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Emerging and Re-emerging Issues

Edited by Md. Anwarul Azim Majumder,
Russell Kabir and Sayeeda Rahman

PUBLIC HEALTH - EMERGING AND RE-EMERGING ISSUES

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Meet the editors

Dr. Md Anwarul Azim Majumder, a medical educationist and public health specialist, is currently working as the Director of Medical Education in the Faculty of Medical Sciences at the University of the West Indies, Cave Hill Campus, Barbados, West Indies. He worked previously at the University of Bradford, UK, Universiti Sains Malaysia, Malaysia and Centre for Medical Education, Bangladesh, and has been actively involved in the innovation and experimentation of medical education. He is also the Executive Editor of the *South East Asia Journal of Public Health* (published by the Public Health Foundation, Bangladesh) and the Editor-in-Chief of the *Journal of Advances in Medical Education and Practice*. He has published a number of peer-reviewed papers on medical education and health care.

Dr. Russell Kabir is a public health researcher and is currently working as a senior lecturer in research methods at the Department of Medical Science and Public Health of Anglia Ruskin University, UK. He obtained his MSc and PhD degrees from Middlesex University, UK. His first degree was a Bachelor of Dental Surgery from the University of Dhaka, Bangladesh. He has authored/co-authored many journal articles and book chapters. He is a member of the International Epidemiological Association and Fellow of the Higher Education Academy, UK. Dr. Kabir is interested in interdisciplinary research in emerging and re-emerging public health problems with a special focus on maternal health, climate change and dental public health issues.

Dr. Sayeeda Rahman is a clinical pharmacologist and an associate fellow of the Higher Education Academy, UK. She received her first degree in Pharmacy (BPharm and MPharm) from the University of Dhaka, Bangladesh, an MBA from Dundee University, UK, and a PhD from Universiti Sains Malaysia, Malaysia. She is trained in various aspects of public health and medical education. Her research interests include diabetes and cardiovascular diseases. She has contributed to medical sciences with her research publications. Dr. Rahman has work experience at university level (Bangladesh, Malaysia, and the UK), and at different national and multinational pharmaceutical companies in Bangladesh. She is currently working at the University of Bradford, UK, and is actively engaged in widening participation in medical education.

Contents

Preface

Modern public health aims to improve the quality of life and provide health care for all. Public health deals with a wide range of individuals and collaborates with various organizations, departments and agencies to improve health, forestall disease, and promote well-being. The field of public health is constantly evolving in response to the needs of communities and populations that are facing demographic, epidemiological and technological challenges. To overcome these challenges, health professionals need conduct research to generate evidence-based policies to improve the health of the community. Throughout the course of this book, a number of emerging and re-emerging public health issues from different countries are discussed and attempts are made to illustrate a balanced and evidence-based approach towards tackling major public health problems.

We divided the chapters into two sections: infectious diseases and policies, plans and programs. The infectious diseases section contains three chapters from Brazil, Italy and the Philippines, which evaluate three emerging and re-emerging public health issues in three continents. The chapter from Brazil discusses the emergence of new epidemiological hepatitis B and C profiles in high-risk groups in Latin America. The second chapter from Italy highlights the emerging and re-emerging arboviral diseases as a global health problem. The last chapter is from the Philippines which maps the evolution of entomological research with a focus on emerging and re-emerging mosquito-borne infections in that country.

The policies, plans, and programs section includes chapters from Germany, the UK, the USA, South Africa, South Korea, and Brazil. The first chapter from Germany discusses the status of health promotion in relation to the living situation of young refugees. The next chapter examines the relationship of increasing socio-demographic and organizational diversity to community health development in the UK with particular focus on the contribution and involvement of faith-oriented agencies to the processes of community cohesion required to underpin public health improvements. The third chapter provides a summary of the National Comprehensive Cancer Control Program (NCCCP) in the USA, and highlights specific examples of interventions implemented and successes achieved to aid cancer planning in other countries. The chapter from South Africa evaluates the role of the Faith-Based Organizations (FBOs) involved in the HIV/AIDS response and how FBOs can be repositioned and further empowered to serve as critical agencies. The penultimate chapter explores the relationship between the social capital and self-rated health status of South Korean women with disabilities. The last chapter discusses the dilemmas and impasses in public health policies directed to use of alcohol and other drugs in Brazil.

We wish to express our gratefulness to IntechOpen for providing us with the opportunity to edit the book. We owe a very special gratitude to Ms. Maja Bozicevic, Author Service Manager, IntechOpen, for her steadfast, thorough and consistent support and guidance in reviewing and finalizing the chapters received from the authors. Of course, we could not have developed this book without the submission of chapters from the authors of various countries. We are grateful for their support, which gives the book a global flavor. The emerging and re-emerging public health issues from different countries will provide relevant evidence for health professionals to tackle priority public health problems in other parts of the world. The ultimate goal is to improve the health of the people of our global village!

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Section 1

Infectious Diseases

Emergence of New Epidemiological Hepatitis B and C Profiles in High Risk Groups in Latin America

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Additional information is available at the end of the chapter

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Abstract

Latin America includes Mexico, the islands of the Caribbean and Central and South America, which possess a rich cultural and natural heritage. A narrative literature review was made to determine epidemiological hepatitis B and C profiles in high risk groups in Latin America, such as, drug users, hemophiliacs, and chronic kidney disease (CKD), human immunodeficiency virus (HIV) infected individuals. Using data from international databases that disseminate published quality studies. All studies with desired information regarding site and study population were included. It was observed that HBV prevalence diminished in several groups, probably due to implementation of HBV vaccination in various Latin America Countries (LACs). On the other hand, HCV prevalence is high among high risk groups compared to general population, but different values were observed in LAC, probably due to different access to education programs, assays evaluated, population size and type of recruitment. Due to chronicity of HBV and HCV, it is important to increase access to diagnosis, HBV vaccination and implementation of education programs to high risk groups to diminish burden of these infections.

Keywords: HBV, HCV, prevalence, HIV, chronic kidney disease, coagulopathy, illicit substance abuse

1. Introduction

The Latin American and Caribbean region encloses the Spanish, Portuguese and French-speaking countries of the American continent and covers almost 22,000,000 km^2. It includes

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Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, El Salvador, Ecuador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Uruguay and Venezuela, which possess a rich cultural and natural heritage [1].

Clinical manifestation of hepatitis B and C virus infection varies in both acute and chronic disease. HBV acute phase could be subclinical or anicteric hepatitis to icteric hepatitis and in some cases fulminant hepatitis. Acute Hepatitis C is often asymptomatic and leads to chronic infection in about 75% of cases. During the chronic phase, manifestations range from an asymptomatic carrier state to chronic hepatitis, cirrhosis, and hepatocellular carcinoma. Extrahepatic manifestations can occur in both acute and chronic infection. Pathophysiology is based on the inflammatory response to the virus that replicates in the hepatocyte [2–4].

Viral hepatitis is an important public health issue over the world, but there is still some gaps regarding the prevalence of these viruses in Latin America. Hepatitis B virus (HBV) infection has a heterogeneous distribution in Latin America and it is estimated at least 7–12 million people infected by virus [5]. Most of Latin American countries presented low seroprevalence (less than 2% of HBsAg positivity), including Mexico, Honduras, Nicaragua, Costa Rica, Panama, Cuba, Paraguay, Uruguay, Chile, Argentina, Peru and North Colombia. Intermediate seroprevalence (2.0–8.0% of HBsAg) are observed in Central America (Guatemala, Belize, El Salvador, Honduras, Haiti the Dominican Republic and Puerto Rico), Ecuador, Venezuela, Guyana, Surinam, French Guyana and South of Brazil. High seroprevalence (>8% of HBsAg presence) are observed in Peru, South Colombia, Northern Bolivia and Northern Brazil; however, these reports are primarily estimates [6–9].

Hepatitis C virus (HCV) infection prevalence varies from 1.2 to 1.6% in Peru, Mexico, Venezuela, Argentina and Brazil where almost 80% were viremic [9]. According the same study, genotype 1 was the most frequent detected, but genotype 1b was the most prevalent in all countries except in Peru where genotype 1a was the highest prevalent. Díez-Padrisa et al. [7] reported that Grenada, Bolivia, Haiti, Trinidad and Tobago and El Salvador have the highest prevalence (≥2.5%) in Latin America.

