaya et al., 2015).

Distal Factors

Residency, Neighborhood Deprivation, Built Environment, and Housing

The literature provides wide illustrations about the association between residency, neighborhood deprivation, built environment, housing, and the adverse maternal, including teenage pregnancy, and neonatal health outcomes. Poor-quality built

environments including housing vacancy and structural deterioration correlate with preterm birth and low birthweight infants (Giurgescu, 2017). According to Amjad et al. (2018) and Giurgescu (2017), the adolescent mothers' rural residency and their neighborhood's low socio-economic level were seen to be correlated with high risk of preterm birth and low birth weight. This conclusion was driven after the adjustment for race, behavioral risk factors during pregnancy (e.g. smoking), and obstetric characteristics (e.g. prenatal care). In their study, Amjad et al. (2018) conveyed that non-White adolescents residing in rural areas were at greater risk for low birth weight when compared to their urban non-White counterparts, and their infants were also at a higher risk of death. Alizadeh et al. (2014) findings showed that residential areas (rural versus urban of Tabriz) reported preterm labor, low birth weight, and cesarean section, but only caesarean section had a significant effect after adjusting confounding factors such as maternal age, education attainment, number of parity, family income, and obstetrical complications.

Disparities and Social Inequalities

Amjad et al. (2018) recognized that the individual's social hierarchy is shaped through complex and interconnected societal resources including education attainment, employment opportunities, community, social networks, and others. This social hierarchy ends up with health disparities affecting the health of the mothers and newborn. A multitude of authors mentioned and studied different forms of disparities including racial disparity, socio-economic disparity, and disparity in resources distribution that complicate the pregnancy outcomes (Alizadeh et al., 2014; Amjad et al., 2018; Harper-

Hanigan et al., 2017; Kumar et al., 2017; WHO, 2016). From this perspective, Harper-Hanigan et al. (2017) carried out a qualitative needs assessment for the African American women community of Northeast Douglas County in Omaha, NE to learn more about their adverse birth outcomes. The community members suffered twice more from adverse birth outcomes (i.e. prematurity and low birth weight, in addition to infant mortality) when compared to all other ethnic groups. The findings showed that the main contributing factors to adverse birth outcomes included high stress levels, lack of support, lack of knowledge, lack of transportation to access the health clinics, and to a lesser extent some behavioral and substance abuse practices like alcoholism and drug addiction. Even though this paper had some limitations for being qualitative and including a small sampling group of African American women, it has a big power in making the voices of the marginalized groups heard and therefore to calling for an action to integrate these groups experiencing disparity in any effort to improve birth outcomes. Future research and needs assessments are needed to address the needs of the underserved and marginalized populations in order to develop specific interventions that take into account their concerns. In addition to this, Borrell et al. (2016) studied the social inequality and racism and their association with adverse birth outcomes among New York City women by using the data from the Bureau of Vital Statistics Association, New York City Department of Health and Mental Hygiene on birth and death-linked data from the period 2000 to 2010. The results showed adverse birth outcomes mainly in terms of low birth weight, preterm births, and infant mortality ranging between 10% and 210% among infants of non-Hispanic Black, Hispanic, and Asian women in comparison to their non-

Hispanic White peers. Moreover, parental race/ethnicity discordance was estimated to be a risk of stress among pregnant women leading to adverse birth outcomes. This study included some limitations in terms of inclusion of data from a single locale NYC but the sample was large enough to provide credible findings. Also, the self-reported nature of race and ethnicity could be another limitation but its strength remains in terms of inclusion of diverse ethnicities including non-Hispanic Black, Hispanic, Asian, and non-Hispanic White women.

Socioeconomic Vulnerability and Access to Cash and Food Assistance

The social and economic conditions of vulnerability and poverty faced by young adolescent mothers was largely discussed in the literature and was attributed to poor pregnancy and perinatal outcomes. Amjad et al. (2018) highlighted the association between the adolescent socio-economic disadvantage and the poor pregnancy outcomes with increased risk of maternal mortality and low infant birth weight. Their lowest income quintile was correlated to higher incidence of obstetrical complications and deaths. Moreover, urban adolescent mothers living in sheltered environments with access to food and care and being under minimal stress were found to have a low risk of low birth weight. Deprivation and socio-economic status was discussed as well in Kapaya et al. (2015) paper as well as its effect on the maternal and fetal health status. The results showed that low index of multiple deprivation scores were associated with better socio-economic statuses and higher education of pregnant women. As a translation of this, a high index of multiple deprivation scores informed the risk of having a baby with a birth weight less than 2.5 kg by 1.7 (OR = 1.664, 95 % CI [1.307, 2.119], $p < .001$). El-Jardali

et al. (2017) said the financial vulnerability of refugees put them in difficult situations preventing them from paying even for the subsidized primary and secondary health care services they are entitled to in Lebanon. Therefore, this is affecting the pregnant women and their late access to antenatal care services. Alizadeh et al. (2014) said family income status is correlated with low birth weight ($p \leq .05$) but the results were not significant to prematurity. Heslehurst et al. (2018) said another effect of low socio-economic stressors on the development of mental health disorders in the perinatal period; economic hardship was seen to be predictor of depression among pregnant women. Moreover, refugees and asylum seekers with low economic status had higher risk of developing outcomes during delivery in comparison to the hosting community of Canada. Gopalan et al. (2017) said the ability to pay is a determinant for health services demand. Kempe et al. as cited in Gopalan et al. (2017) noted that in Yemen, the usage of untrained traditional birth attendants (32%) was much higher than of medical doctors (17%) or nurse-midwives (13%) because of the socio-economic status and the inability to pay. Therefore, the odds of skilled birth attendance use correlates with the absence of user fees or the availability of health insurance programs. Moreover, the use of emergency obstetric and newborn care (EmONC) increases with affordable services by the households.

Education Attainment

Amjad et al. (2018) evaluated in their systematic review six cross-sectional retrospective and case-control observational studies that treated the influence of education over the adverse maternal and birth outcomes. The maternal education appropriate to age was conferred as a protective effect against pregnancy complications;

maternal illiteracy was reported as well for being a significant predictor for maternal mortality. The findings showed that second births to adolescents with less than 12 years of completed education were found to be at an increased risk of pre-term birth and low birth weight in comparison to adolescent mothers with more than 12 years of completed education. Gopalan et al. (2017) findings reported that education was an important determinant for the demand for maternal and neonatal health services. A retrospective study done by Alizadeh et al. in Tabriz, Iran from August 2012 until October 2013 had similar findings whereby the results showed that the strongest social predictor for poor pregnancy outcomes, specifically for pre-term birth and caesarian section, was the mothers' education attainment; the higher the education attainment of the women, the more likely they are to adopt health behaviors such seeking timely antenatal care, exclusive breastfeeding for at least six months, and folic acid supplementation during pregnancy. These behaviors inform better health outcomes in terms of decreased infant mortality, stillbirth, preterm labor, and newborn being small for their gestational age.

Social Norms and Attitudes (e.g. Discrimination, Racism)

The results informed that race is a predictor of adverse maternal and birth outcomes showing that Black or African American adolescents had increased odds of preterm birth (*pOR* = 1.67, 95% CI [1.59, 1.75]) and low birth weight of their infants when compared to White or Caucasians adolescent mothers even after controlling for potential confounders like smoking, gestational age, and area of residence (*pOR* = 1.53, 95% CI [1.45, 1.62]). An increased risk of low birth weight was moreover associated to twins born to Black mothers than White twins (Amjad et al., 2018). In addition to adverse

maternal and birth outcomes, racial discrimination affects the mental health and well-being of pregnant African American women in comparison to non-Hispanic White women (Giurgescu, 2017).

Religion

The association between religion and adverse maternal and birth outcomes was evaluated in Amjad et al. (2018) through two reviewed retrospective cohort and cross-sectional studies. The results provided inconclusive evidence regarding the role of religion in adverse adolescent pregnancy outcomes. Therefore, the researchers recommended well-designed observational studies to determine the estimated risk related to adolescent pregnancy outcomes.

Recommendations to Improve Maternal and Neonatal Health Outcomes

Maternal and neonatal health are two interlinked indicators whereby it is recommended that all nations work closely for their improvements in the context of the Sustainable Development Goals (SDG). Maternal deaths are in majority preventable and in order to reach the SDG, no country should have a maternal mortality rate of more than twice the global average rate. All women should have access to comprehensive health care services during pregnancy, delivery, and after childbirth through skilled health professionals and should be able to access timely health conditions management and treatment (WHO, 2019c). The United Nations General Assembly that was held in New York in September 2019 had a dedicated focus for the first time on universal health coverage and stressed on the participated nations to achieve the universal health coverage by 2030; they reaffirmed that health is a social, economic, and environmental indicator as

well as an index for the implementation of the 2030 Agenda for Sustainable Development (United Nations, 2019). Obstacles for accessing the health care services in adolescent mothers should be reviewed by policy and decision makers in order to understand barriers and determinants of health like poverty, racial disparity, lack of information, inadequate and poor quality health services, culture, beliefs, practices, underserved areas and other factors. Therefore, understanding these barriers allows the decision makers to define and design appropriate interventions and perinatal health programs that incorporate and consider the social determinants of health in line with the context to improve the perinatal outcomes of the designated groups (Amjad et al., 2018; Taylor et al., 2018; WHO, 2019c). Brizuela and Tunçalp (2017) added that the global objective should not only be focused on ending preventable maternal and neonatal mortalities, but to expand enabling environments in order to ensure the health and wellbeing of mothers and their infants. Governments, non-governmental organizations, health workers, researchers, and advocates should put in place initiatives, strategies, and financing mechanisms within a global strategy and agenda to pave the way towards the achievement of the SDG (Brizuela et al., 2017; WHO, n.d).

Summary and Conclusions

The literature review showed a consistent positive correlation between the social determinants of health and the adverse maternal and health neonatal outcomes. Varying constructs showed the obstacles experienced by migrants and refugee women to reach their basic needs including sexual and reproductive health which affected in a negative way their health as well as the health of their newborn. The findings were similar among

the Syrian refugee women and girls who are bearing the cost of the war and the impact of the context they are living in. Distal, intermediate, and proximate factors were found to be responsible for the deterioration of the indicators that are relevant to the mother and newborn health among which the following can be listed: early marriage, education attainment, occupation and work hardship, vulnerable socio-economic situations, lack of social capital and social support, neighborhood, integration in the hosting community, social policies, disparities and other important factors. What has not been shown in the literature review is the influence of the social determinants of health on the Syrian refugee mothers and newborn health outcomes. The upcoming chapter will encompass on describing the methodology used including the study design, sampling, and statistical methods in order to shed light on the Syrian refugee mother and newborn health outcomes in reference to selected social determinants of health.

Chapter 3: Research Method

Introduction

The purpose of the study is to examine relationships between adverse maternal health and birth outcomes among Syrian refugees in Lebanon and social determinants of health. The rationale for the research design choice and methodology is described, followed by further description of the population and sampling procedures, data sources, and how access to the dataset was gained. The data analysis plan is addressed, as well as variable selection, screening and cleaning, dependent and independent variables, potential covariates, and confounding variables. This is followed by the presentation of the statistical test that was used to answer the research questions and how results were interpreted. Threats to validity and ethical procedures and concerns were also discussed. Finally, a summary concludes Chapter 3.

Research Design and Rationale

In order to answer the study's research questions, the decision was made to propose using a retrospective cross-sectional quantitative design based on analysis of the collected data by the UNHCR through the referral care program, the reception center unit responsible for registration of the population of concern and verification and validation of their demographic information, as well as the basic assistance unit maintaining data related to assistance received per household. Variables are mainly quantitative and will lead to an in-depth understanding of the problem and the health trends involving the Syrian refugee population, specifically women and newborns who were enrolled in the research. The relationship between the independent variable (Syrian refugee mothers'

age) and dependent variables (maternal and newborn health outcomes) was defined using confounding variables in modelling demographic and assistance data—food and cash support. Reliance on secondary data has many advantages, especially in terms of economy of the design and related savings in term of costs, effort, and time, in addition to the capacity of identifying attributes related to my population of interest. The data maintained within the UNHCR was convenient in terms of my topic under study and served to answer the research questions. The dataset was observed closely and cleaned properly in order to answer my research questions.

Methodology

Population

The population of concern were Syrian refugee women and newborns who fled to Lebanon and used the referral care program within the UNHCR hospital network. Since the onset of the civil war in Syria, Lebanon has received Syrian refugees, and by April 2018, the UNHCR (2018a) reported around one million Syrian refugees and approximately 20,000 refugees of other nationalities (Iraqi and others) registered within its database in Lebanon, out of which a large proportion resides in urban settings.

Sampling and Sampling Procedures

The sampling strategy and technique credibility is crucial for researchers to be able to generalize their results to the population of interest. The study's sample was Syrian refugee mothers who were admitted to a UNHCR referral care program during 2018 in Lebanon governorates due to pregnancy and delivery and any related complication at the pre, per and/or post-partum. Participants' newborns were tracked as

well to understand health outcomes(morbidity/mortality) including whether any admission happened to the neonatal intensive care unit (NICU). The UNHCR (2018) said the number of approved admissions for Syrian refugees in Lebanon related to life-saving and emergency conditions was 79,416 within a network of 40 contracted hospitals in Lebanese territories. 63% of these referrals were related to maternal care and 6.6% were related to perinatal care. The number of beneficiaries of the referral program was 74,714 individuals whose hospitalization costs were supported due to one or more referrals during the year. Moreover, there were 921 cases of mortality that occurred within the same period, out of whom 57% were children under the age of 1, predominantly in the perinatal phase (UNHCR, 2019a).