Epidemiological studies to determine HBV and HCV prevalence are important, principally among high risk population, such as human immunodeficiency virus (HIV) infected subjects, drug users, hemophiliacs and chronic kidney patients. HIV individuals coinfected with HBV or HCV could present clinical complications of liver disease and increased risk of developing cirrhosis. Individuals who are drug and alcohol abusers are at risk of becoming infected with HBV or HCV due to unprotected sexual practices that are common to these users besides the sharing of needles and syringes [10]. Chronic kidney disease (CKD) and coagulopathy patients are often exposed to blood, such as during hemodialysis or blood components transfusion where the risk of contracting viral infections is also very high [11].

Knowing the scenario of HBV and HCV infection in Latin American countries (LAC) is important to raise awareness among the population and health professionals, strengthening preventive measures mainly among the high-risk population, increasing access to diagnosis, improving the attendance of the diagnosed cases, treatment and monitoring [7]. In this chapter, a narrative literature review was undertaken to give information for developing policies and evidence-based care. This type of review gives comprehensive background for understanding current knowledge and highlighting the significance of new research in this area.

2. Methodology

A narrative review of the literature was done using SCIELO, LILACS and MEDLINE® database searches in an iterative manner during December to April 2018 to retrieve articles related to current and historical epidemiological profile of hepatitis B and C in the countries of Latin America and the Caribbean.

Search terms included "hepatitis B," "hepatitis C," "HIV," "illicit substance," "drug user", "CKD", "dialysis", "coagulopathy", "prevalence", "epidemiology", "Latin America". The reference lists of each article found were also reviewed in detail to find additional articles.

All authors independently read each article in full text, evaluated the relevance and quality of retrieved articles to include the data, and recorded the main findings of each study to include the relevant articles in **Table 1**. Primary and secondary studies were included in the review, but duplicate studies were removed.

3. Results and discussion

3.1. Hepatitis B and C prevalence in patients infected by HIV

HIV infection can increase clinical complications of liver disease associated to HBV and HCV, such as increasing the risk of developing cirrhosis up to five times in those co-infected with HIV/HCV [12]. With antiretroviral therapy and a significant increase in the life expectancy of people living with HIV, liver disease in patients with HCV and/or HBV infection has become the leading cause of non-AIDS-related deaths in this population.

In Latin America and the Caribbean, the prevalence of HBV and HCV in people living with HIV is quite variable. Moreover, few data are available, unlike data for Europe and the United States [12]. Over the world, 10% of people infected with HIV are also coinfected with HBV [13], since both viruses has the parenteral and sexual pathways as a route of infection, coinfection of these two viruses are common [14].

According Tengan et al. [15], estimated prevalence of HBsAg in LAC ranged from 2.0% (95% CI 1.0–5.0%) to 15.0% (95% CI 9.0–24.0%) and pooled prevalence was 7.0% (95% CI 7.0–7.0%). They also observed a drop in HBsAg prevalence from 8.0% (95% CI 8.0–9.0%) in the 12 studies published from 1999 to 2006 to 6.0% (95% CI 5.0–6.0%) in 16 studies published from 2007 to 2016. The decrease in HBsAg prevalence could be related to implementation of vaccination against hepatitis B.

In Brazil, HBsAg prevalence in HIV infected individuals ranges from 1.9 to 10.3% according geographical regions [15–18]. Tengan et al. [15] reported HBsAg prevalence in HIV of 3.3% in

Authors	Country	Year study	Type of study	Methodology	Key findings	Comments, if any
Alonso et al. [38]	Latin America and Caribe	2015	Secondary study/ analyze database/ systematic review	53 studies included both genders	Injecting drug users, HBV, HCV, Latin America and prevalence	
Degenhardt et al. [28]	Latin America and	2017	Secondary study/ analyze database/ systematic review	976 studies/individuals 15–64 years, both genders	Injecting drug users, HBV, HCV, Latin America and prevalence	Global study
Bautista-Amorocho et al. [14]	Colombia	2014	Primary study	275 individuals, 2009–2010, both genders s	HIV, HBV, HCV, Latin America and prevalence	
Mejia et al. [50]	Colombia	2004	Conference	No information	Injecting drug users, HBV, Latin America and prevalence	Summaries of a conference
Weissenbacher et al. [45]	Argentina	2003	Primary study	174 individuals, average of 30 years and both genders	Injecting drug users, HBV, HCV, Latin America and prevalence	
Sheehan et al. [40]	Argentina	2012	Primary study	205 individuals, age 18–65 years, 2005–2006 and both genders	Injecting drug users, HBV, HCV, Latin America and prevalence	
Caiaffa et al. [46]	Brazil	2006	Primary study	1144 individuals, 1998–2001 and both genders	Injecting drug users, HBV, HCV, Latin America and prevalence	
Osimani et al. [43]	Uruguay	2003	Secondary study/ analyze database/ systematic review	367 individuals, both genders and aging over 18 years	Users of illicit drugs, HBV, HCV, Latin America and prevalence	
Monsalvand Castillo et al. [51]	Venezuela	2007	Primary study	197 individuals of both genders	Risk population, HBV, HCV, Latin America and prevalence	
Reyes et al. [47]	Porto Rico	2006	Primary study	400 individuals of both genders	Injecting drug users, HBV, HCV, Latin America and prevalence	
Lopes et al. [53]	Brazil	2009	Primary study	691 individuals, both genders and 2005–2006	Injecting drug users, HBV, HCV, Latin America and prevalence	Drug-treatment centers

Authors	Country	Year study	Type of study	Methodology	Key findings	Comments, if any
Germano et al. [42]	Brazil	2010	Primary study	750 individuals and both genders,	Risk population, HBV, HCV, Latin America and prevalence	Voluntary Counseling and Testing Center
Oliveira et al. [30]	Brazil	1999	Primary study	102 individuals and both genders	Users of illicit drugs, HBV, HCV, Latin America and prevalence	
Oliveira-Filho et al. [41]	Brazil	2013	Primary study	384 individuals and both genders	Risk population, of illicit drugs, HBV, HCV, Latin America and prevalence	
Pazeto et al. [30]	Brazil	2012	Primary study	Individuals and both genders	Risk population, HBV, HCV, Latin America and prevalence	Alcoholic individuals
Cortês et al. [37]	Brazil	2013	Primary study	90 individuals and both genders	Risk population, HBV, HCV, Latin America and prevalence	Alcoholic individuals
Santos-Cruz et al. [36]	Brazil	2013	Primary study	160 individuals, ages 18–24, both genders from 2010 to 2011	Users of illicit drugs, HBV, HCV, Latin America and prevalence	
Ferreira et al. [79]	Brazil	2009	Primary study	1095 individuals and both genders	Hemodialysis, HBV, HCV, Latin America and prevalence	Dialysis units
Marchesini et al. [32]	Brazil	2007	Primary study	205 individuals and both genders	Users of illicit drugs, HBV, HCV, Latin America and prevalence	Public health clinics.
Matos et al. [33]	Brazil	2013	Primary study	149 individuals and both genders	Users of illicit drugs, HBV, HCV, Latin America and prevalence	
Novaes et al. [32]	Brazil	2009	Primary study, transversal	314 individuals and male gender	Users of illicit drugs, HBV, HCV, Latin America and prevalence	
Andrade et al. [29]	Brazil	2017	Primary study, transversal	66 individuals, 28.4 years and most were male	Users of illicit drugs, HBV, HCV, Latin America and prevalence	
Frost et al. [48]	Mexico	2006	Primary study	200 individuals and year of 2005	Users of illicit drugs, HBV, HCV, Latin America and prevalence	
Valtuille et al. [61]	Argentina	2002	Primary study	1994–2000	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis

Authors	Country	Year study	Type of study	Methodology	Key findings	Comments, if any
Marinovich et al. [62]	Argentina	2012	Primary study	13,466 with mean age of 60.4 years	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
Méndez-Chacon et al. [59]	Peru	2005	Primary study	128 patients and year of 2000	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
Pujol et al. [60]	Venezuela	1996	Primary study	227 patients	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	spread in hemodialysis
Gonzalez et al. [65]	Chile	2000	Primary study	Year of 1995	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
Santana et al. [65]	Cuba	2009	Multi-center analysis	Year of 1995	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
Cabezas et al. [67]	Cuba	2010	Primary study	Year of 1995	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence and prevalence	Spread in hemodialysis
López et al. [59]	Uruguay	2005	Cross-sectional study	409 patients	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Multi-transfused patients
González Michaca et al. [68]	Uruguay	2000	Cross-sectional study	235 patients	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
Méndez-Sanchez et al. [69]	Mexico	2004	Primary study	149 patients	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
Paniagua et al. [77]	Mexico	2010	Primary study, cross-sectional study	368 patients and mean age of 52 years	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis

Authors	Country	Year study	Type of study	Methodology	Key findings	Comments, if any
Oliveira-Penido et al. [75]	Mexico	2008	Primary study	884 patients, between 41 and 60 years old and the majority male	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
Leão et al. [76]	Brazil	2010	Primary study, cross-sectional study	236 patients and year of 1995	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
Guimarães et al. [78]	Brazil	2017	Primary study, cross-sectional study	181 patients and the majority male	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
de Jesus et al. [74]	Brazil	2013	Primary study	798 patients	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
Ribeiro Barbosa et al. [17]	Brazil	2017	Primary study, cross-sectional study	798 patients	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
Callegaro et al. [72]	Brazil	2006	Primary study	798 patients and year of 2000–2002	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
Carrilho et al. [80]	Brazil	2004	Primary study	813 patients, 149 hemodialysis workers and 772 healthy controls	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
Ferreira et al. [81]	Brazil	2006	Primary study	1095 patients	Hemodialysis, chronic kidney disease, HBV, HCV, Latin America and prevalence	Spread in hemodialysis
Tengan et al. [12]	Latin American countries	2016	Systematic review	37 studies	HIV, HBV, HCV, Latin America and prevalence	People living with HIV/AIDS
Greer et al. [19]	Brazil	2017	Primary study	1241 HIV positive and 1232 HIV negative subjects	HIV, HBV, HCV, Latin America and prevalence	
Flores et al. [16]	Brazil	2017	Primary study, cross-sectional study	409 individuals	HIV, HBV, HCV, Latin America and prevalence	HCV+ our HBV+ individuals

Authors	Country	Year study	Type of study	Methodology	Key findings	Comments, if any
Toscano and Corrêa [18]	Brazil	2017	Primary study	2242 individuals	HIV, HBV, HCV, Latin America and prevalence	People living with HIV/AIDS
Oliveira et al. [21]	Brazil	2016	Primary study	505 individuals	HIV, HBV, HCV, Latin America and prevalence	
Freitas et al. [24]	Brazil	2004	Primary study	848 individuals	HIV, HBV, HCV, Latin America and prevalence	People living with HIV/AIDS
Brandão et al. [25]	Brazil	2015	Primary study	495 individuals	HIV, HBV, HCV, Latin America and prevalence	People living with HIV/AIDS
Tizzot et al. [26]	Brazil	2016	Primary study	303 individuals and mean age 41.2 years	HIV, HBV, HCV, Latin America and prevalence	People living with HIV/AIDS
Bautista-Amorocho et al. [20]	Colombia	2014	Primary study	275 individuals and year of 2009–2010	HIV, HBV, HCV, Latin America and prevalence	People living with HIV/AIDS
Quarleri et al. [22]	Argentina	2007	Primary study	593 individuals	HIV, HBV, HCV, Latin America and prevalence	People living with HIV/AIDS
Ballester et al. [95]	Cuba	2005	Primary study	318 individuals	Hemophilia, HBV, HCV, Latin America and prevalence	Multi-transfused patients
Beltrân et al. [71]	Colombia	2005	Primary study	500 individuals	Hemophilia, HBV, HCV, Latin America and prevalence	**Groups:** hemophilia, hemodialysis, acute bleeding, ontological illnesses and sickle cell disease or thalassemia
Laguna-Torres et al. [97]	Peru	2005	Cross-sectional multi-center study	351 patients and year of 2003–2004	Hemophilia, HBV, HCV, Latin America and prevalence	Multi-transfused patients
Vinelli and Lorenzana [94]	Honduras	2005	Cross-sectional study	502 patients and year of 2002–2005	Hemophilia, HBV, HCV, Latin America and prevalence	Multi-transfused patients
Remesar et al. [100]	Argentina	2005	Multi-center, cross-sectional study	504 patients	Hemophilia, HBV, HCV, Latin America and prevalence	Multi-transfused patients
Ferreira et al. [98]	Brazil	2014	Secondary study, analyze database	9122 patients	Hemophilia, HBV, HCV, Latin America and prevalence	Patients with hemophilia A

Table 1. Main characteristics of studies included in the review according country and type of individuals.

Colombia, 3.1% in Venezuela, 6.1–8.5% in Chile, 3.3–14.5% in Argentina, 5.1–10.3% in Cuba. Occult hepatitis B infection (OBI) has been reported in 3.8% of HIV infected individuals from Central West region in Brazil and 12% of Colombian HIV people [20, 21]. HBV genotype A was the most detected in studies from Brazil and Argentina while genotype F was most found in Colombia [17, 19–22].

All over the world, HIV/HCV coinfection is reported in 4% of HIV-infected people and probability of HCV infection is six times higher in people living with HIV than in the general population [23]. Recently, a systematic review reported prevalence of HIV/HCV co-infection in Latin America of 8% varying from 5 to almost 50% according countries [23]. In LAC, the estimated seroprevalence of HCV infection varied from 0.8 to 58.5% (mean 17.37; median 10.91), with the highest in Argentina (58.5%) and Brazil (53.5%) and the lowest in Venezuela (0.7%) and Colombia (0.8%) [12].

The differences in HCV prevalence observed in LAC were probably due to difference in assays used and characteristics of the population included. In addition, it was observed that HCV prevalence is higher in HIV infected individuals compared to general population in Latin America countries [12].

Recent studies found anti-HCV prevalence in HIV infected individuals of 1.3% in Northeast Brazil, 4.6% in Southeast Brazil, 12.9% in South Brazil, 6.9–9.7% in Midwest Brazil [16, 17, 24–26]. In all of these studies, HCV genotype 1 was the most prevalent.

This high rate of coinfection among these viruses is probably due to the common transmission of these infections, especially among high risk individuals, such as injecting drug users (IDU) living with HIV. Health preventive measures for reducing HBV and HCV infection in these individuals could reduce the prevalence of hepatitis viruses in Latin America region.

3.2. HBV and HCV infection in illicit substance users

According to United Nations Office on Drugs and Crime (UNODC) [27], around 5% of the global adult population used illicit substance at least once in 2015 and 0.6% of global adult population suffer from drug use disorders [27]. The consumption of psychoactive substances is related to risks and damages of great social magnitude: unprotected sexual practices, sharing of syringes and needles, as well as exposure to sexually transmitted and parenteral infections, such as HBV [10]. Worldwide prevalence of HBV infection among injecting drug users (IDU) is estimated at 7.4%, suggesting that 880,000 IDU are infected with HBV [27].

In Latin America, the most consumed illicit substance by individuals at drug treatment is Cannabis (around 45%), followed by Cocaine (almost 40%). Recent systematic review demonstrated that HBsAg prevalence varies from 2 to 10% among people who inject drug (PWID) in Latin America countries [28]. In this review, studies published from 2011 to 2017 were included and most of PWID were young (aging less than 25 years), had history of arrest and incarceration, and use opioid.