Inclusion and Exclusion Criteria

The de-identified sample used from the UNHCR referral care dataset for 2018 includes approximatively 50,032 observations related to maternal admissions and 5,241 neonatal conditions.

Inclusion Criteria

The participants needed to be Syrian refugee women of childbearing age (11-51), registered with UNHCR who were admitted through the referral care program during the year 2018 in a contracted hospital with UNHCR, their diagnosis fitting the International Classification of Diseases (ICD 10) for obstetrical conditions. Their newborns were tracked for admission at the neonatal intensive care unit according to the ICD 10 classification for neonatal morbidities and mortalities within UNHCR contracted hospitals.

Exclusion Criteria

Participants excluded from the study were women and girls not being Syrian refugees, outside the age group (11 -51 years of age) who were not registered with UNHCR, admitted in non-contracted hospitals with UNHCR, their diagnosis not fitting International Classification of Diseases (ICD 10) for obstetrical conditions, and being admitted outside the period of January first 2018 and December 31st 2018.

G*power 3 software was used to calculate the sample size. The type of power analysis was set; the input effect size effect was chosen as odds ratio. The probability error (significance level) α was set at .05 and the power of the test was 1-β = 0.95. The total sample size required is 1,188 with an actual power of 0.95 and a critical Z of 1.959 (Faul et al., 2007).

The estimated sample size included in the study was larger than 1,188 since all observations that match the inclusion criteria were counted. The 2018 UNHCR annual referral healthcare report includes 79,416 observations, of which around 55,000 admissions were maternal and neonatal admissions, added to reported confirmed mortalities of those under 1 year of age from which I extracted the sample. The UNHCR (2019a) said that for pregnancy and childbirth categories of admission, around 2.9% of cases are related to abortive conditions and other obstetric causes, which is estimated to be around 1,450 cases, whereas 97% of admitted cases for delivery may have records of complications.

The UNHCR (2019a) said that out of the 6.6 % admissions for perinatal conditions in 2018, 8.8% related to prematurity and poor growth, 68% were respiratory

and circulatory disorders, and 7% were infections, which makes the estimated number of observations to be around 5,000 cases.

After cleaning the dataset, it was requested of UNHCR to share demographic information for each of the study's observations as well as types of assistance received by each of them. When recording and registering Syrian refugees, the UNHCR provides each family with a registration number, and an individual number is assigned for each member within the same family. Therefore, the study's sample was tracked through this registration system and individual numbers, and the dataset was constructed using this strategy.

Archival Data

The UNHCR maintains data for all refugees who are registered or recorded in Lebanon. The refugees' demographic information is collected during the initial interview performed at UNHCR reception centers in Lebanon whereby each family receives a registration number and each member within the family will have an individual number that identifies them. The latter information is updated during the verification or renewal exercises. The demographic variables treated in the study included area of origin from Syria, geographic distribution in Lebanon, time of arrival from Syria, individual accommodation, employment after asylum, education attainment, and vulnerability score accessible from UNHCR reception centers.

In reference to the assistance of registered and recorded Syrian refugee families, it was based on the vulnerability score of each household and entails on access to cash (seasonal support in winter, Multi-Purpose Cash Assistance Programme [MCAP],

Protection Cash Assistance Programme [PCAP]), and food assistance for those entitled for this kind of support. These information and figures are conserved in UNHCR database (UNHCR, 2017; UNICEF, 2017; WFP, 2017).

Regarding medical information or data, UNHCR receives from the TPA all the information related to persons of concern who are eligible for secondary and tertiary care support within the referral care program. To note that UNHCR only subsidizes the hospitalization costs for those who have critical or potentially life-threatening conditions, or an urgent medical case that may lead to severe permanent disability, and delivery care (UNHCR, 2018a). The medical information that is accessible from the UNHCR public health unit includes registration number, individual number, date of birth, date of admission, policy number, gender, dependency, nationality, provider name, provider region, claim external reference, status, cause, specific assessment, ICD-10, discharge diagnosis assessment, first estimation cost, estimated USD amount, declined claim, emergency, total claimed, total approved, patient share, treating physician, professional specialty, date of death, invoice number, discharge date, product name, authorization, and medical notes. The medical information this study requires to be collected from UNHCR public health section will be limited to the following variables: registration number, individual number, date of birth, date of admission, provider name, provide region, cause, specific assessment, international classification of diseases, discharge diagnosis assessment, date of death, and discharge date.

The study's dataset was constructed based on the demographic information of refugees, the type of assistance received, the medical data that was tracked using the

registration, and recorded numbers of the selected observations. The access to the de-identified dataset was requested officially from UNHCR following the beginning of the University Research Review, the acceptance of the proposal, and after receiving Walden University IRB approval.

Data Analysis Plan

In this section, the procedures and the exact steps for treating the data and answering the formulated research questions are outlined, followed by re-stating the research questions, describing the variables, the built model, the statistical test and descriptive statistics that were used (Rudestam & Newton, 2015).

Research Questions

The research questions that were studied and explored within my study were:

RQ1: Is there a statistically significant difference in terms of neonatal birth outcomes (e.g. prematurity, respiratory distress, cardiac arrest, septicemia, acute respiratory failure, and other morbidities) between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon?

$H_0$1: There is no statistically significant difference in terms of neonatal birth outcomes (e.g. prematurity, respiratory distress, cardiac arrest, septicemia, acute respiratory failure, and other morbidities) between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability,

access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon.

H_a1: There is a statistically significant difference in terms of neonatal birth outcomes (e.g. prematurity, respiratory distress, cardiac arrest, septicemia, acute respiratory failure, and other morbidities) between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon.

RQ2: Is there a statistically significant difference in terms of neonatal mortality between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon?

$H_0 2$: There is no statistically significant difference in terms of neonatal mortality between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon.

$H_a 2$: There is a statistically significant difference in terms of neonatal mortality between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when

adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon.

RQ3: Is there a statistically significant difference in terms of maternal health outcome complications (e.g. missed abortion, maternal anemia, hemorrhage, premature separation of placenta, hypertension complicating pregnancy, pre-eclampsia, eclampsia, or any other complications involving pregnancy, delivery, and post-natal aggravating conditions) between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon?

$H_0$3: There is no statistically significant difference in terms of maternal health outcome complications (e.g. missed abortion, maternal anemia, hemorrhage, premature separation of placenta, hypertension complicating pregnancy, pre-eclampsia, eclampsia, and any other complications involving pregnancy, delivery, and post-natal aggravating conditions) between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon.

H_a3: There is a statistically significant difference in terms of maternal health outcome complications (e.g. missed abortion, maternal anemia, hemorrhage, premature separation of placenta, hypertension complicating pregnancy, pre-eclampsia, eclampsia,

and any other complications involving pregnancy, delivery, and post-natal aggravating conditions) between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syrian, time of arrival from Syria, and type of accommodation in Lebanon.

Variables Selection

This study employs a quantitative cross-sectional research design with one independent variable (Syrian refugee mothers' age) and three dependent variables (maternal morbidities, neonatal morbidities, and neonatal mortalities). The confounding variables that are selected to build the model are the socio-economic vulnerability, access to cash and food assistance, education attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon. The qualitative variables were transformed into dummy variables in order to be incorporated in the regression model (Daniel & Cross, 2018).

Before proceeding to statistical analysis, the data was screened and cleaned to ensure that each observation had valid, usable, and reliable values. The necessary decision was then made based on the quality of the dataset (e.g. reconstruction or replacing missing data) (Creswell, 2014).

Statistical Test

The main purpose of the study is to investigate how the independent variable, singly and in combination with the confounding variables, are related and predict the maternal and neonatal health outcomes. For this, SPSS was used to run a binominal

logistic regression statistical test which is applicable in this case since both the dependent and independent variables are dichotomous. The value of the independent variable indicates the status of the subject relative to the presence or absence of risk factor which is the early conception of Syrian refugee mothers in this research. The value of the dependent variables or outcomes indicates whether or not a subject acquired a disease or passed away, which in this situation correlates with the maternal and neonatal morbidities and the neonatal mortalities (Daniel & Cross, 2018).

Significance tests including Odds Ratio (*OR*, 95% CI) were used to measure how much greater or less the odds are for girls conceiving at an early age to experience a particular health event or health outcome for them and their newborn in comparison to those conceiving on the age of 18 and above. A value of an Odds Ratio greater than 1.0 indicates that the odds of exposure to adverse health events among girls conceiving at an early age are greater than the odds of exposure for those conceiving after the age of 18 years old. Therefore, early marriage and early conception might be considered a risk factor for the maternal and neonatal adverse health outcomes. However, an Odds Ratio close or equal to one means that early marriage is not associated to neonatal and maternal morbidities and mortalities, and a value less than one considers that early marriage is a protective factor against any potential maternal and neonatal complications (Daniel & Cross, 2018).

The significance test helps with making predictions or inferences about the study's population of Syrian refugee women and girls from the analysis of the secondary data.

Table 1

Statistical Analysis Plan for Variables Included in Research Questions

Research question	Variables	Statistical Tests
RQ1: Is there a statistically significant difference for neonatal birth outcomes (e.g. prematurity, respiratory distress in newborn, cardiac arrest of newborn, septicemia, acute respiratory failure, and other morbidities in newborn) among newborn to young (below 18) versus adult (above 18) Syrian refugee mothers in Lebanon	- Dependent variable: neonatal birth outcomes (Presence/Absence of complication(s) (e.g. prematurity, respiratory distress in newborn, cardiac arrest of newborn, septicemia, acute respiratory failure, and other morbidities in newborn) - Independent variable: mother's age (below 18; 18 and above) - Confounding variables: socio-economic vulnerability, access to cash and food	Significance tests including Odds Ratio (OR, 95%CI) will be used (Laerd statistics. 2018). Binominal logistic regression analysis will be used to predict the dependent variable through the effect of the independent and confounding variables. I will represent the results of assumption tests, the "classification table", and the "variables in the equation table" to outline which predictor was statistically significant.

Research question	Variables	Statistical Tests
adjusting for socio-economic vulnerability, access to cash and food assistance, education attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon?	assistance, education attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon	
RQ2: Is there a statistically significant difference in neonatal mortality among newborn to young (below 18)	- Dependent variable: neonatal mortality (Yes/No) - Independent variable: mother's age (below 18; 18 and above)	Significance tests including Odds Ratio (OR, 95%CI) will be used (Laerd statistics. 2018).

Research question	Variables	Statistical Tests
versus adult (above 18) Syrian refugee mothers in Lebanon adjusting for socio-economic vulnerability, access to cash and food assistance, education attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon?	- Confounding variables: socio-economic vulnerability, access to cash and food assistance, education attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon	Binominal logistic regression analysis will be used to predict the dependent variable through the effect of the independent and confounding variables. I will represent the results of assumption tests, the "classification table", and the "variables in the equation table" to outline which predictor was statistically significant.
RQ3: Is there a statistically significant difference	- Dependent variable: maternal health outcomes in terms of complications	Significance tests including Odds Ratio (*OR*, 95%CI)

Research question	Variables	Statistical Tests
for maternal health outcomes in terms of complications (e.g. missed abortion, maternal anemia, hemorrhage, premature separation of placenta, hypertension complicating pregnancy, pre-eclampsia, eclampsia, and any other complications of pregnancy, delivery and postnatal aggravating condition) among young (below 18) versus adult (above	(Presence/Absence of complication(s) (e.g. missed abortion, maternal anemia, hemorrhage, premature separation of placenta, hypertension complicating pregnancy, pre-eclampsia, eclampsia, and any other complications of pregnancy, delivery and postnatal aggravating condition) - Independent variable: mother's age (below 18; 18 and above) - Confounding variables: socio-economic vulnerability, access to cash and food assistance, education attainment, geographic	will be used (Laerd statistics. 2018). Binominal logistic regression analysis will be used to predict the dependent variable through the effect of the independent and confounding variables. I will represent the results of assumption tests, the "classification table", and the "variables in the equation table" to outline which predictor was statistically significant.

Research question	Variables	Statistical Tests
18) Syrian refugee mothers in Lebanon adjusting for socio-economic vulnerability, access to cash and food assistance, education attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon?	distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon	

Descriptive Statistics

This part includes the procedure that helps in organizing and describing the variables related to the study's population of interest. Measures of central tendency and

measures of variability were used, so the study included numeric descriptions (mean, standard deviations for continuous variables, and frequency for categorical variables) and graphic representations that present and describe the features of the dataset (Frankfort-Nachmias & Leon-Guerrero, 2015).