Most of prevalence studies of HBV in illicit substance users (ISU) in Latin America were conducted in Brazil, followed by Argentina, Colombia, Mexico and Uruguay. In Northern Brazil, HBV prevalence (anti-HBc positivity) was 36.7% in ISU, genotypes A, D and F were found and risk factors were: (i) male gender, (ii) age above 35 years, (iii) anti-HIV positivity, (iv) tattoos, (v) the use of injected drugs, (vi) the use of illicit drugs for more than 3 years, (vii) sexual relations without protection, (viii) sexual relations with another DU, and (ix) more than 10 sexual partners in the past 24 months [29]. In Southeast Brazil, anti-HBc prevalence around 55% was found among IDU in 1999 and IDU living with HIV in 2007. It is important to observe that HBsAg prevalence drops from 7.8 to 3.4% in this region what could be the result of vaccination campaigns [30–32]. Occult HBV infection (OBI) of 12.7% was also documented in IDU from Central West region of Brazil demonstrating a high prevalence of OBI in this population [33].

Among non-injecting drug users (NIDU) (crack, alcohol, marijuana, cocaine), HBsAg prevalence varies from 0.1 to 6.2% according geographical regions in Brazil showing a low risk in this group compared to IDU [34–37].

HCV prevalence varies among ISU in Latin America. Degenhardt et al. [28] estimates prevalences less than 40% and higher than 80% among IDU in Latin America. A recent review included studies from 2000 to 2013 conducted in Argentina, Brazil, Colombia, Dominican Republic, Mexico, Panama, Peru, Puerto Rico, Uruguay and Venezuela [38]. Anti-HCV prevalence in ISU was below 7% in the majority of studies included in this review, but anti-HCV rates from 30 to 67% were found in ISU in Argentina and Brazil [39–41].

In NIDU, anti-HCV ranged from 0 to 10% with the highest values found in Brazil (8%), and Uruguay (10% in 2003) [42]. Studies conducted in alcohol abusers found 5.6% of anti-HCV in Southeast Brazil [37] and 15% in Southern Brazil [43] what could reflect the diminish in anti-HCV prevalence in this group. The pooled value for HCV prevalence in NIDU was 3.6% (95% CI 2.6–4.5%) [38].

HCV infection rate for IDU varied considerably between and within countries. The highest values were reported in Argentina (55% in 2001) [44], Brazil (53% in 1998, 46% in 2001) [45], Puerto Rico (89% in 2006) [46] and Mexico (Ciudad Juarez and Tijuana) (96% in 2005) [47]. Studies in Colombia (Bogota) found anti-HCV prevalence of 0 and 1.7% in IDU [48, 49]. Pooled regional anti-HCV prevalence among IDU was 49% (95% CI 22.6–76.3%) with significant heterogeneity among studies [38].

HCV current infection (both anti-HCV and HCV-RNA) varies from 0% in drug users from Venezuela [50] to almost 60% in IDU in North Brazil [41]. Only three studies from Brazil [41, 51–53] determined HCV genotypes. The study from Pará found a high prevalence of genotype 1b (42%), especially in NIDU (50%), while in the other two studies, individuals had genotype 1a in over 60%.

3.3. Hepatitis B and C prevalence in patients with chronic kidney disease patients under dialysis treatment

It is well known that patients undergoing dialysis treatment are at increased risk for contracting viral infections. The reasons may be their underlying impaired cellular immunity and the blood exposure to infectious materials through the extracorporeal circulation for a prolonged period. Moreover, hemodialysis patients may require blood transfusion, frequent hospitalizations and surgery, which increase opportunities for nosocomial infection exposure [11]. Most frequent viral infections reported hemodialysis units are HBV, HCV and HIV [54]. These infections influence negatively the survival of the hemodialysis patients and those undergoing renal transplant [55].

Worldwide, HCV prevalence among patients on hemodialysis varies from as low as 1 to up to 70% [56] and the dialysis-related risk of HCV infection development is estimated at 2% per year [54]. Anti-HCV prevalence is low in Latin America (about 1.23%) [57] and varies from country to country, between regions of the same country and even among hemodialysis patients [58]. High anti-HCV prevalence was found in hemodialysis patients in Peru (59%) and from them, 4.5% had mixed infection with hepatitis B (HBsAg positive) [59]. In Venezuela, a study conducted in four hemodialysis units found 71% of anti-HCV and 25% of HBsAg among hemodialysis patients [60].

In Argentina, a study demonstrated a drop in anti-HCV prevalence in a same hemodialysis unit showing prevalence of 41.5% in 1994; 26.9% in 1996; 12% in 1998 and 8.5% in 2000 [61]. According to the Chronic Dialysis Registry of Argentina, anti-HCV prevalence decreased from 2% in 2004 to 1% in 2011 and global HCV prevalence was 4.9% in 2011 [62, 63].

In Chile, anti-HCV prevalence varied from 30% in hemodialysis patients at 1993 to 13% 2 years later [64, 65]. In Cuba, despite the implementation of anti-HCV screening in 1995, high anti-HCV positivity was found in hemodialysis patients in 2009 (76%) and 2010 (18.8%) [66, 67]. In Mexico, anti-HCV prevalence of 10.2% was observed in CKD patients and 12.7% in those at hemodialysis [68]. Years later, a study showed that among 149 patients in hemodialysis, 6.7% presented anti-HCV antibodies and from them, 5% presented HCV RNA [69]. Anti-HCV prevalence of 6.3, 6.5, 59% in hemodialysis patients from Uruguay, Colombia, Peru [59, 70, 71].

In Brazil, some studies have been performed to evaluate HCV prevalence in different hemodialysis units. In 2006, among 70 patients of the south region undergoing hemodialysis, seven (10%) presented HCV infection [72]. Still in 2006, but in Salvador city (Northeast Brazil), the anti-HCV prevalence among hemodialysis patients was 10.5% with detectable HCV RNA in 73.6% of them. In this study, the most frequent HCV genotype was genotype 1 followed by genotypes 3 and 2 [73]. In North region, anti-HCV prevalences from 4 to 14% were found in 7 dialysis center in Para State in 2013. In this study, HCV RNA was detected in 5.3% of the patients and genotype 1 was the most frequent, followed by genotypes 2 and 3 [74]. Recently, Barbosa-Ribeiro et al. [17] found 12.6% of anti-HCV prevalence in Hemodialysis patients at Northeast Brazil. In Southeast region, anti-HCV prevalence of 13 and 14.8% was found in 2008 and 2010 years [75, 76].

HBV prevalence varies in CKD patients in Latin America. In Mexico [77] found 7.1% of HBsAg prevalence in 10 hemodialysis units at 2010 and two of them were co-infected with HCV (0.5%) [77]. In Uruguay, HBsAg prevalence of 1% was found in hemodialysis patients probably due to mandatory screening of blood donors and patients for HBsAg since 1981 [71].

In Brazil, prevalence of HBsAg of 0, 2.4, 7, 10, 34.1% were reported in hemodialysis center in Southeast, Central, Northeast, South and Midwest regions of Brazil [78–82]. HBsAg prevalence of 4.5, 25, 1.4% was found in hemodialysis patients in Peru, Venezuela, Cuba [59, 67].

Among patients undergoing hemodialysis, it is relatively common to observe occult hepatitis B cases due to vial of transmission and prolonged vascular access [83]. In Brazil, prevalence of OBI of 1.5, 3 and 15% was found in Northeast and Southeast region of Brazil [83–85]. HBV genotype A was the most prevalent in these studies.

3.4. HBV and HCV infection among coagulopathy patients

Hereditary coagulopathies are hemorrhagic diseases resulting from deficiency of one or more plasma coagulation proteins, implying a reduction in the formation of thrombin which is a key factor for blood clotting. Among hereditary hemorrhagic disorders, hemophilia (type A and B) and von Willebrand's disease (VWD) are the most common [86]. Hemophilia A and B are X-linked hemorrhagic disorders caused by mutations in the factor VIII and factor IX genes, affecting almost exclusively male individuals. Both factors play a role in the intrinsic pathway of blood clotting and the affected individuals present severe, moderate and mild forms of disease defined by plasma coagulation factor levels [87]. While VWD is caused by a decreased or dysfunction of the protein called Von Willebrand Factor (VWF) and affects both genders. The diversity of mutations leads to the appearance of several clinical manifestations, manifesting with platelet dysfunction associated with the decrease of serum levels of factor VIII [88].

Worldwide, it is estimated that hemophilia affects 1 in 5000 newborns while VWD reaches from 0.8 to 2% of the population. According to the 2015 global annual report of the World Federation of Hemophilia, which included data from more than 304,000 people with hereditary coagulopathy from 111 countries, 49.7% of the cases were from hemophilia A, 9.9% from hemophilia B, 24.6% of DVW and 13.9% of other coagulopathies [86].