Threats to Validity

Internal validity is defined as the degree to which the design of a study supports in concluding that changes in the independent variable causing any observed differences or changes in the dependent variable. Therefore, if a study has internal validity, it provides evidence supporting causal inferences. External validity is the degree to which the results of a study can be generalized to groups of people, settings, events, and past and future situations occurring in the real world. As for construct validity, it is considered as an overarching concept aiming to assess the validity of the measurement process and procedure that we use to measure a given construct (Creswell, 2014; Warner, 2013). This section discusses the threats to internal, external, and construct validity and develops the responses and actions considered to improve it.

External Validity

In accordance with Creswell in 2014 who portrayed that the external validity threats arise because of the sample characteristics selected, the setting uniqueness, and the timing of the experiment, it is assumed that the sample features may be a threat to the external validity in this study. If not selected properly, the sample through its particular features may be responsible for the effect (or partially responsible), leading to limited generalizability of the findings to the population of interest. Therefore, in order to deal

with this threat, the study defined the inclusion and exclusion criteria properly in order to well delineate the population under research (Creswell, 2014).

Internal Validity

According to Warner (2013), internal validity increases with experimental studies, thus there is a greater experimental control of extraneous variables. However, a non-experimental study, likewise this study, usually has weak internal validity. If researchers find a strong correlation between *X* and *Y*, this is not sufficient to draw causal inferences since changes in *Y* may be affected by confounding variables (Warner, 2013).

Participants' selection bias may be one of the factors threatening the internal validity. The study may have selected participants having certain characteristics that predispose them to having certain outcomes or health results. In order to mitigate this risk, the study will select all participants who are admitted to any contracted hospital during the year 2018 and meet the sample inclusion criteria as mentioned above in order to ensure that the characteristics have the probability of being equally distributed among the groups, and that the participants are representative of the population being studied (Creswell, 2014).

Construct Validity

An important problem researchers observe in front of a logistic regression analysis is whether the results related to the studied sample can be extended to the corresponding population. Therefore, once the model has been built, it is very important to validate it. This validation can be done by running the model summary and justifying the Cox and Snell's R^2 or Nagelkerke adjusted R^2 statistic as well as Correct

Classification Rate (CCR). The summary measures of goodness-of-fit analysis shall be processed (Laerd statistics, 2018; Warner, 2013).

Among the construct threats that might arise is one related to statistical conclusion validity. This type of threat occurs when the researcher draws inaccurate inferences from the data because of inadequate statistical power or the violation of statistical assumptions. In addition to this, threats to construct validity happen when investigators use inadequate definitions and measures of variables (Creswell, 2014). In order to improve the validity and lower the threat, the study follows accurate definition of variables and their measures.

Moreover, using logistic regression imposes looking at the following assumptions and testing. The first assumption imposes that the study's dependent variables (the maternal and neonatal health outcomes) should be measured on a dichotomous scale. The second assumption outlines that the independent variable can be either continuous or categorical. In the current study's case, the independent variable is ordinal (age of the mothers: below 18 or 18 and above). The third assumption stipulates that the study should have independence of observations and the dependent variable should hold mutually exclusive and exhaustive categories**.** The fourth assumption specifies that there has to be a linear relationship between any continuous independent variables and the logit transformation of the dependent variable (Laerd statistics, 2018).

The power analysis of the statistical test will be increased, through the determination of a large sample size for controlling both type I and type II errors (Daniel & Cross, 2018).

Ethical Procedures

Walden University Institutional Review Board (IRB) has a main objective of ensuring that all Walden University research complies with and follows the university's ethical standards. After the University Research Review (URR) phase began, I sought the institutional board review guidance on which forms or specific documentation were needed for me to request access to the data sources from UNHCR. Therefore, I refrained from requesting any data before getting Walden University IRB approval (Walden University, 2019b).

Since I conducted a secondary data analysis, I minimized the exposure of my vulnerable population of concerns to any risk by requesting a dataset where UNHCR removed all identifiers before sharing it with me (e.g. name and registration number). Thus, the dataset brought to my attention was free from any information that could allow the recognition of the observations enrolled in my study, thus ensuring their privacy and confidentiality (Walden University, 2019 a).

Since the data was de-identified and I did not have access to the codes, I required a waiver of consent. I did not need a full review by the ethical board, but only the confirmation that the dataset was actually anonymous (Tripathy, 2013). Moreover, being a UNHCR member may put me in a position of potential conflict of interest. Therefore, I complied with all the necessary university and institutional regulations and requirements to preserve my integrity and conduct my research with high professionalism. I did not request the data before being granted IRB approval, nor did I try to access it in a non-

ethical manner (Resources for Research Ethics Education, 2016). I got the IRB approval on November 10th 2021 and the number given for the study was 11-09-20-0503070

From UNHCR's side, they requested a data sharing agreement (DSA) describing the type of information/data I required to receive. The DSA specified the purpose of data use and the importance that the data to be handled and protected accordingly, and to remain inaccessible to a third party. It included the need and methodology to destroy the data after finalizing the study. Therefore, I complied with UNHCR requirements and recommendations.

After receiving the data from UNHCR, I ensured that it was secured technically to preserve the confidentiality of the cases handled by preventing any unauthorized access (European University Institute, 2019).

I will keep my data as long as it is necessary to fulfil my research purpose. After the retention period has expired, I will be sure to securely delete it (European University Institute, 2019).

Summary

Chapter 3 outlined the research topic methodology including the sampling strategy, the data analysis plan along with the statistical tests that were envisaged in order to address the research questions accordingly and draw conclusions that may be representative to the population of concern. The upcoming chapter covers the study results and findings presentation.

Chapter 4: Results

This study was conducted to examine whether there was a statistically significant relationship between adverse maternal and birth health outcomes among Syrian refugees in Lebanon and social determinants of health. The independent variables (Syrian refugee mothers' age at conception) and confounding variables (socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, time of arrival from Syria, and type of accommodation) were included in the study to make inferences and predict variables related to maternal and newborn health outcomes, including presence or absence of maternal and neonatal complications and neonatal mortalities. Three research questions and relevant hypotheses were developed and tested in order to make judgements and conclusions that could serve the health science discipline and inform new policies and recommendations that could benefit Syrian refugees in Lebanon. This chapter displays the data collection procedure that was used thorough this research process as well as study results following statistical tests that were applied.

Data Collection

As described in Chapter 3, secondary data from the UNHCR were used in the study. This included referral care program data related to all maternal and neonatal admissions for the year 2018. For each observation included in the sample, demographic and assistance data were also extracted from the database and compiled in a dataset. Two de-identified datasets were prepared by the UNHCR: one maternal dataset and one neonatal dataset. Each dataset included referral care, demographic, and assistance data

that were organized by the UNHCR and shared with me following IRB approval (IRB approval number for this study is 11-09-20-0503070). Maternal and neonatal household IDs were encrypted, allowing for the organization of the datasets before starting statistical tests in order to properly answer the research questions.

Discrepancies and Deviations

The focus of the study was to examine how the independent variable, singly and in combination with confounding variables, predict maternal and neonatal health outcomes. All maternal and neonatal admissions that took place within the network of 40 contracted hospitals in the Lebanese territories between January until December 2018 were included. The sample size of data was estimated to be 50,032 maternal and 5,241 neonatal admissions. In preparation for datasets, the inclusion and exclusion criteria described in Chapter 3 were applied by the UNHCR. Ten weeks after receiving IRB approval, the UNHCR shared datasets that included maternal (N = 49,665) and neonatal observations (N = 6,080). Therefore, the sample size did not significantly deviate from the initial estimation; the maternal dataset sample had 367 fewer observations and the neonatal dataset was marginally higher by 839 observations; however, this was not the final dataset sample size that remained after cleaning and adjusting data.

The sample adjustment that was necessary to perform involved handling of missing data, where a few observations had missing variables related to socioeconomic vulnerability, access to cash and food assistance, education attainment, geographic distribution, employment, time of arrival from Syria, and type of accommodation. Therefore, since the study's sample size was large enough, I removed from the dataset the

observations with missing variables or information to prevent imbalanced observations that may lead to invalid conclusions. Also following data cleaning, it was necessary to remove all observations where mothers and newborn diagnoses on admission to and discharge from hospitals were not relevant to health outcomes of interest in the present study. Examples of maternal observations removed from the dataset include abdominal or pelvic swelling, mass or lump, prolapse of vaginal vault after hysterectomy, unspecified disorders of menstruation, and other abnormal bleeding from the female genital tract. Neonatal observations removed from the newborn dataset involved medical conditions not related to perinatal conditions even if they were admitted to the neonatal intensive care unit. The neonatal dataset was composed by matching household IDs for mothers and newborns.

The final sample included maternal observations (N = 48,083) and neonatal observations (N = 4,288). As stated in Chapter 3, following the use of the G*Power 3, the total sample size required was 1,188 with an actual power of 0.95 and a critical Z of 1.959. The sample is large enough for results to be generalized to Syrian mothers and newborns.

In reference to variables, only newborn gender was missing from the dataset even though this type of information is collected by the TPA; but this variable did not have any impact on the study analysis.

Study Results

The software used during the study was IBM SPSS statistical software for Windows version 22 for data management and analyses. Data included numbers and

percentages for categorical variables, as well as means and standard deviations (±SD) for continuous variables. Associations between predictors (mother age, length of stay [LOS], socioeconomic vulnerability, access to cash and food assistance, education attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon) and outcomes (neonatal birth outcome, neonatal mortality and complications) were assessed using the Pearson chi-square test for categorical variables, whereas a t-test was used for continuous predictors. Moreover, multivariable regression analysis was used to adjust for potentially confounding variables. Logistic regression analysis was carried out to identify predictors of each outcome. Results are presented as adjusted *OR* and 95% CI. A *p*-value of less than .05 was used to indicate statistical significance.

Descriptive Statistics

Overall, 48,083 women of child-bearing age were included in the study; among these women, 4,489 (9.3%) were under the age of 18, with the youngest age group including two cases under 12 and 382 cases between 12 and 14, while 4,105 girls were between 15 and 17. For the category of age 18 and above, 1,156 were above 40 (2.4%), and the majority of participants were between 18 and 29 (*N* = 30,151) constituting 62.7% of the overall sample. In reference to the geographical distribution of mothers across Lebanon Governorates, 30% reside in Mount Lebanon, 23% in Bekaa, 13.4% in the North, 9.1% in the South, 8.7% in Baalbeck/Hermel, 8.5% in Akkar, 5.7% in Nabatieh, and 1.4 % in Beirut. 34.7% originated from North Syria (Aleppo and Ar-raqqa), 9.8% from the Northeast (Al-hasakeh, Deir-ez-zor), 14.2% from the Northwest (Idleb;

Lattakia), 14.5% from the Southwest (Damascus, rural Damascus, Dara'a and Quneitra), and 26.8% from central-east Syria (Homs, Halab, and Tartus). 76.5% were accommodated in individual dwellings, 21.4% in informal settlements and camps, and 2.1% in collective centers. Only 2.8% of mothers were reported as having arrived in Lebanon before 2011, sometime before the onset of the Syrian crisis; 46.2% of mothers fled to Lebanon between five to six years before their inpatient admission date and were recorded entering Lebanon in 2012 and 2013; 33.7% fled between 2014 and 2016, and only 15.2% were reported as having arrived in Lebanon in 2017, meaning a few months to 1 year before their admission event.

11.7% of mothers were not educated; respectively, 39.5% and 32.6% completed primary and complementary school, while 11% attended secondary school and only 5.2% accomplished higher education. In reference to mothers' occupations, 16.1% had no employment and 83.9% were employed. Among the employed mothers, 66.7% were reportedly in the category of housekeeping services including housewives and restaurant workers, and 1.7% worked in the domain of agriculture and farming. It was noticed as well that 3.7% were recorded as students. Regarding socio-economic vulnerability, 60.8% were severely vulnerable, 23.8% highly vulnerable, while 15.4% were mildly to least vulnerable. 62.7% were receiving cash assistance, and 45.5% food assistance.

Out of the 48,083 women recruited in this study, 1,678 (3.5%) had developed complications; 109 (6.49%) being under 18 years old and 1,569 (93.5%) being 18 and above. It should be noted that the diagnostic on discharge from the hospital was the one considered to report the presence or absence of complications since it covers both the

cases admitted with complications related to child birth and delivery in addition to those who developed complications during the hospital stay and before the discharge date. The complications that were recorded were in the majority related to missed, spontaneous, and incomplete abortion (ICD-9 and ICD-10: 632, 634.90, O02.1, O03.4;78.2% from the overall type of complications); 75.2% were within the category of age below 18 while 78.4% were within the category of age 18 and above with respective *N* = 82 and *N* = 1231. Ectopic, abdominal, or tubal pregnancy (ICD-9 and ICD-10: 633.00, 633.10, 633.11, 633.80, 633.81, 633.90, 633.91, O00.0, O00.1, O00.8, O00.9) represented the second rank of reported complications (4.4% of the overall type of complications); with 2.7% within the category of age below 18 and 4.5% within the category of age 18 and above with respective *N* = 3 and *N* = 71. Specified and unspecified complications of pregnancy, labor, or delivery (ICD-9:646.80, 646.81, 646.82, 646.84, 646.90, 646.91, 646.93, 669.90, 669.92) ranked the third among the complications (4.1% of the overall type of complications); with 8.2% within the category of age below 18 and 3.8% within the category of age 18 and above with respective *N* = 9 and *N* = 61. Eclampsia/Pre-eclampsia at the antepartum, unspecified as to episode of care or with deliveries (ICD-9 and ICD-10: 642.40, 642.41, 642.50, 642.51, 642.52, 642.54, 642.61, 642.62, 642.63, 642.64, 642.70, 642.71, 642.74, O14.10, O14.12, O14.90, O14.93, O15.2, O15.9), and hemorrhage at the ante-partum, delivery, post-partum, following ectopic and molar pregnancy, from placenta previa, or following incomplete spontaneous abortion (ICD-9 and ICD-10: O72.1, O72.2, O46.8X1, O08.1, D69.8, 641.10, 459.0, O03.1, 641.81)

represented respectively 2.3% and 1.9% from the overall type of reported complications. Additionally, six women were reported dead during the reported period.

The neonatal observations included *N* = 4,288 among which 267 deaths occurred. The age at admission ranged between zero and 28 days. 62.4% of the newborn admissions occurred upon their birth, 15.74% at day one and two, 2.2% at day three, and 4.6% at day four and five. Half of the reported complications among newborn (54.5%) were related to respiratory distress syndrome of newborn (ICD-10: P22.0); 12.8% were due to neonatal jaundice unspecified, related to infection, bruising, or to other specified causes (ICD-10: P59.9, R17, P59.8, P58.2, P58.0). Moreover, 10.7% of the neonatal admissions identified with other respiratory pathology or illnesses of the newborn including tachypnea, bronchopneumonia, dyspnea, bronchiolitis, pneumonia, acute upper respiratory infection, and respiratory arrest of newborn (ICD-10: P22.0, P 22.1, P22.9, R06.00, J20.9, J18.0, J18.9, J21.0, R06.82, J21.9, R06.02, J06.9, P28.81). Also, 5.3% of the complications were related to sepsis of the newborn, bacterial or with unspecified organism (ICD-10: P36.9, A41.9). Low birth weight (ICD 10: P07.16, P07.14, P07.15, P07.17, P07.18, P07.03) and prematurity (ICD-10: P07.30, P07.37, P07.35, P07.33, P07.36, P07.38, P07.31, P07.02) constituted respectively 5.1% and 1.3% of the total complications. The length of stay ranged from hours after birth to 18 days with a mean of 1.2 days.

RQ1

RQ1: Is there a statistically significant difference in terms of neonatal birth outcomes (e.g. prematurity, respiratory distress, cardiac arrest, septicemia, acute

respiratory failure, and other morbidities) between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon?

Table 2 includes information regarding the association between neonatal birth outcomes and demographic characteristics of mothers. Maternal age was found to be significantly associated with neonatal complications, and 91.8% of neonatal complications occurred in babies born to mothers aged 18 and above ($p < .003$). Mothers between the ages of 30 and 39 (28.6%) as well as those 40 and above (2.7%) were most likely to develop complications respectively in comparison to those who did not ($p < .0001$). In addition, newborn ill health was associated with mothers' illiteracy (12.5%) and primary education (41.9%) in comparison to those who did not have complications. Also, mothers' employment was seen as a predictor for neonatal complications (85.6%) in reference to those who did not have complications (83.5%).

Table 2

Association of Neonatal Birth Outcomes with Demographic Characteristics of Mothers

Demographics Characteristic		Neonatal Birth Outcome		*T-test /Chi-square*	*p*
		No	Yes		
		N = 42,115	*N* = 4,288		
Age (years)	Mean ± SD	25.95 ± 6.47	26.66 ± 6.61	**-6.67**	**< .0001**
	< 12	2 (0.0%)	0 (0.0%)	**42.42**	**< .0001**

Demographics Characteristic		Neonatal Birth Outcome		*T-test /Chi-square*	*p*
		No	Yes		
		N = 42,115	*N* = 4,288		
Age (years)	12–14	348 (0.8%)	22 (0.5%)		
	15–17	3,684 (8.7%)	328 (7.6%)		
	18–29	26,728 (63.5%)	2,597 (60.6%)		
	30–39	10,405 (24.7%)	1,225 (28.6%)		
	40 and above	944 (2.2%)	116 (2.7%)		
	< 18	4,034 (9.6%)	350 (8.2%)	**9.14**	**.003**
	≥ 18	38,077 (90.4%)	3,938 (91.8%)		
Education Attainment	No education	4,748 (11.5%)	531 (12.5%)	**22.79**	**< .0001**
	Primary school	16,319 (39.1%)	1,784 (41.9%)		
	Complementary school	13,757 (33.0%)	1,291 (30.3%)		
	Secondary school	4,656 (11.2%)	442 (10.4%)		
	Technic/university and above	2,212 (5.3%)	207 (4.9%)		
Employment	Not employed	5,792 (16.5%)	527 (14.4%)	**10.50**	**.001**
	Employed	29,409 (83.5%)	3,138 (85.6%)		

Table 3 presents the association of neonatal birth outcomes with medical characteristics of their mothers. It was evident that the newborns' length of stay at the neonatal intensive care unit who were born with or developed complications upon birth was 1.36 ± 0.63 in comparison to those who did not have complications 1.18 ± 0.52 ($p <$ .0001). Maternal complication was significantly association with neonatal birth complication ($p <$ .0001).

Table 3

Association of Neonatal Birth Outcomes with Medical Characteristics of Mothers

Medical Outcomes		Neonatal Birth Outcome		*T-test /Chi-square*	*p*
		No	Yes		
		N = 42115	*N* = 4288		
LOS (days)	Mean ± SD	1.18 ± 0.52	1.36 ± 0.63	**-18.08**	**< .0001**
Maternal Complication	No	42,078 (99.9%)	4,276 (99.7%)	**13.60**	**< .0001**
	Yes	37 (0.1%)	12 (0.3%)		
Maternal Complication at Admission	No	42,110 (100.0%)	4,287 (100.0)		.53
	Yes	5 (0.0%)	1 (0.0%)		
Maternal Complication at discharge	No	42,078 (99.9%)	4,276 (99.7%)	**13.60**	**< .0001**
	Yes	37 (0.1%)	12 (0.3%)		
Mortality Outcome	Death	3 (0.0%)	1 (0.0%)	1.18	.28
	Survival	42,112 (100.0%)	4,287 (100.0)		

Table 4 represents the association of neonatal birth outcomes with social characteristics of the mothers. Among the main characteristics of mothers that were significantly associated with the neonatal complications was their socio-economic vulnerability ($p < .0001$), whereby 65.4% of the newborn who developed complications where born to mothers severely vulnerable, and 23.2% to mothers highly vulnerable. Moreover, for mothers who had access to cash, their newborn were most likely to develop complications (64.8%) in comparison to those who did not have complications (62.2%) ($p = .0001$), and mothers deprived from food assistance (53.3%) had adverse neonatal health outcomes ($p = .04$). Regarding the geographic distribution, it was noted that neonatal cases were more likely to develop complications when mothers living in Mount Lebanon (31.1%), Bekaa (25.4%), South (12.6%), and Nabatieh (6.7%) when compared to non-complicated cases (30.1%, 22.9%; 8.7%, and 5.6%), respectively. Furthermore, 76.3% of mothers of newborn who had complications lived in individual accommodation and it was proven that newborn are more likely to develop complications when mothers are residing in camps (1.1%) and collective centers (2.6%) in comparison to those who did not experience complications (0.9%) and (2.1%) with $p = .09$. Finally, the results reflected that mothers originating from north of Syria (Aleppo or Al-raqqa) or northeast of Syria (Al-hasakeh, Deir-ez-zor) were more likely to have a child with complications, 36.4% and 10.8% as compared to those who did not have complications, 34.4% and 9.7%. It is worth mentioning that neonatal complications were not found to be associated with time of arrival from Syria ($p = 0.61$). And finally, the results showed that

in 0.3% of the newborn who developed complications their mothers exhibited complications as well on discharge ($p < .0001$).

Table 4

Association of Neonatal Birth Outcomes with Social Characteristics of Mothers

Social Characteristics		Neonatal Birth Outcome		*T-test /Chi-square*	*p*
		No *N* = 42115	Yes *N* = 4288		
Socio-economic Vulnerability	Least	2,182 (5.5%)	122 (3.0%)	**75.65**	**< .0001**
	Mildly	4,176 (10.5%)	339 (8.4%)		
	Highly	9,524 (23.9%)	939 (23.2%)		
	Severely	23,953 (60.1%)	2,645 (65.4%)		
Access to Cash	No	15,938 (37.8%)	1,509 (35.2%)	**11.67**	**.001**
	Yes	26,177 (62.2%)	2,779 (64.8%)		
Access to Food Assistance	No	23,157 (55.0%)	2,287 (53.3%)	**4.28**	**.04**
	Yes	18,958 (45.0%)	2,001 (46.7%)		
Geographic Distribution	Baalbeck/Hermel	3,657 (8.7%)	273 (6.4%)	**179.34**	**< .0001**
	Beqaa	9,628 (22.9%)	1,087 (25.4%)		
	Akkar	3,725 (8.9%)	242 (5.6%)		
	North	5,768 (13.7%)	470 (11.0%)		
	Beirut	602 (1.4%)	53 (1.2%)		

Social Characteristics		Neonatal Birth Outcome		*T-test /Chi-square*	*p*
		No	Yes		
		N = 42115	*N* = 4288		
Geographic Distribution	Mount Lebanon	12,683 (30.1%)	1,334 (31.1%)		
	Nabatieh	2,365 (5.6%)	286 (6.7%)		
	South	3,646 (8.7%)	539 (12.6%)		
Area of Origin from Syria	North (Aleppo; al-raqqa)	14,414 (34.4%)	1,551 (36.4%)	**16.98**	**.002**
	Northeast (Al-hassake; der -elzor)	4,084 (9.7%)	462 (10.8%)		
	Northwest (idleb; latakia)	5,947 (14.2%)	595 (14.0%)		
	Southwest (Damascus; daraa; quneitra; rural damascus)	6,125 (14.6%)	583 (13.7%)		
	Western-Central (homs, hama, tartus)	11,327 (27.0%)	1,070 (25.1%)		
Time of Arrival From Syria	< 2011	1,173 (2.8%)	121 (2.8%)	5.38	.61
	2012	7,605 (18.1%)	777 (18.1%)		
	2013	11,891 (28.2%)	1,170 (27.3%)		
	2014	7,312 (17.4%)	744 (17.4%)		
	2015	2,556 (6.1%)	249 (5.8%)		
	2016	4,343 (10.3%)	443 (10.3%)		
	2017	6,438 (15.3%)	689 (16.1%)		

Social Characteristics		Neonatal Birth Outcome		*T-test /Chi-square*	*p*
		No	Yes		
		N = 42115	*N* = 4288		
Time of Arrival From Syria	2018	797 (1.9%)	95 (2.2%)		
Type of Accommodation in Lebanon	Camp	359 (0.9%)	44 (1.1%)	**6.61**	**.09**
	Center	847 (2.1%)	109 (2.6%)		
	Individual accommodation	31,205 (76.6%)	3,186 (76.3%)		
	Settlement	8,327 (20.4%)	837 (20.0%)		

The coefficient of determination Nagelkerke R^2 = .017 (Table 5). It shows that the model only explains 1.7% of the variation in the dependent variable neonatal birth outcomes (Daniel et al., 2018; Laerd Statistics, 2018).

Table 5

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	27807.649 [a]	.008	.017

[a] Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

The results of the multivariable logistic regression analyses for the predictors of neonatal birth outcomes or complications are presented in Table 6. After adjusting for the multiple confounding such as socio-economic vulnerability, access to cash and food

assistance, education attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon, I found that no significant difference between mother's age and neonatal birth outcomes (*OR* = 1.139, 95% CI [1.008, 1.288], *p* = .467). Newborn had less risk of developing complications when their mothers had access to cash assistance (*OR* = 0.801, 95% CI [0.708, 0.906], *p* < .0001). Moreover, infants born to mothers who are severely and highly vulnerable had higher odds for developing complications in reference to those born to mothers who are at least vulnerable with *OR* = 2.069, 95% CI [1.743, 2.455], *p* < .0001 and *OR* = 1.415, 95% CI [1.229, 1.628], *p* < .0001. Moreover, mothers originating from southwest of Syria are considered protected from their newborn developing neonatal complications (*OR* = 0.875, 95% CI [0.781, 0.981], *p* = 0.022). Mothers who arrived from Syria in 2018 were found to have 1.4 times the odds of neonatal birth complication (*OR* = 1.364, 95% CI [1.013, 1.836], *p* = 0.041). Mothers residing in collective centers are considered at risk for their newborn to develop neonatal complications in comparison to those who live in individual accommodations with *OR* = 1.234, 95% CI [1.001, 1.522], *p* =.049. In addition, mothers' employment is considered a risk factor for the newborn to develop ill health (*OR* = 1.167, 95% CI [1.079, 1.262], *p* < .0001). Finally, in reference to the residency in Lebanon, for mothers living in Baalbeck, Akkar, and North, their newborn are considered protected (*OR* = 0.595, 95% CI [0.512, 0.692], *p* < .0001; *OR* = 0.493, 95% CI [0.421, 0.577], *p* = < .0001; *OR* = 0.725, 95% CI [0.645, 0.815], *p* < .0001), respectively, while those born to mothers residing in the South are at risk (*OR* = 1.337, 95% CI [1.198, 1.492], *p* < .0001).