The treatment of coagulopathies is based on the replacement of the deficient coagulation factor, when there are hemorrhagic manifestations or as primary prophylaxis. This therapy increases the survival of these patients and their success in preventing the different hemorrhagic manifestations [89, 90]. On the other hand, due to multiple blood transfusions and use of cryoprecipitate, elaborated from a pool of frozen human plasma, these individuals are at risk for transmission of infectious agents, such as hepatitis B and C viruses [91, 92].

Most of viral infections occurred before 1985, when inactivation techniques were introduced in clotting factor concentrates. Thus, countries in Latin America, as well as other regions of the world, suffer the impact of these viral infections, which have evolved into chronic cases of the disease.

HBsAg prevalences were 2.4, 6, 24, 33.3 and 42% in coagulopathy patients from Mexico, Honduras, Cuba, Colombia, Peru [93–97]. In Brazil, it was possible to observe a significant decrease in the prevalence of HBsAg over the years, being 2.3% in 2007 and 1.0% in 2012 [98].

Regarding anti-HCV prevalence in coagulopathy patients, a universal screening in 1995 identified 51.6% of anti-HCV in hemophiliac patients from Cuba [95]. In 2007 to 2010, anti-HCV prevalence was 39.03% in this group in Cuba [99]. While in Colombia, patients from the cities of Bogotá and Medellin in 2003 presented 32.2% of anti-HCV [74]. In Peru, a study with multi-transfused patients from the seven largest hospitals in the country revealed 56.6% of anti-HCV prevalence [97]. In Honduras, 8 hospitals in the cities of Tegucigalpa and San Pedro Sula identified anti-HCV prevalence of 26.9% [94]. In Mexico, 46.3% of anti-HCV prevalence was found in hemophiliacs at 2008 [93]. In Argentina, 42.7% of anti-HCV positivity was found in hemophiliacs from 2002 to 2004 [100]. As the same was found for HBV, Ferreira et al. [98] observed a decrease in anti-HCV prevalence from 24.2% in 2007 to 4.7% in 2012. However, recent study in coagulopathy patients from Northeast Brazil found 47% of anti-HCV prevalence [17].

4. Conclusion(s)

In Latin America countries, HBV and HCV infection are still great public health problem in individuals infected by HIV, CKD patients, coagulopathy patients, illicit substance abusers. Prevalences of these infections are higher in these individuals compared to general population and different patterns of epidemiology were found between and within countries probably due to differences in access to diagnosis and treatment in these regions. A fall in the prevalence of HBV and HCV infection has been observed in these groups due to HBV immunization and HCV screening especially among CKD and coagulopathy patients. However, outbreaks still happen in these groups showing the importance of education programs to prevent the transmission of these viruses.

The recommendations for each group are: among CKD and coagulopathy individuals, it is important to provide access to sensitive methods of diagnosis, screening of blood products and equipment and HBV vaccination. Among ISUs and HIV infected individuals, it is important to provide access to diagnosis, increase prevention and education campaigns to reduce the risk of acquiring HBV and HCV due to risky sexual behavior or sharing of needles and syringes. Vaccination against HBV should also be a priority in these groups. All these recommendations must be made in all countries of Latin America since epidemiological differences between HBV and HCV infection among countries is based on the different investments made in health, especially those related to diagnosis and prevention.

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Conflict of interest

The authors declare no conflict of interest.

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Chapter 2

Emerging and Re-emerging Arboviral Diseases as a Global Health Problem

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Abstract

Newly emerging or re-emerging infections continue to pose significant global public health threats. This chapter provides an overview of the combinations of factors that led to the emergence of arthropod-borne viruses as human and veterinary health threats, in order to understand the risk associated and how this can be mitigated. Considering the history of emergence of some arboviruses, these epidemics have occurred globally as a result of climate and socioeconomic changes that have allowed the spread to new geographical areas of viruses previously confined to specific ecological niches such as West Nile and Chikungunya, or viruses considered under control such as Dengue, Japanese encephalitis, and Yellow fever. Moreover, the greatest risk for humans derives from the ability of these viruses to adopt transmission cycles involving highly anthropophilic mosquito species. Finally, many other arboviruses are largely ignored despite their potential to emerge globally. The recent epidemic spread of Zika virus throughout the Americas is the evidence that arboviruses are likely to continually emerge and re-emerge and that improved scientific technologies and knowledge is essential to deal with future vector-borne epidemics. Research priorities should therefore focus on surveillance systems and vector control tools, as well as on the development of antiviral molecules or candidate vaccine.

Keywords: arbovirus, emerging infectious diseases, dengue, Chikungunya, yellow fever, West Nile, Zika virus

1. Introduction to arboviruses

Arthropod-borne viruses (arboviruses) are important cause of animal and human disease worldwide, infecting millions of individuals and causing a large social and economic burden.

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These viruses are generally transmitted by arthropod vectors to their vertebrate host and circulate among wild animals serving as reservoir in sylvatic life cycle. Through spillover transmission from enzootic amplification cycles, humans can be infected as incidental and dead-end hosts. By contrast, some arboviruses undergo urban cycle involving humans as amplifying hosts and causing several epidemics in urban areas [1–3].

By definition, arboviruses require an arthropod vector in the transmission cycle, in which they must replicate prior to transmission [1]. Most common arthropods include mosquitoes, flies, and ticks along with others hematophagous arthropods [2, 3]. *Aedes* mosquitoes are the most important arboviral vectors; the two main species, *Ae. aegypti* and *Ae. albopictus*, allow the transmission of medically important viruses such as chikungunya virus (CHIKV), dengue virus (DENV), and yellow fever virus (YFV) [2]. Other prevalent vectors are *Culex* mosquitoes, ticks, sandflies, and *Culicoides* [4, 5]. Arboviral maintenance and amplification cycles involve horizontal, vertical, and venereal transmission. In horizontal transmission, the virus is transmitted from an infected vector to a vertebrate host, during blood feeding. Following a viremic bloodmeal, virus enters midgut and disseminates through the alimentary tract in the vector and replicates in the salivary glands. During the following blood feeding, injection of infectious saliva allows the transmission to a new host, initiating a new transmission cycle [1, 2, 4]. Many arboviruses are also maintained in nature through a secondary cycle that involves vertical transmission from an infected female to the offspring. In this case, disseminated virus infects the developing eggs, persisting in larval and pupal stages and subsequently into adults. Moreover, venereal transmission allows the transfer of virus from a vertically infected male directly to a female during copulation [2]. The long-term survival is also enhanced by non-viremic transmission, during which infected and noninfected mosquitoes or ticks co-feed on a non-viremic host and the virus is transmitted directly between them, without necessarily infecting the vertebrate host [2, 4].

Most of the arboviruses that cause human/animal diseases belong to four virus families, *Togaviridae* (genus *Alphavirus*), *Flaviviridae* (genus *Flavivirus*), *Bunyaviridae* (genera *Orthobunyavirus, Phlebovirus*, and *Nairovirus*), and *Reoviridae* (genera *Coltivirus* and *Orbivirus*) [2, 5]. Infections in humans and animals could range from subclinical or mild to encephalic or hemorrhagic with a significant proportion of fatalities. In contrast, arthropods infected by arboviruses do not show detectable signs of infection, even though the virus may remain in the arthropod for life [4].

A high proportion of arboviruses associated with human and animal disease circulate in tropical and subtropical regions, where arthropods tend to be abundant. However, many arboviruses also circulate among wildlife species in temperate regions of the world. Despite the global distribution of viruses such as West Nile virus (WNV), DENV and now CHIKV, most other arboviruses are generally endemic but limited to specific regions of the world. Nevertheless, even within this relatively localized distribution, dispersion to distant locations can occur via animal or vector migration [4]. Global warming, deforestation, and urbanization have led to rapid expansion of the habitats of the vectors and caused enormous increase in vector-borne diseases throughout the world. Increase in international travel, shipping, and industrialization can lead to transport of infected mosquito and eggs to different new ecological niches facilitating the contact with naïve individuals causing outbreaks of high magnitude due to lower herd immunity [2]. The greatest health risk of arboviral emergence comes from extensive tropical urbanization and the colonization of this expanding habitat by the highly anthropophilic mosquito, *Ae. aegypti*, together with the recent invasion into the Americas, Europe and Africa of *Ae. albopictus* that could enhance transmission of these viruses in temperate regions [1].