Table 6

Logistic Regression of Predictors of Neonatal Birth Outcomes

Predictor	*OR*	95% CI		*p*
		LL	UL	
Mother's age [a]				
≥ 18 years	1.139	1.008	1.288	.467
Access to cash [b]				
Yes	.801	.708	.906	**<.0001**
Access to food assistance [c]				
Yes	1.022	.932	1.120	.572
Socio-economic vulnerability [d]				
Mildly	1.081	.920	1.271	.346
Highly	1.415	1.229	1.628	**<.0001**
Severely	2.069	1.743	2.455	**<.0001**
Education attainment [e]				
Primary	1.046	.941	1.163	.408
Complementary	.974	.869	1.091	.645
Secondary	1.038	.901	1.196	.608
University	1.058	.884	1.266	.538
Area of origin from Syria [f]				
North	.972	.887	1.065	.548
Northeast	1.007	.887	1.144	.910
Northwest	.924	.828	1.031	.156
Southwest	.875	.781	.981	**.022**
Time of arrival from Syria [g]				
2012	1.005	.818	1.235	.962
2013	.955	.781	1.169	.657
2014	.987	.802	1.215	.901
2015	.968	.765	1.224	.785

Predictor	*OR*	95% CI		*p*
		LL	UL	
Time of arrival from Syria [g]				
2016	.983	.790	1.223	.877
2017	1.068	.864	1.321	.544
2018	1.364	1.013	1.836	**.041**
Type of accommodation in Lebanon [h]				
Camp	1.354	.985	1.862	.062
Center	1.234	1.001	1.522	**.049**
Settlement	1.002	.916	1.095	.972
Mother employment [i]				
Employed	1.167	1.079	1.262	**<.0001**
Geographic distribution [j]				
Baalbeck	.595	.512	.692	**<.0001**
Beqaa	.934	.841	1.037	.199
Akkar	.493	.421	.577	**<.0001**
North	.725	.645	.815	**<.0001**
Beirut	.799	.593	1.077	.141
Nabatieh	1.071	.934	1.229	.327
South	1.337	1.198	1.492	**<.0001**

Note. CI = confidence interval; LL = lower limit; UL = upper limit.

[a] Reference: < 18 years old. [b] Reference: no. [c] Reference: no. [d] Reference: least. [e] Reference: no education. [f] Reference: Western-Central. [g] Reference: ≤ 2011. [h] Reference: individual accommodation. [i] Reference: not employed. [j] Reference: Mount Lebanon governorate.

RQ2

RQ2: Is there a statistically significant difference in terms of neonatal mortality between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon?

Table 7 displays the association of neonatal mortality with the demographic characteristics of the mothers. For the neonatal data, the mean age of the newborn in the death group was 1.10 ± 3.31 days and 2.51 ± 5.43 days in the survivor group ($p < .0001$). As for the maternal data, we found that age, education and employment characteristics were not found to be significantly different with the neonatal mortality ($p = .96$, $p = 1.00$ and $p = .14$)

Table 7

Association of Neonatal Mortality with Demographic Characteristics of Mothers

Demographic characteristic		Neonatal mortality		*T-test /Chi-square*	*p*
		Death *N* = 267	Survival *N* = 4,021		
Neonatal data					
Age (days)	Mean ± SD	1.10 ± 3.31	2.51 ± 5.43	**-6.44**	**< .0001**
Maternal data					
Age (years)	Mean ± SD	26.69 ± 6.90	26.66 ± 6.59	0.68	.95
	12–14	1 (0.4%)	21 (0.5%)	2.07	.72
	15–17	21 (7.9%)	307 (7.6%)		

Demographic characteristic		Neonatal mortality		*T-test /Chi-square*	*p*
		Death *N* = 267	Survival *N* = 4,021		
Age (years)	18–29	152 (56.9%)	2,445 (60.8%)		
	30–39	86 (32.2%)	1,139 (28.3%)		
	40 and above	7 (2.6%)	109 (2.7%)		
	< 18	22 (8.2%)	328 (8.2%)	0.002	.96
	≥ 18	245 (91.8%)	3,693 (91.8%)		
Maternal data					
Education attainment	No education	34 (12.7%)	497 (12.5%)	0.19	1.00
	Primary school	110 (41.2%)	1,674 (42.0%)		
	Complementary school	83 (31.1%)	1,208 (30.3%)		
	Secondary school	28 (10.5%)	414 (10.4%)		
	Technic/university and above	12 (4.5%)	195 (4.9%)		
Employment	Not employed	40 (17.7%)	487 (14.2%)	2.16	.14
	Employed	186 (82.3%)	2,952 (85.8%)		

Table 8 presents the association of neonatal mortality with the medical characteristics of the mothers. For neonatal data, the length of stay at the neonatal intensive unit averaged 5.43 ± 8.04 days in the death group, and 7.26 ± 7.83 days in the survivor group ($p < .0001$). For maternal data, results showed that maternal complication was significantly associated with birth mortality outcome ($p = .04$) and it was shown that

in 1.1% of the children who passed away, their mothers developed complications on discharge (p = .04)

Table 8

Association of Neonatal Mortality with Medical Characteristics of Mothers

Medical Characteristics		Neonatal mortality		*T-test /Chi-square*	*p*
		Death *N* = 267	Survival *N* = 4,021		
Neonatal data					
LOS (days)	Mean ± SD	5.43 ± 8.04	7.26 ± 7.83	**-3.70**	**< .0001**
Maternal data					
LOS (days)	Mean ± SD	1.38 ± 0.85	1.36 ± 0.62	0.285	.71
Maternal complication	No	264 (98.9%)	4,012 (99.8%)	**7.26**	**.04**
	Yes	3 (1.1%)	9 (0.2%)		
Maternal complication at admission	No	267 (100.0%)	4,020 (100.0%)	0.07	1.00
	Yes	0 (0.0%)	1 (0.0%)		
Maternal complication at discharge	No	264 (98.9%)	4,012 (99.8%)	**7.26**	**.04**
	Yes	3 (1.1%)	9 (0.2%)		
Maternal mortality outcome	Death	0 (0.0%)	1 (0.0%)	0.07	1.00
	Survival	267 (100.0%)	4,020 (100.0%)		

Table 9 displays the association of neonatal mortality with social characteristics of the mothers. It was found that the geographic distribution showed statistically significant difference in neonatal mortality (p = .01), furthermore neonatal survival was higher among newborn whose mothers live in Beqaa (25.8%), South (12.8%), North (11%), Nabatieh (6.7%), and Beirut (1.3%) in comparison to neonatal death (19.2%, 8.6%, 10.5%, 6.4%, and 0.8%), respectively. Moreover, mothers having access to cash support (65.1%) were less likely to end up with a newborn mortality in comparison to those who died (59.9%, p = .09). The results did not reveal any association between neonatal mortality and socio-economic vulnerability (p = .16), access to food assistance (p = .28), type of accommodation in Lebanon (p = .95), area of origin from Syria (p = .90), nor time of arrival from Syria (p = .95).

Table 9

Association of Neonatal Mortality with Social Characteristics of Mothers

Social characteristics		Neonatal mortality		*T-test /Chi-square*	*p*
		Death *N* = 267	Survival *N* = 4,021		
Socio-economic vulnerability	Least	12 (4.8%)	110 (2.9%)	5.20	.16
	Mildly	26 (10.3%)	313 (8.3%)		
	Highly	62 (24.6%)	877 (23.1%)		
	Severely	152 (60.3%)	2,493 (65.7%)		
Access to cash	No	107 (40.1%)	1,402 (34.9%)	**2.98**	**.09**

Social characteristics		Neonatal mortality		*T-test /Chi-square*	*p*
		Death *N* = 267	Survival *N* = 4,021		
Access to cash	Yes	160 (59.9%)	2,619 (65.1%)		
	No	151 (56.6%)	2,136 (53.1%)	1.19	.28
Access to food assistance	Yes	116 (43.4%)	1,885 (46.9%)		
Geographic distribution	Baalbeck/Hermel	22 (8.3%)	251 (6.2%)	**17.60**	**.01**
	Beqaa	51 (19.2%)	1,036 (25.8%)		
	Akkar	16 (6.0%)	226 (5.6%)		
	North	28 (10.5%)	442 (11.0%)		
	Beirut	2 (0.8%)	51 (1.3%)		
	Mount Lebanon	107 (40.2%)	1,227 (30.5%)		
	Nabatieh	17 (6.4%)	269 (6.7%)		
	South	23 (8.6%)	516 (12.8%)		
Area of origin from Syria	North (Aleppo; Al-raqqa)	90 (33.7%)	1,461 (36.6%)	1.07	.90
	Northeast (Al-hasakeh, Deir-ez-zor)	32 (12.0%)	430 (10.8%)		
	Northwest (idleb; latakia)	38 (14.2%)	557 (13.9%)		
	Southwest (Damascus; daraa; quneitra; rural damascus)	37 (13.9%)	546 (13.7%)		
	Western-Central (homs, hama, tartus)	70 (26.2%)	1,000 (25.0%)		

Social characteristics		Neonatal mortality		*T-test /Chi-square*	*p*
		Death *N* = 267	Survival *N* = 4,021		
Time of arrival from Syria	≤ 2011	7 (2.6%)	114 (2.8%)	2.14	.95
	2012	48 (18.0%)	729 (18.1%)		
	2013	73 (27.3%)	1,097 (27.3%)		
	2014	43 (16.1%)	701 (17.4%)		
	2015	17 (6.4%)	232 (5.8%)		
	2016	26 (9.7%)	417 (10.4%)		
	2017	49 (18.4%)	640 (15.9%)		
	2018	4 (1.5%)	91 (2.3%)		
Type of accommodation in Lebanon	Camp	3 (1.2%)	41 (1.0%)	0.35	.95
	Center	6 (2.3%)	103 (2.6%)		
	Individual accommodation	195 (75.3%)	2,991 (76.4%)		
	Settlement	55 (21.2%)	782 (20.0%)		

The coefficient of determination Nagelkerke R^2 = .022 (Table 10). It shows that the model used is able to explain approximately 2.2 percent of the variation in the dependent variable neonatal mortality (Daniel et al., 2018; Laerd Statistics, 2018).

Table 10

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1497.684 [a]	.008	.022

[a] Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

The results of the multivariable logistic regression analyses for the predictors of neonatal mortality can be found in Table 11. After adjusting for multiple confounding factors such as socio-economic vulnerability, access to cash and food assistance, education attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon, it was evident that there was no statistically significant difference in neonatal mortality among newborn to young (below 18) versus adult (above 18) Syrian refugees' mothers in Lebanon (p = .278). Moreover, it was found that mothers' employment is considered a protective factor against newborn mortality (OR = 0.652, 95% CI [0.441, .964], p = .032), in addition to being residents of Beqaa and South with respective OR= 0.643, 95% CI [0.386– 1.071], p = .09 and OR = 0.518, 95% CI [0.310, 0.867], p = .012.

Table 11

Logistic Regression of Predictors of Neonatal Mortality

Predictor	*OR*	95% CI		*p*
		LL	UL	
Mother's age [a]				
≥ 18 years	1.605	0.683	3.773	.278
Access to cash [b]				
Yes	1.043	0.603	1.804	.881
Access to food assistance [c]				
Yes	1.044	0.680	1.601	.845
Socio-economic vulnerability [d]				
Mildly	0.887	0.406	1.941	.764
Highly	0.705	0.337	1.478	.355
Severely	0.524	0.216	1.272	.153
Education attainment [e]				
Primary	1.077	0.661	1.756	.765
Complementary	0.844	0.495	1.439	.533
Secondary	0.774	0.404	1.483	.440
University	0.772	0.347	1.718	.526
Area of origin from Syria [f]				
North	0.883	0.582	1.340	.559
Northeast	0.798	0.443	1.439	.453
Northwest	1.161	0.729	1.850	.529
Southwest	1.094	0.661	1.811	.726
Time of arrival from Syria [g]				
2012	1.611	0.558	4.654	.378
2013	1.674	0.590	4.748	.333
2014	1.246	0.427	3.635	.688
2015	1.735	0.554	5.432	.344
2016	1.259	0.412	3.854	.686
2017	1.641	0.555	4.848	.370

Predictor	*OR*	95% CI		*p*
		LL	UL	
Time of arrival from Syria				
2018	2.846	0.585	13.859	.195
Type of accommodation in Lebanon [h]				
Camp	1.296	0.389	4.318	.673
Center	1.173	0.451	3.049	.744
Settlement	1.191	0.797	1.781	.394
Mother employment [i]				
Employed	0.652	0.441	0.964	**.032**
Geographic distribution [j]				
Baalbeck	0.963	0.480	1.931	.916
Beqaa	0.643	0.386	1.071	.090
Akkar	0.871	0.444	1.708	.687
North	0.687	0.418	1.130	.139
Nabatieh	0.583	0.303	1.121	.106
South	0.518	0.310	0.867	**.012**

Note. CI = confidence interval; LL = lower limit; UL = upper limit.

[a] Reference: < 18 years old. [b] Reference: no. [c] Reference: no. [d] Reference: least. [e] Reference: no education. [f] Reference: central. [g] Reference: ≤ 2011. [h] Reference: individual accommodation. [i] Reference: not employed. [j] Reference: Mount Lebanon governorate.

RQ3

RQ3: Is there a statistically significant difference in terms of maternal health outcome complications (e.g. missed abortion, maternal anemia, hemorrhage, premature separation of placenta, hypertension complicating pregnancy, pre-eclampsia, eclampsia, or any other complications involving pregnancy, delivery, and post-natal aggravating

conditions) between young (below 18) and adult (above 18) Syrian refugee mothers in Lebanon when adjusting for socioeconomic vulnerability, access to cash and food assistance, educational attainment, geographic distribution, employment, area of origin from Syria, time of arrival from Syria, and type of accommodation in Lebanon?

Table 12 exhibits the association of maternal complications with their demographic characteristics. The average age in this study for mothers who had complications versus mothers who did not have complications was 28.84 years ± 7.15 and 26.02 years ± 6.49, respectively. Also, 6.5% of the mothers who had complications were under 18 years of age versus 9.4% of the mothers who did not have complications ($p < .0001$). Results showed that mothers in the category of age 30 to 39 (39.4%) and 40 and above (5.7%) were more likely to have complications in comparison to those who did not have complications (25% and 2.3%). In addition to this, illiteracy and primary education were associated with complications with respective (15.2%) and (42.4%) in comparison to those who were not complicated (11.6%) and (39.4%) ($p < .0001$). Finally, 87.5% of the complicated cases were employed as compared to 83.7% of no complications ($p < .0001$).

Table 12

Association of Maternal Health Outcomes with Demographic and Social Characteristics

Demographics characteristic		Complication		*T-test /Chi-square*	*p*
		No	Yes		
		N = 46,405	*N* = 1,678		
Age (years)	Mean ± SD	26.02 ± 6.49	28.84 ± 7.15	**-15.94**	**< .0001**
	< 12	2 (0.0%)	0 (0.0%)	**283.09**	**< .0001**
	12–14	369 (0.8%)	13 (0.8%)		
	15–17	4,009 (8.6%)	96 (5.7%)		
	18–29	29,339 (63.2%)	812 (48.4%)		
	30–39	11,622 (25.0%)	661 (39.4%)		
	40 and above	1,060 (2.3%)	96 (5.7%)		
	< 18	4,380 (9.4%)	109 (6.5%)	**16.57**	**< .0001**
	≥ 18	42,021 (90.6%)	1,569 (93.5%)		
Education attainment	No education/illiteracy	5,314 (11.6%)	252 (15.2%)	**36.89**	**< .0001**
	Primary school	18,104 (39.4%)	701 (42.4%)		
	Complementary school	15,056 (32.7%)	467 (28.2%)		
	Secondary school	5,096 (11.1%)	160 (9.7%)		
	Technic/university and above	2,419 (5.3%)	74 (4.5%)		

Demographics characteristic		Complication		*T-test /Chi-square*	*p*
		No	Yes		
		N = 46,405	*N* = 1,678		
Employment	Not employed	6,319 (16.3%)	173 (12.5%)	**13.94**	**< .0001**
	Employed	32,554 (83.7%)	1,211 (87.5%)		

Table 13 presents the association of maternal complications with the medical characteristics. Results showed that maternal complications were not found to be associated with the length of stay at the hospital ($p = .39$). However, mortality outcome was significantly associated with complication outcome ($p < .0001$).

Table 13

Association of Maternal Health Outcomes with Medical Characteristics

Medical Characteristics		Complication		*T-test /Chi-square*	*p*
		No	Yes		
		N = 46,405	*N* = 1,678		
LOS (days)	Mean ± SD	1.20 ± 0.52	1.22 ± 1.17	-0.853	.39
Mortality outcome	Death	2 (0.0%)	4 (0.2%)	**71.11**	**< .0001**
	Survival	46,403 (100.0%)	1,674 (99.8%)		

Table 14 describes the association of maternal complications with social characteristics. Maternal complications were significantly associated with the socio-

economic vulnerability, access to cash and access to food assistance ($p < .0001$), with 66.2% being severely vulnerable; 70.9% having access to cash and 53.3% having food support in comparison to those who did not have complications 60.6%, 62.4% and 45.2%, respectively. Regarding the geographic distribution, it was found that maternal cases were more likely to be complicated in Baalbeck/Hermel (14.3%%), Nabatieh (6.1%), and south (12.1%), as compared to mothers who did not have complications (13.5%, 5.7%, and 9.0%, respectively). Finally, mothers arriving to Lebanon in the same year of hospital admission were more likely to develop complications (3.2%), in addition to those arriving before 2011 (3%), in 2012 (21.2%), in 2013 (28.2%), and in 2014 (19.5%) in comparison to those who did not have reported complications (1.9%, 2.8%, 18.1%, 28.1%, 17.4%) ($p < .0001$), respectively.

Table 14

Association of Maternal Health Outcomes with Social Characteristics

Social Characteristics		Complication		*T-test /Chi-square*	*p*
		No	Yes		
		N = 46,405	*N* = 1,678		
Socio-economic vulnerability	Least	2,302 (5.2%)	58 (3.6%)	**27.09**	**< .0001**
	Mildly	4,517 (10.3%)	126 (7.8%)		
	Highly	10,467 (23.9%)	364 (22.5%)		
	Severely	26,597 (60.6%)	1,071 (66.2%)		
Access to cash	No	17,452 (37.6%)	488 (29.1%)	**50.33**	**< .0001**
	Yes	28,953 (62.4%)	1,190 (70.9%)		

Social Characteristics		Complication		*T-test /Chi-square*	*p*
		No	Yes		
		N = 46,405	*N* = 1,678		
Access to food assistance	No	25,442 (54.8%)	784 (46.7%)	**42.89**	**< .0001**
	Yes	20,963 (45.2%)	894 (53.3%)		
Geographic distribution	Baalbeck/Hermel	3,958 (8.5%)	240 (14.3%)	**99.72**	**< .0001**
	Beqaa	10,718 (23.1%)	346 (20.6%)		
	Akkar	3,971 (8.6%)	121 (7.2%)		
	North	6,262 (13.5%)	180 (10.7%)		
	Beirut	657 (1.4%)	19 (1.1%)		
	Mount Lebanon	13,967 (30.1%)	465 (27.7%)		
	Nabatieh	2,647 (5.7%)	103 (6.1%)		
	South	4,180 (9.0%)	202 (12.1%)		
Area of origin from Syria	North (Aleppo, Al-raqqa)	15,973 (43.6%)	613 (36.7%)	8.989	.061
	Northeast (Al-hasakeh, Deir-ez-zor)	4,547 (9.9%)	161 (9.6%)		
	Northwest (idleb; latakia)	6,534 (14.2%)	257 (15.4%)		
	Southwest (Damascus; daraa; quneitra; rural damascus)	6,706 (14.5%)	240 (14.4%)		
	Western-Central (homs, hama, tartus)	12,401 (26.9%)	400 (23.9%)		

Social Characteristics		Complication		*T-test /Chi-square*	*p*
		No	Yes		
		N = 46,405	*N* = 1,678		
Time of arrival from Syria	< 2011	1,290 (2.8%)	50 (3.0%)	**57.71**	**< .0001**
	2012	8,388 (18.1%)	356 (21.2%)		
	2013	13,063 (28.1%)	473 (28.2%)		
	2014	8,054 (17.4%)	327 (19.5%)		
	2015	2,806 (6.0%)	96 (5.7%)		
	2016	4,783 (10.3%)	149 (8.9%)		
	2017	7,128 (15.4%)	173 (10.3%)		
	2018	893 (1.9%)	54 (3.2%)		
Type of accommodation in Lebanon	Camp	401 (0.9%)	14 (0.9%)	1.85	.60
	Center	955 (2.1%)	33 (2.0%)		
	Individual accommodation	34,392 (76.6%)	1,224 (75.3%)		
	Settlement	9,167 (20.4%)	354 (21.8%)		

The coefficient of determination Nagelkerke R^2 = .020 (Table 15). It shows that the model used is able to explain only 2% of the variation in the dependent variable maternal health outcomes (Daniel et al., 2018; Laerd Statistics, 2018).

Table 15

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	10844.093[a]	.005	.020

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

The results of the multivariable logistic regression analyses for the predictors of maternal health outcomes or complications are presented in Table 16. It was found that mothers aged 18 years or older are twice fold more likely to have a complicated delivery (*OR* = 2.118, 95% CI [1.391, 3.226], $p < .001$). It was also noted that mothers who had access to cash (*OR* = 1.302, 95% CI [1.058, 1.604], $p = .013$) and access to food assistant cash (*OR* = 1.181, 95% CI [1.008, 1.384], $p = .039$) are more likely to experience complications. Complementary and secondary education are found to be protective factors against the occurrence of complications among the mothers with respectively *OR* = 0.720, 95% CI [0.592, 0.875], $p = .001$ and *OR*= 0.763, 95% CI [0.596, 0.976], $p = .031$. Women arriving in 2018 from Syria had two-fold risk of developing complications in reference to those arriving before 2011 (*OR* = 2.052, 95% CI [1.202, 3.503], $p = .008$), and the same goes for those who are employed who have 1.3 times the risk of having complications in comparison to those who are not employed (OR= 1.324, 95% CI [1.324, 1.110], $p = .002$). Finally, in reference to residency in Lebanon, those who live in Baalbeck and South have a higher risk of developing complications with respectively *OR* = 1.530, 95% CI [1.219, 1.919], $p < .0001$ and *OR* = 1.396, 95% CI [1.158, 1.682], $p <$

.0001, while those residing in the Bekaa have less risk (*OR* = 0.779, 95% CI [0.635, 0.955], *p* = .016).

Table 16

Logistic Regression of Predictors of Maternal Health Outcomes

Predictor	*OR*	95% CI		*p*
		LL	UL	
Mother's age [a]				
≥ 18 years	2.120	1.391	3.228	**<.0001**
Access to cash [b]				
Yes	1.308	1.062	1.610	**.011**
Access to food assistance [c]				
Yes	1.179	1.007	1.382	**.041**
Socio-economic vulnerability [d]				
Mildly	1.103	0.785	1.550	.571
Highly	1.152	0.838	1.582	.384
Severely	0.998	0.691	1.440	.991
Education attainment [e]				
Primary	0.910	0.764	1.083	.287
Complementary	0.713	0.587	0.867	**.001**
Secondary	0.754	0.589	0.964	**.024**
University	0.843	0.618	1.149	.280
Area of origin from Syria [f]				
North	1.171	0.993	1.380	.061
Northeast	1.236	0.984	1.554	.069
Northwest	1.184	0.979	1.433	.082
Southwest	1.221	0.996	1.498	**.055**
Time of arrival from Syria [g]				
2012	1.178	0.823	1.687	.371
2013	0.996	0.699	1.421	.984

Predictor	*OR*	95% CI		*p*
		LL	UL	
Time of arrival from Syria [g]				
2014	1.012	0.703	1.458	.948
2015	0.927	0.614	1.400	.718
2016	1.010	0.687	1.487	.958
2017	0.838	0.571	1.232	.369
2018	2.040	1.196	3.479	**.009**
Type of accommodation in Lebanon [h]				
Camp	0.831	0.440	1.570	.569
Center	0.857	0.562	1.306	.473
Settlement	0.991	0.848	1.157	.906
Mother employment [i]				
Employed	1.324	1.110	1.578	**.002**
Geographic distribution [j]				
Baalbeck	1.510	1.206	1.890	**<.0001**
Beqaa	0.770	0.629	0.943	**.012**
Akkar	0.829	0.645	1.065	.143
North	0.882	0.723	1.075	.214
Beirut	0.726	0.414	1.273	.264
Nabatieh	1.030	0.809	1.312	.812
South	1.392	1.155	1.678	**<.0001**

Summary

The data analysis was intended to address the research questions that were identified and formulated earlier in the proposal. The three research questions and the related variables determined the use of the chi-squared and binomial logistic regression statistical tests to convey the results of each one. The sample size included 48,083 maternal and 4,288 neonatal observations and it was large enough to generalize the findings to the whole population of Syrian refugees' mothers and newborn.

The results showed no statistically significant association between early conception with the mothers and newborn health outcomes. However, it informed that maternal complications were significantly associated with mothers aged 18 and above when introducing the confounding variables to the logistic regression. Moreover, additional factors predicted either maternal or neonatal adverse events like mothers' access to cash and to food assistance, socio-economic vulnerability, education attainment, and others that will be described in depth in Chapter 5. However, the three models were not satisfactory predictors of the outcomes since they explained a very small percentage of the variance.

Chapter 5 addresses interpretations of findings and compares them to similar research in the literature review section. In addition, it discusses the significance to theory, practice, and implications for social change and related recommendations.

Chapter 5: Discussion, Conclusions, and Recommendations

A retrospective cross-sectional quantitative study design was used to predict the effect of Syrian mothers' early conception on maternal and neonatal health outcomes, adjusting for diverse cofounding variables including socioeconomic vulnerability, access to cash and food assistance, education attainment, geographic distribution, employment, time of arrival from Syria, and type of accommodation in Lebanon. The study was conducted with a large sample of mothers and newborns who used the healthcare system in 2018 within UNHCR-contracted hospitals through their TPA in Lebanon.