More than 500 species of viruses are registered in the International Catalog of Arboviruses and this estimate is continuously increasing. While many current arboviruses do not appear to be human or animal pathogens, this large number of widely different and highly adaptable arboviruses provides an immense resource for the emergence of new pathogens in the future [4].

2. Emerging and re-emerging arboviral infections

2.1. Factors associated with arbovirus emergence or invasion

Recent global changes in climate and human behavior are important determinants of arbovirus emergence. The viral transmission can be limited by the ecology of the host or of the virus itself; arboviruses frequently persist at low maintenance levels until changes in single or multiple factors disrupt the transmission cycle, facilitating rapid and widespread amplification [1, 6]. Arboviruses can therefore emerge at epidemic levels due to changes in viral genetics, in the composition or dynamics of the host or vector population and/or in the environmental structure that often are of anthropogenic origin [1].

As arboviruses are virtually all RNA viruses lacking proofreading functions, a high frequency of mutations associated with fast replication allows them to rapidly adapt to different environments. The high rate of genetic mutations could lead to changes in virulence, epidemiology or competence of vectors, which can occur via simple point mutations [3, 5]. Often, outbreaks of emerging arboviruses may be related to relatively small changes in viral genetics or to the introduction of new strains that have increased virulence and viremia levels in vertebrate, thereby expanding the host range and increasing amplification potential. Alternatively, genetic changes can improve vector competence and therefore transmission rates [1].

Zoonoses exploiting complex rural or suburban ecosystems may have multiple vectors and infect a variety of vertebrate host species. Arboviral amplification can progress rapidly to epidemic levels when competent vector and vertebrate host populations meet repeatedly within a permissive environment for viral transmission and replication. Moreover, humans may be exposed to arboviruses when they invade rural environments or when bridge vectors bring viruses into peridomestic environments [1]. Deforestation associated with urbanization process has contributed to increase the contact between humans and vectors [7]. Furthermore, the expansion of urbanization has led to high concentrations of susceptible human hosts, often living in socioeconomic conditions favorable to the expansion of the vector population, facilitating viral transmission and outbreaks of epidemics [1]. Furthermore, the feeding preferences (anthropophilic and/or ornithophilic) of arthropod vectors are of fundamental importance [8–10]. Arthropods frequently exposed to the human environment, domestic animals, and livestock can undertake an adaptive process defined as domestication [8, 11]. Moreover, many of the epidemic vectors are peridomestic, naturally existing in close association with humans. The vectors of CHIKV, YFV, and Zika virus (ZIKV) all use human habitat to maintain their populations [12, 13]; thus, general living conditions along with ineffective vector control programs, can contribute to providing one component necessary for arboviral transmission [5, 7].

Changes in the composition of vertebrate or vector host species may be related to environmental changes that expand old or create new ecological niches. Extensions of the vector range into permissive environments are often followed by invasion of the arboviruses they transmit. These invasions are generally facilitated by travel and commerce [1], constantly introducing new species of viruses and their arthropod vectors into new geographic areas. Most of these introductions are not detected until they cause an epidemic, when they are already well established and it is not possible to eliminate them from the new area [7]. An additional factor that plays a role in the generation of arboviral outbreaks is the immunity status of vertebrate hosts in the affected areas. Outbreaks registered for the first time in a new area usually involve immunologically naïve populations, exhibiting extremely high rates of attack. Even in areas where epidemics have previously occurred, rare epidemic events interspersed with significant interepidemic periods may render the younger generation susceptible to infection [5].

Following their recent local and global emergence, some arboviruses have acquired great importance in terms of public and veterinary health. The combinations of factors that led to their emergence are of fundamental importance to understand the risk associated and how this can be mitigated. Moreover, many other arboviruses are largely ignored despite their potential to emerge globally [1].

2.2. Emerging and re-emerging arboviruses

2.2.1. Dengue virus

DENV (*Flaviviridae*: *Flavivirus*) is the only arbovirus that has completely evolved and adapted to the human host and its environment, eliminating the need of other animal reservoirs. There are four DENV strains, referred to as DENV1–4 serotypes, antigenically distinct but with the same epidemiology and symptomatology in humans. Generally, DENV is associated with mild clinical manifestations during interepidemic periods, but it can cause epidemics associated with a more severe disease every 3–5 years. Co-circulation of multiple serotypes (hyperendemia) is the most common risk factor associated with the emergence of the severe form of the disease, dengue hemorrhagic fever/shock syndrome (DHF/DSS), in an area [7]. Relying exclusively on humans as reservoir and amplification hosts, the maintenance of DENV is based on transmission by mosquito vectors living in close association with humans [1]. The main vector in urban environments is *Ae. aegypti*, however DENV can also be transmitted by *Ae. albopictus* in suburban, rural, and forest areas in tropical, subtropical, and temperate regions of the world where it is widely present [8, 13]. DENV is the geographically most widespread arbovirus and the most serious arboviral threat, showing high levels of endemic transmission in the Americas, south-east Asia and the western Pacific, with about 4 billion people at risk of infection [14]. Moreover, DENV is hyperendemic in many Asian tropical regions, where two or more serotypes circulate both endemically and epidemically [1]. A total of 390 million infections, of which about 100 million symptomatic, are estimated each year, with several hundred thousand cases of DHF and thousands of deaths [15, 16]. The resurgence of DENV has been stimulated by population growth and density, urbanization and international travels, as well as changes in environmental conditions, prevalence of vectors and virus genetics. The resulting geographic expansion has been accompanied by exponential increases in cases, epidemics, and co-circulation of different serotypes. In particular, hyperendemicity in many areas of tropics and subtropics is due to serotype dispersal derived from large-scale human movements, which together with levels of preexisting immunity of the herd to specific viral serotypes have led to an increase of DHF epidemics [17, 18]. Moreover, introduction of DENV has occurred several times in temperate or subtropical climate zones in recent years. By 2010, autochthonous cases of DENV infection were identified in Europe, and in October 2012, Madeira recorded a major DENV outbreak, with over 2100 cases by March 2013 [19–21]. Furthermore, the repeated episodes of DENV local transmission (Hawaii in 2001–2002, Texas in 2005, and Florida in 2009–2011) and the wide distribution of *Ae. aegypti* and *Ae. albopictus* in the USA underscores the importance of surveillance and vector control in areas at risk of DENV introduction [22–24].

2.2.2. *Chikungunya virus*

CHIKV is an *Alphavirus* of the *Togaviridae* family that circulates in enzootic cycles among nonhuman primates with multiple *Aedes* mosquitoes implicated as vectors, with *Ae. aegypti* identified as the main human vector [25]. Historically, CHIKV has been considered a highly debilitating but not life-threatening pathogen, whose infection is associated with fever, headache, myalgia, rash, and severe arthralgia. Because these symptoms often mimic those of DENV and because CHIKV circulates in DENV-endemic regions, CHIKV has long been underdiagnosed and underestimated as an important arboviral disease [1]. In Southeast Asia, CHIKV was recognized as the etiologic cause of febrile disease epidemics in the 1950s and continues to be an important pathogen [26]. Unlike in Africa, where there is evidence of a sylvatic cycle involving arboreal mosquitoes and nonhuman primates, CHIKV appears to be maintained in Asia in a strictly human-peridomestic cycle of mosquitoes [1]. CHIKV has re-emerged in 2005 in a succession of massive outbreaks in East Africa and the Southern Indian Ocean Islands [5]. The first major outbreak occurred in Kenya during 2004, followed by a large outbreak on La Réunion Island in 2005–2006 [6]. The genetic characterization indicated that the epidemic strain originated from the East/Central/South African (ECSA) lineage, but the outbreak of La Réunion was associated with a mutation on the viral envelope glycoproteins enabling more effective transmission by *Ae. albopictus* [6, 27, 28]. This new lineage, called Indian Ocean Lineage (IOL), spread quickly across the Indian Ocean Basin, India, and Southeast Asia. Moreover, infected travelers imported it into Europe, with two small outbreaks occurring in northern Italy and southern France [29–31]. Between late 2013 and beginning of 2014, autochthonous cases of CHIKV were reported in the Caribbean. The strain implicated belonged to the Asian strain, identified in the late 1950s in Southeast Asian countries [32]. Finally, a distinct East/Central/south African strain (ECSA) spread directly to Brazil in 2014 [33]. During these massive outbreaks of CHIKV, also the clinical presentation appeared to be evolving as well, with neurological manifestations and mortality. Moreover, maternal infection was observed to be vertically transmitted, most commonly during birth, leading to severe disease and encephalopathy in half of neonates and resulting in long-term neurologic sequelae [34].