Preliminary findings showed that being 18 and above, employed, having access to cash and food assistance, being residents of Baalbeck and the South, arriving to Lebanon in the same year of their hospital admission for delivery, and originating from Southwest Syria predicted maternal complications. Moreover, socioeconomic vulnerabilities, being employed, accommodation in collective shelters and in the South governorate, and fleeing in 2018 into Lebanon informed neonatal complications.

Mothers' employment and residing in the South governorate were shown to be protective factors against the occurrence of neonatal mortalities. Mothers' access to cash, originating from Southwest Syria, and residing in Baalbeck, Akkar, and North governorates were protective factors against the development of neonatal complications. Finally, complementary and secondary education and location in the Bekaa governorate prevented maternal complications.

Interpretations of findings, study limitations, recommendations for future research in addition to implications for positive social change are discussed in this chapter.

Interpretation of Findings

The study's findings were addressed according to the causal continuum framework relevant to the social ecology model of health.

Proximate Factors

Early Conception (Adolescent Pregnancy)

Results of this study have shown that mothers' age significantly predicted higher risk of adverse maternal health outcomes. More precisely, mothers over 18 had 2.12 times greater odds of complications compared to mothers under 18. The overall maternal complications rate in this population was 3.5%, with the highest exposed age group (93.5%) being mothers aged ≥ 18 years, compared to 6.5% among mothers aged < 18 years. Maternal complications and death were more likely to occur among young adolescents between 10 and 14 compared to women between 15 and 19 (Amjad et al., 2019; Shahabuddin et al., 2017; Ujah et al., 2005; WHO, 2020).

Chi-squared findings showed that neonatal birth outcomes slightly increased in mothers who were 18 and over (91.8%) compared to mothers under 18 (8.2%) with p = .003. There was not a statistically significant difference in terms of neonatal mortality and maternal age (p = .96). After adjusting for potential confounders, older mothers were found to have 1.139 times (95% *CI* [1.008, 1.288], p = .467) the odds for neonatal birth outcomes as well as 1.605 times (95% CI [0.683, 3.773], p = .278) the odds of neonatal mortality, but results were not statistically significant. Amjad et al. (2019) said predictors like rural residency, illiteracy, and low socioeconomic status led to prematurity, and low

infant birth weight. Young maternal age informed increased neonatal mortality and morbidity (Bhatti et al., 2017; Markovitz et al., 2005; Marphatia et al., 2017).

Intermediate Factors

Occupation

Mothers' occupation is one of the main demographic predictors of maternal and neonatal health outcomes in this study. Findings showed that employed mothers are more likely to experience complications during delivery by 1.324 times compared to unemployed mothers (*OR* = 1.324, 95% *CI* [1,110, 1,578], *p* = .002). Amjad et al. (2019) said unemployed teen mothers had increased maternal risks and caesarean sections were among these reported complications. Kapaya et al. (2015) said unemployed women are more likely to be anxious by six times in comparison to those who were employed, which delays their access to antenatal care services, therefore increasing likelihood for poor health outcomes. In addition, there is an association between mothers' occupation and occurrence of neonatal birth complications (*OR* = 1.167, 95% *CI* [1.079, 1.262], *p* < .0001), and this aligns with Amjad et al. (2018) and Kapaya et al. (2015) studies' conclusions, especially when it comes to small babies for gestational age. This result could be the effect of hard working conditions that pregnant women are exposed to, including housekeeping and agriculture field work. Finally, mothers' employment (*OR* = 0.652, 95% CI [0.441, 0.964], *p* = .032) along with being residents of the South governorate were the only significant protective factors against neonatal mortality. This finding is original for this study. In the study's literature review, no correlation was found between refugees' occupation and decreased neonatal mortality risks.

Time of Arrival and Integration in the Host Country/Community

Mothers who migrated to Lebanon in 2018 were more likely to have complications by 2.04 times (*OR* = 2.040, 95% *CI* [1.196, 3.479], *p* = .009). Also, they were more likely to end up with neonatal complications by 1.364 times (*OR* = 1.364, 95% *CI* [1.013, 1.836], *p* = .041) compared to mothers who arrived in Lebanon in 2011, and these results were statistically significant. Shorter duration of residency in the host country was the most common factor affecting adverse mental health perinatal outcomes (Fellmeth et al., 2017; Heslehurst et al., 2018; Murphy, 2015). This could be the effect of the lack of integration in the host country's health system and not relying on a social support system; newcomers may face barriers to seeking healthcare services and other support services. Moreover, not having legal status in the country of asylum exposes refugees to fear of demanding support. Also, they may be not aware of different referral mechanisms and pathways available. Moreover, results did not show any statistically significant association between time of arrival from Syria and neonatal mortality (*p* > .05).

Distal Factors

Residency, Neighborhood, Type of Accommodation, and Housing

Regarding pregnant refugees' types of accommodation in Lebanon, no significant relationship was confirmed between type of accommodation and maternal outcomes, nor with neonatal mortalities (*p* > .05). Only mothers residing in collective centers in Lebanon were more likely to be associated with neonatal birth outcomes (*OR* = 1.234, 95% *CI* [1.001, 1.522], *p* = .049) compared to individual accommodation. This could be

the result of neighborhood deprivation and housing structural deterioration that leads to poor health outcomes (e.g. prematurity, low birth weight, etc.) as described in Giurgescu (2017).

Regarding the geographic distribution of pregnant women in different Lebanese governorates, results showed that complications among women were significantly more likely to occur among those residing in Baalbeck and South areas of Lebanon (*OR* = 1.510; *OR* = 1.392; $p < .0001$), whereas they were less likely to occur among those living in the Beqaa governorate (*OR* = 0.770, $p = .012$). As for the neonatal birth complications, it was found that mothers being residents of Baalback, Akkar, and North were protected against neonatal birth complications (*OR* = 0.595, 95% CI [0.512, 0.692]; *OR* = 0.934, 95% CI [0.841, 1.037]; and *OR* = 0.725, 95% CI [0.645, 0.815], $p < .0001$ respectively) and no association was found with neonatal mortality among women living in these areas. Furthermore, mothers residing in the South governorate of Lebanon were more likely to have neonatal complications (*OR* = 1.337, 95% CI [1.198, 1.492], $p < .0001$) and less likely to have neonatal mortality (*OR* = 0.518, 95% CI [0.310, 0.867, $p = .012$). This is comparable to the literature reviewed articles which also showed that urban residencies predict lower risk for adverse birth outcomes in comparison to rural areas (Alizadeh et al., 2014; Amjad et al., 2018; Mondal et al., 2009). Lowest attendance to antenatal care could be a driver of the complications occurring among mothers living in Baalbeck and South, and this could be due to the different vulnerabilities surrounding their living conditions and because of the less access to the reproductive health services. However,

this was not shown in Benage et al. (2015) study that highlighted that residents of Bekaa and North are less likely to attend ante-natal care services hence better birth outcomes.

Socioeconomic Vulnerability, Disparities, and Social Inequalities

The Chi-squared results presented in Table 14 outline that the maternal complications were significantly associated with the mothers' socio-economic vulnerability specifically with the severely vulnerability group with 66.2% developing complications in comparison to those who did not have complications 60.6% ($p < .0001$). This is comparable to the literature review that shows disadvantaged pregnant mothers are more likely to experience a complicated pregnancy outcome (Alizadeh et al., 2014; Amjad et al., 2018; Harper-Hanigan et al., 2017; Kim et al., 2018; WHO, 2016). In the multivariable analysis and after adjusting all the confounders, it was found that socio-economic vulnerability was not an independent predictor of poor maternal health outcomes as the *p*-value for each group was more than .05.

In reference to the neonatal health outcomes, results showed that mothers' high or severe socio-economic vulnerability predicted neonatal birth complications as compared to least or mildly socio-economic vulnerability by 1.415 times and 2.069 times, respectively ($p < .0001$). Carrying out a thorough literature review yielded few studies that ascertained our results in terms of the association of socio-economic vulnerability and poor birth infant outcomes in terms of prematurity, low birth weight, and others (Amjad et al., 2018; El-Jardali et al., 2017; Harper-Hanigan et al., 2017; Kapaya et al., 2015). Additionally, the study results showed that there was no statistically significant association between neonatal mortality and mothers' socio-economic vulnerability which

contradicts the literature reviewed articles findings (Borrell et al., 2016; Harper-Hanigan et al., 2017; Markovitz et al., 2005). The socio-economic vulnerability, disparity in resources, and social inequalities are considered as important contributing factors that affect the deprived pregnant women possibly due to high level of stress and their inability to seek for health care because of the implicated cost of care and transportation.

Access to Cash and Food

A significant relationship was associated between maternal health outcomes and access to cash and food assistance respectively ($p = .011$; $p = .041$); mothers who had access to cash and food assistance are more likely to have complications upon delivery with respectively $OR = 1.308$, 95% CI [1.062, 1.610] and $OR = 1.179$, 95% CI [1.007, 1.382]. Many studies conducted by UNHCR in 2017 and 2018 reported opposite results compared to my results where cash, voucher or food access decreased the risk of mother to have complications (UNHCR, 2017; UNICEF, 2018). Furthermore, the association between access to cash and neonatal health outcomes was statistically significant whereby newborn had less risk to developing complications when their mothers had access to cash assistance ($p < .0001$). This is in line with a study done by Kumar el al. (2017) that highlighted that mothers' poor financial situations predicted poor health outcomes in their children. Efevbera et al. (2017) illustrated long term infant development problems for financially vulnerable early married girls. Nevertheless, the access to cash was not significantly associated with neonatal mortality ($p = 0.881$), and access to food assistance was not statistically correlated with neonatal birth outcomes nor with neonatal mortality with respectively ($p = .572$; $p = .845$). These results open an

important window for reflection based on the fact that access to cash and food was not enough to prevent the likelihood of mothers' complication occurrence due to different factors like increasing of the refugees' household vulnerabilities, and use of cash for basic needs other than seeking health care services.

Education Attainment

In this study, the Chi-squared results report that mothers' being illiterate and low educated (85.8%) are most likely associated with maternal complications as compared to women with secondary and university education (14.2%). Moreover, the logistic regression analysis found that complementary, and secondary mother education were protective factors against the occurrence of maternal complications with $OR = 0.713$, 95% CI [0.587, 0.867], $p < .0001$ and $OR = 0.754$, 95% CI [0.589, 0.964], $p = .024$ respectively. This is in line with a myriad of other studies which showed that lack of education was significantly associated with maternal complications (Marphatia, 2017; Gopalan et al., 2017; Alizadeh et al., 2014; Amjad et al., 2018). Furthermore, studies proved that mothers' education predicted the latter health behavior whereby the more pregnant women are educated, the more they attend antenatal care whereby they could be less exposed to maternal complications among birth (Benage et al., 2015).

As for the association between education attainment and each outcome of neonatal data (neonatal birth outcome and neonatal mortality), it was evident that education was not significantly associated with neonatal mortality and/or morbidity ($p > .05$). However, the Chi-squared results only found that mother illiteracy and mothers' primary education predicted neonatal adverse birth outcomes ($p < .0001$). This conforms

with Alizadeh et al. (2014) study who had similar findings whereby they showed that education attainment was the strongest social predictor for poor pregnancy outcomes, specifically for pre-term birth.

Area of Origin

In this study, the results assert that area of origin from Syria is a significant factor affecting maternal complication and neonatal birth outcomes. However, most of the articles that studied mothers and neonatal morbidity and mortality among the Syrian refugees did not consider this factor as a significant factor. To begin with, mothers originating from southwest of Syria were more likely to have complications by 1.221 times (*OR* = 1.221, 95% CI [0.996, 1.498]) and were found to be borderline significant associated with poor maternal outcomes (p = .055). Whereas, there was an evident decrease in odds of neonatal birth outcomes for the same mothers' origin (Southwest of Syria) (*OR* = 0.875, 95% CI [0.781, 0.981]) with a significant relationship (p = .022). Nevertheless, the findings showed no significant association with neonatal mortality and the area of mothers' origin. Further research is needed to be conducted in order to understand the different characteristics and factors surrounding the mothers originating from different governorates in Syria being a driver for maternal and neonatal health outcomes (e.g. culture, behavior, access to health services, and others).

Limitations of the Study

This study has some potential limitations. Mainly cross-sectional studies support in identifying potential associations or relationship between variables that are introduced in the model; they have limitations in recognizing direct causations (ScienceDirect,

2017). Moreover, since the study deals with human beings and in a natural setting, there will be certain difficulties in proving cause and effect. Therefore, the study's findings were reported with probable outcomes caused by the independent variables affecting the dependent variables (Creswell, 2014).

Moreover, the quality of the secondary data used may be questionable and include some inaccuracies in addition to missing, incomplete and wrong entries (Creswell, 2014). Therefore, it is assumed that some complications and adverse events that happened among mothers and newborn admitted to secondary health care may not have been registered by the TPA delegates upon the patients' discharge from the hospitals, or that there was some inaccurate and/or wrong information/diagnosis on admission and on discharge for some observations. Added to this, the dataset includes some missing data that may have posed a limitation to the study.

Response bias or imprecision of refugees' answers regarding their socio-demographic information collected by UNHCR during their registration appointments/interviews may be one of the limitations of the study whereby inaccurate or false information may have been provided.

One of the limitations as well is the reliance on UNHCR dataset for the admissions that occurred in 2018 at the contracted hospitals by UNHCR TPA, therefore it excluded all the admissions information that happened at other settings or hospitals outside the network or at home.

Finally, some mothers and newborn may have recorded complications or deaths after their discharge from the hospital for which this level of information is not accessible to UNHCR, therefore remaining excluded from the dataset.

However, despite these limitations, the results are trustworthy, and findings can be generalized to the Syrian refugees' mothers and newborn community since the study's dataset included a large sample size with maternal observations (N = 48,083) and neonatal observations (N = 4,288). Moreover, since all admissions of refugees' mothers and newborn were included in the study for a period of one year without excluding observations based on specific people traits or characteristics, it is guaranteed that threats to external validity were minimized (Creswell, 2014).

Recommendations

Suggesting further researches in the discipline of maternal and newborn health is an opportunity when connecting it to the study limitations. For this, enrolling the same study and including all beneficiaries who were admitted as well to UNHCR non-contracted hospitals is one of the recommendations for further research, noting that this study only included the patients admitted within UNHCR/TPA contracted hospitals. There are additional deliveries happening at field hospitals or delivery facilities, knowing that these centers are localized in rural settings and disadvantaged areas. The beneficiaries' profiles who selected to receive the childbirth care at the latter's health care facilities could differ from those who were admitted to the formal hospitals that are within UNHCR/TPA hospital network. It would be interesting to understand the maternal and neonatal birth outcomes in relation to their socio-economic determinants. Comparing

the results or the health outcomes between both set-ups, field hospitals and delivery facilities vs. hospitals being within UNHCR network would be also important to understand.

Furthermore, repeating the same study amidst the COVID-19 pandemic and the deteriorated socio-economic conditions in Lebanon will be able to produce new and different results which are considered to be an important step towards understanding to which extent Syrian refugees' households are being affected and how the humanitarian support should be differently designed to produce positive social changes that can benefit deprived refugees. The refugees are bearing not only the results of their fleeing into Lebanon, but also additional burdens that make them forced to take choices that do not benefit their health in many instances; not to forget that women, children and newborn are among the groups who may be directly harmed by these changes and pressures (Heslehurst et al., 2018).

This study was not able to project maternal mortalities and/or neonatal adverse health outcomes following the mothers and newborn discharge from the hospitals. The study was only limited to the complications that were recorded by the TPA delegates upon the patients' arrival to the hospitals, within their hospital stay, and on discharge. Therefore, following on the beneficiaries' health statuses after their discharge from the hospital and recording the complications and/or death that may have occurred in the community and including these variables in upcoming research may also influence the study results.

The Women's Refugee Commission (2016) said early marriage is a human rights violation and described the impact on the girls in relation to intimate partner violence, limiting the girls' education opportunities and exposing them to sexually transmitted infections and other harms. It is important from a protective perspective to study in addition to the adverse health outcomes, the Syrian refugees' child marriage impact on other segments of their lives including their mental health status and any related trauma. Also, it would be very informative to run a study to understand and to assess the Syrian refugees' drivers for girls' early marriage and compare to previous studies results.

An additional suggestion is to integrate a new variable related to the access of pregnant Syrian refugees' women to the antenatal care and its effect on the maternal and neonatal birth outcomes. Access to antenatal care through a focused package of interventions is one of the fundamentals of the primary health care packages, so understanding the extent of the relation between both variables will help the health sector in focusing on the promotion of this program among the Syrian refugee women and girls (WHO, n.d.).

Finally, it is recommended to collect and maintain health indicators relevant to the displaced women, girls, and children; mainly Reproductive, Maternal, Newborn, and Child Health (RMNCH) indicators. Standardizing the data collection, reporting mechanisms among the NGOs, and using the same case definition will be effective to develop a baseline and to monitor the health status of the displaced and marginalized groups that will allow to intervene in front of alerts. Also, it will be necessary to share data being collected among humanitarian organizations that is usually problematic due to

organizations policies in order to analyze trends and come up with solutions (DeJong et al., 2017)

Implications

Through this section, the multiple implications for social change at individual, societal, policy, and practical levels according to the causal continuum framework relevant to the social ecology of health model are developed. Following this framework allows the discernment of the different interventions recommended at distal, intermediate, and proximate levels that may produce a change to the maternal and neonatal health outcomes of the Syrian refugee women, girls, and children (Coreil, 2010).

Interventions at the Distal Level

Access to Education

Loss of education opportunities for females, especially secondary education for adolescent girls, is one of the most common early marriage drivers. Therefore, when girls have access to education and when families have their basic needs met, child marriage can be reduced. Education programming should be well developed to prevent school dropout, with consideration of the school location not to be very far from refugees' residencies to prevent risk of sexual harassment or assault during long commutes. Also, looking at transportation support is one of the areas to consider (Mourtada et al. 2017; Women's Refugee Commission, 2016).

Improvement of Living Conditions/Accommodation

The study's finding revealed that mothers accommodating in collective centers are more likely to have newborn who develop complications. For this, it is mandatory to

reach the households accommodated in the collective centers with the necessary health promotion about the available services, and to ensure studying the living conditions that may be in discordance to the standards in order to improve them.

Interventions at the Intermediate Level

Social Support and Access to Assistance (Food and Cash Support) and Decreasing Inequalities and Disparities

The objective is to make sure that the basic needs of the refugee families are met. The literature review on child marriage in conflict settings displayed that conflict does not necessarily lead alone to a rise in child marriage, but it depends as well on other factors, especially the financial and economic situation and societal factors. Therefore, looking on opportunities to improve the household situation is an important facet to addressing this problem (Girls Not Brides, 2018; Mourtada et al. 2017; Women's Refugee Commission, 2016). To note that a qualitative study done by Mourtada et al. (2017) revealed that Syrian refugee households displaced into Lebanon experience significant challenges in term of insecurity, poverty, and dire living conditions that push them towards making early marriages decisions to ease the financial pressure. Moreover, the study results showed that access to cash and food were not considered as protective factors against the development of maternal complications, and access to cash was seen to protect against the development of neonatal adverse events only; therefore, UNHCR's role is to review the refugees' households support system, consequently ensuring that adolescent girls, including child-brides and adolescent mothers, are identified and reached with programming and the necessary aid and information on the referral

pathways. It is urgently needed to identify them and, through a good mapping of services, to liaise them to the different programs and activities that may benefit them. Access to cash and food through economic and livelihood interventions for their self-reliance is also optimal in emergency settings to prevent the severely and highly vulnerable pregnant women and girls to have increased risks for neonatal and maternal complications (Women's Refugee Commission, 2016).

Mothers' Employment

Since employed mothers are at risk for developing complications along with their offspring, the above recommendations about targeting women and girls with support could prevent them from being victims of difficult work conditions.

Integration of Newcomers

Newcomers are most affected by complications and adverse events, so it is necessary to improve sharing of information and awareness about the available and existing subsidized health services granted for refugees at PHCC levels to improve access of pregnant adolescent and women to ante-natal care (UNHCR, 2017a). This comes in line with the strategy to a better integration and adaptation of new arrival of families in the new contexts. Working with the community health workers and volunteers and creating new communication channels through social media platforms and outreach face to face interventions is vital and fundamental (Masterson et al., 2014; UNHCR, 2017a).

Access to Health Services in Different Governorates

The study results showed that maternal and neonatal complications are most likely to occur in South governorate and maternal complications more likely to happen in

Baalbeck. Therefore, the health sector's role is to assure the availability of a wide dispersal of services available for refugees looking at the hard to reach areas and reinforcing the primary health care centers packages through the humanitarian community in coordination with MoPH to address the health care system weaknesses that is working above its capacity, noting that large population movement places a strain on the health system and reduces its ability to respond to the emergent needs of the refugees and host communities. Using balanced scorecards to monitor the primary health care facilities would support the health sector to evaluate the centers' readiness and capacities to provide the needed support based on the identified gaps (Benage et al., 2015; Tappis et al., 2017; UNHCR, 2015). Moreover, there is a need to ensure that sexual reproductive health and contraceptive services, methods, and commodities are present and accessible to refugees, and that the latter know about their availability at a subsidized cost. Additionally, understanding the preferred contraceptive methods is also an important step towards increasing their utilization by the Syrian refugees and preventing unwanted pregnancies. For this, health promotion is required by trained front-line staff at PHCC and community levels (Benage et al., 2015; Cherri et al., 2017; UNHCR, 2017a).

Quality of Care at the Hospital Level

The study did not point out the quality of care at hospital levels and its impact on the neonatal and maternal adverse events. But it is basic and will be appropriate, in order to improve the quality of neonatal and maternal care that may lead to preventable deaths, that MoPH works closely with the hospitals to integrate a maternal and neonatal near-miss reporting, and to do auditing on the neonatal and maternal complications and

mortalities in order to improve the health care system performance. This health policy related to investigating the series of neonatal and maternal near-miss, complications, and death events to be implemented in a non-blaming culture and approach that will be effective to understand gaps and weaknesses and to carry out constructive corrective and preventive actions. Also, it will be necessary to integrate health care accreditation standards and evidence-based practices to ensure the provision of higher standards and quality of care through a functioning health system and a significant amelioration of the health care professional's knowledge, skills, and attitude (El-Jardali et al., 2017; Wick, 2017)

Interventions at the Proximate Level

Addressing Child Marriage

Likewise any situation of conflict and displacement, increased child marriage is one of the negative consequences impacting children, especially girls (Bartels, et al., 2018). Even though the maternal complications were not found to be statistically associated with early conception in this study, the descriptive statistics reported 4,489 women under the age of 18 who conceived and delivered (two cases under 12, 382 cases between 12 and 14 years old, while 4,105 girls were between 15 and 17 years old). Therefore, it is necessary to work as humanitarian entities, policy makers, governments, and donors to combating early marriage through different perspectives and among a variety of sectors including:

Evaluation of the current programs addressing early marriages to understand what really works and what is suitable to implement in the context of Syrian refugees displaced

into Lebanon. It is imperative to involve and consult girls and adolescents including the married ones, in addition to key community members and influencers, and to address their concerns and issues in program planning through gender-sensitive assessments and culturally sensitive and practical methods to be carried by trained staff. Piloting the interventions to prevent early marriages are also recommended (Girls Not Brides, 2018; Mourtada et al., 2017; Women's Refugee Commission, 2016).

Implementing guiding principles and approaches for addressing gender-based violence since early marriage is internationally recognized in law as a form of gender-based violence and is considered as a concern for the Global Protection Cluster's and the Child Protection Working Group. Moreover, humanitarian actors may address the violence prevention trough a socio-ecological model that takes into account the multiple levels of influence on the health behavior for marginalized groups including individual contextual and sociocultural factors (Inter-Agency Standing Committee, 2016; Mourtada et al, 2017; Yasmine et al., 2016).

Empowering and investing in women and girls in order to build and reinforce girls' intrinsic values within communities and increasing their participation in social activities, life-skills training, and decision making. They should be having the full right to decide freely and having their voices heard for the matters related to marriage, sexuality, and reproductive health with no coercion. Engaging men and boys, particularly leaders in the community, in the planning and implementation processes and in creating supportive environment for women and girls to induce a change (Girls Not brides, 2014; Women's Refugee Commission, 2016).

Promoting optimal pregnancy age is an essential pillar, as the study results revealed complications for women being 30 and above and the risk doubled for those aged 40 and above. It is important that the health sector to promote appropriate maternal age to bear babies to be between 20-30 years to prevent related conception risks, in addition to increase awareness about family planning services and access to free contraceptives commodities (Bellieni, 2016; Cherri, el al., 2017).

Conclusions

The Syrian conflict is classified as one of the worst humanitarian crises in recent history that impacted the refugees' households, specifically women, girls, and children in a myriad of ways. Lost opportunities for children, and in particular girls, in terms of access to education, violation of their rights, and negative household coping mechanisms lead to irreversible damages and increases their vulnerabilities (Bartels, et al., 2018; DeJong et al., 2017). The pregnant women, girls, and their offspring bear the burden of displacement exacerbated by the different surrounding factors at proximal, distal, and proximate levels that disproportionately affect their health. The UN agencies, along with the humanitarian entities, government, and donors need to critically integrate the forcibly displaced population in a global health and protection accountability framework whereby their emergent needs are rapidly assessed and addressed through a strengthened response plan (DeJong et al., 2017). Furthermore, the refugees' support programs, services, and criteria for assistances should be revisited to target those most in need including women, girls, and children to build resilience and aid recovery so no one is left behind. Moreover, they should work hand in hand through a theory of change to achieve the universal

sustainable development goal 5.3 in order to eliminate the early and forced marriage of children by 2030 through gender-specific strategies in order reduce related maternal and neonatal morbidities and deaths. Finally, women and girls should be granted and enjoy equal statuses, rights, and opportunities with boys and men to achieve their full potential in the different aspects of their lives.

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