2.2.3. *Zika virus*

ZIKV (*Flaviviridae*: *Flavivirus*) is primarily transmitted by mosquitoes of *Aedes* genus, including not only *Ae. aegypti* for urban transmission but also *Ae. albopictus*, *Ae. poliniensis*, and *Ae. hensilli.* Recently, transmission of the virus has also been reported via sexual, neonatal, and blood transfusion. ZIKV infection can be asymptomatic or cause a mild febrile illness characterized by headaches, myalgia, fever, rash, and conjunctivitis [35]. ZIKV was isolated and associated with human disease more than 60 years ago, but remained poorly studied until an association with neurological involvement was observed. In fact, an increase in the incidence of cases of Guillain-Barré syndrome and microcephaly in neonates was observed in regions with an ongoing ZIKV epidemic [35, 36]. The first major outbreak of ZIKV was reported outside Africa in 2007 in Micronesia [37, 38], followed by a second major outbreak in French Polynesia in 2013 [39]. The largest ZIKV outbreak began in Brazil at the end of 2014 with 1.3 million cases estimated by the end of 2015. In May 2016, 47 countries and territories in the Americas, including the USA, reported autochthonous cases of ZIKV [6]. The impact of ZIKV infections on the development of the central nervous system will be defined only in the years to come; at present, the degree of developmental delay or other neurological sequelae that could have babies born to mothers affected by ZIKV is not known. Another important aspect of the future epidemiology of ZIKV infections is the possibility of blood transmission and the consequent need for blood testing in high-incidence areas [35]. In 2017, the number of reported cases that decreased dramatically in Brazil and other American countries, maybe due to the high number of infected people who have acquired protective immunity to reinfection and improved vector control strategies in countries where an epidemic has been reported. However, now the epidemic is no longer considered an international medical emergency and there may be a sharp decline in investment in research and control related to ZIKV. Although the number of ZIKV cases has declined, the risk of another major epidemic in Brazil and other tropical and subtropical countries is still significant and its intensity is difficult to predict. It is therefore essential to develop systems that allow a more accurate diagnosis of ZIKV infections to differentiate it from other flavivirus infections, in particular by using serological tests that can be performed in any developing country. Furthermore, the development of a safe vaccine is of paramount importance for the containment of ZIKV infection, in particular for immunocompromised and pregnant women, but the adverse effects in the development of Guillain-Barré syndrome and the enhancement of other flavivirus diseases by antibodies produced against ZIKV, in particular, toward a future DENV infection must be considered [35].

2.2.4. *Yellow fever virus*

YFV is the type of species in the *Flavivirus* genus of the family *Flaviviridae*. The primary transmission cycle occurs between nonhuman primates and a range of arboreal mosquito species mainly belonging to the genera *Aedes* and *Haemagogus*, in Africa and South America, respectively. Transmission to humans occurs as the result of frequent spillover events in the so-called zone of emergence, where the presence of *Ae. aegypti* as primary peridomestic vector can initiate an urban cycle characterized by rapid human-mosquito transmission that leads to explosive outbreaks [40, 41]. The epidemiology of YFV in Africa often involves both sylvatic and urban cycles increasing the force of infection during human epidemics, that result larger than in South America [40]. In humans, YF is a severe acute illness with fever, nausea, hepatitis with jaundice, renal failure, hemorrhage, and shock with case fatality lower in Africa (20%) than in south America (40–60%) [42], suggesting a correlation between genetic factors and lethality of the infection. In Africa as well as in South America, high YF case rates likely occur due to low vaccination coverage in area of endemic transmission. According to WHO and the United Nations Children's Emergency Fund (UNICEF) estimates, only 41% of the target population had received YF vaccination in 2014, well below the recommended 80% threshold for the prevention of an epidemic [41]. However, the underlying reasons for virus amplification could be multifactorial, including the possibility of a new virus lineage emerging correlating with the expansion of YFV activity [43]. In endemic areas, deforestation has been associated with emergence of YF outbreaks due to the higher biting activity of vectors, especially in new settlements inside or near the forest frequently colonized by unvaccinated migrant populations. Moreover, perturbation in environmental conditions, such as increase in rainfall and temperatures, has been associated with an abundance of vectors enhancing YFV circulation with increased outbreaks in Africa and South America [40]. YFV could potentially emerge and disperse in a similar manner to DENV, CHIKV, and ZIKV in South America. The recent outbreak of YF in Brazil and multiple reports of cases outside endemic regions highlight the possibility of urban YF arising [8]. In fact, many cases were reported in areas considered free of virus circulation, where routine YF vaccination is not performed. A molecular study showed implicated a new YFV lineage which evolved from the lineage circulating in Brazil in the 1990s, and moved toward the Atlantic coast, the most populated area in Brazil [40]. Moreover, YFV could become the next arbovirus to emerge as a public health emergency if swift to international spread occurs. Since December 2015, YF epidemic has been reported in Angola, spreading to Kenya and the Democratic Republic of the Congo. Moreover, in April 2016, YFV was exported to China via unvaccinated workers, representing the first laboratory-documented cases of YFV in Asia [41]. This risk is particularly acute in the Asia-Pacific region, where systems for YFV surveillance and detection are largely untested and YF vaccination is limited to travelers [44]. If introduction of YFV occurs in areas with a high density of *Ae. aegypti*, it is possible that local transmission could occur and potentially spread to Southeast Asia, putting approximately 2 billion people at risk without there being sufficient vaccine stockpiles [41].

2.2.5. West Nile virus

WNV belongs to the Japanese encephalitis virus (JEV) serocomplex in the genus *Flavivirus.* It is maintained in nature within an enzootic transmission cycle among birds and *Culex* mosquitoes, with outbreaks caused by spillover transmission to equids and humans, which are dead-end hosts [1]. Based on serological evidences, WNV circulates in the absence of clinical disease in the majority of humans and a wide variety of different animal species, but in abundancy of *Culex* species mosquitoes WNV, may also cause epidemics with disease symptoms ranging from subclinical or mild febrile to encephalic with or without flaccid paralysis and fatality [8, 10]. WNV is distributed globally, with two main genetic lineages: Lineage 1 is widely distributed and highly invasive, whereas Lineage 2 appears to have remained enzootic in Africa. Lineage 3 and 4 have been described from single isolates in Central Europe, whereas Lineage 5 appears to be confined to India [45]. International dispersal of *Cx. pipiens* mosquitoes that appear to be closely associated with human infection and urban outbreaks, and the introduction of the house sparrow (*Passer domesticus*) as a highly competent host for most WNV strains, has provided the availability of maintenance and amplification cycle of the virus almost circumglobally. Moreover, climate changes at northern temperate latitudes, recently, have made these areas more conducive to WNV invasion [1]. Outbreaks of WNV were recorded throughout the Mediterranean basin, Central Europe, and Russia, where *Cx. pipiens* appeared to be the primary vector. In the Americas, WNV was introduced into New York during the summer of 1999. Phylogenetic evidence suggest that the invading strain was closely related to a 1998 isolate from Israel that contained a mutation causing high viremia and mortality in American crows and higher transmission competence of *Culex* mosquito species. Once the virus had been introduced in the USA, migratory birds played a major role in the dispersal of WNV throughout North America [1, 10]. WNV is now one of the most broadly distributed arboviruses in the world, as well as the most common cause of arboviral neuroinvasive disease in the USA [1, 5]. Currently, WNV vaccines are only available for equids, although human vaccines are under development [6]. However, the motivation for human vaccine development may be limited by the low attack rate that the virus exhibits in humans following epidemics. Therefore, in the near term, protection for public health will continue to rely on mosquito control [1].

2.2.6. Japanese encephalitis virus

JEV is the most frequent cause of mosquito-borne encephalitis globally. The public health significance and the global distribution of JEV have been progressively expanding; currently, more than 3 billion people in Asia reside in areas at risk of JE, with an estimated 50,000 symptomatic cases and 10,000 deaths occurring annually [46]. Taxonomically, JEV is placed within the genus *Flavivirus* and is the type of virus for the JEV serocomplex. JEV is maintained within an aquatic bird-*Culex* mosquito transmission cycle and is amplified within a domestic swine-*Culex* cycle. Moreover, *Culex* mosquitoes can transmit JEV to equids and humans, which are dead-end hosts for the virus. JEV is endemic in large parts of Asia and the Pacific, where mosquito vectors are present in association with rice and other irrigated crops [1, 46]. Of the five major genetic lineages, lineages 1 and 3 have been found co-circulating in subtropical and temperate latitudes and are associated with outbreaks of neuroinvasive disease. However, lineage 5 now appears to be emerging as the predominant genotype. The epidemiological significance is bounded to the fact that lineage 5 is antigenically the most diverse genotype and the current JEV vaccine shows limited efficacy against this genotype [8, 47]. Moreover, the primary mosquito vector, *Culex tritaeniorhynchus,* has been recently identified in north western Greece [48] and JEV RNA was detected in *Cx. Pipiens* mosquitoes in Italy [49], thus potentially increasing the risk of JEV emergence in Europe. In addition, the even more recent detection of autochthonous JEV co-infection during the YF outbreak in Angola [50] supports the idea that JEV may have already expanded its Asian boundaries [8]. The rapid and widespread expansion of JEV in the Asian continent was associated closely with increases in human populations, in acreage of irrigated rice and pig farming. In endemic areas of Japan, the avian-*Culex* maintenance cycle may be bypassed when vertically infected *Cx. tritaeniorhynchus* directly initiate the amplification cycle in pigs [1]. The risk that JEV becomes a greater threat in the near future is quite high, given the genetic diversity of the virus and several *Aedes* species as marginal competent vectors [6]. Air transport of mosquitoes was the probable cause of JEV outbreaks on isolated Pacific Islands, demonstrating the potential of this virus to invade new areas such as the west coast of the USA. Moreover, with the spread of JEV into much of the Indian subcontinent, other destinations served by frequent routes of commerce or passenger air travel, such as Africa and Europe, also could be at risk [1].

2.3. Arboviruses with potential of emergence

2.3.1. Rift Valley fever virus

Rift Valley fever virus (RVFV) is classified within the genus *Phlebovirus* in the family *Bunyaviridae* and circulates in Central West, East and South Africa and in the Arabian Peninsula [8, 51]. Infection causes severe and often fatal illness in sheep, cattle, goats and camels, with occasional spillover to humans, in which the infection shows no symptoms or a mild illness associated with fever and liver abnormalities [1, 8]. However, during RVFV epizootics, up to 10% of affected humans may develop more severe disease, including encephalitis, retinitis, and hemorrhagic fever with case fatality rate approximately 10–20% [8, 52]. RVFV is maintained in an enzootic cycle among wildlife and a wide variety of mosquito species, including *Aedes*, *Culex*, *Anopheles*, and *Mansonia*. The virus is maintained by vertical transmission in eggs of *Aedes* species during dry season, with intermittent epizootic outbreaks occur during rainy season [1, 8]. Historically, RVFV was restricted to sub-Saharan eastern Africa, especially Rift Valley of the Kenya and Tanzania. Subsequent outbreaks with human involvement have been documented in South Africa, the Nile Valley, and the Saudi Arabian Peninsula. A large outbreak in Mauritania indicated dispersal of the virus in West Africa [53, 54], demonstrating the ability of RVFV to escape historical enzootic areas. Major irrigation projects and the El Nino effect are considered to be the important factors influencing the epidemiology of RVFV [4, 55] and the movement of viremic camels along trade routes that has been suspected to be the routes of dispersal. Moreover, before the onset of the disease, humans develop viremias suitable to infect susceptible mosquitoes; uncontrolled air travel therefore could introduce RVFV into North America or Europe where susceptible wild and domestic hosts and suitable vectors reside [1, 56]. RVFV is generally considered to be a candidate for emergence and global dispersion but, as the virus is transmissible by a wide variety of mosquitoes adapted to the local habitats in Africa and *Ae. Aegypti* is not a recognized primary vector, the likelihood of expansion outside Africa and Saudi Arabia appears to be low. However, RVFV could be inadvertently introduced via infected mosquitoes into a tropical region where competent domestic *Ae. aegypti* predominate in the urban environment [8]. Nevertheless, laboratory infection has highlighted the presence of competent *Cx. Pipiens* in Southern France and Tunisia with the potential for RVFV epizootics to occur in the virus, which was introduced into countries of the Mediterranean basin [57]. Several vaccines for RVFV have been developed and appear effective; however, their use is limited. Failure to contain these outbreaks provides a source of virus to seed outbreaks into other areas of Africa and the Middle East as well as the rest of the world. With a high potential impact on wildlife, domestic animal, and human health, failure to contain RVFV could seriously impact veterinary and human health in Asia, Europe, and the Americas [1, 51].

2.3.2. Mayaro virus

Mayaro virus (MAYV) is an emerging *alphavirus* with autochthonous transmission in central and south America with higher prevalence in amazon region; recently, it has been reported to circulate in the Caribbean [58, 59]. Infection produces indistinguishable symptoms to the closely related CHIKV; therefore, due to the high degree of co-circulation with CHIKV, DENV, and similar viruses, cases of MAYV infection are not reported frequently. An estimated 1% of all febrile dengue-like illness in northern South America is caused by MAYV, as evidenced by the high rates of detection during regional serosurveillance [6, 60, 61]. The transmission cycle of MAYV is similar to the sylvatic transmission of YFV, with nonhuman primates as main reservoirs. The primary vectors are likely mosquitoes from the genus *Haemagogus*; however, the virus has also been detected in other mosquitoes and mites [1]. A major concern is that MAYV has also been detected in two of the most abundant mosquito genera: *Culex* and *Aedes* [6, 62]. Experimental evidence suggests that the virus is highly infectious to *Ae. aegypti* [63] and can be transmitted at low rates by *Ae. albopictus*, making that species a potential secondary vector [6, 64]. Historically, MAYV outbreaks have been sporadic, however, spillover events have occurred following deforestation and urbanization in endemic areas, both of which bring the virus into closer proximity to larger human populations, and to their associated urban vectors [1, 6, 65]. Given the close genetic relationship with CHIKV, it is plausible that MAYV could also evolve to become more infectious to humans or anthropophilic mosquitoes, and experience similarly high levels of outbreaks.

2.3.3. Venezuelan equine encephalitis virus

Venezuelan equine encephalitis virus (VEEV) is an alphavirus (*Togaviridae: Alphavirus*) widely distributed in tropical and subtropical regions of the Americas, where it circulates endemically between mosquitoes of the genus *Culex* and rodents. The VEEV complex can be subdivided into six different subtypes (I to IV) with type I further divided into other antigenic variants; only VEEV subtypes IAB and IC are considered epizootic variants and are pathogenic for horses [66, 67]. Also humans infected with epidemic VEEV strains develop high titers viremia and may therefore play a role as maintenance and amplification hosts [67–69]. Main epidemics occur when VEEV epidemic strains spill over into competent mosquitoes of the genera *Aedes* and *Psorophora*, which have a peridomestic behavior and may transmit VEEV to equids. An equine-mosquito amplification cycle may induce an extensive virus circulation that may spill over to humans and cause outbreaks of VEEV. Epidemic VEEV infection in humans is a highly disabling dengue-like febrile disease, which can lead to severe encephalitis with fatality rates of between 1 and 3%, especially in children [67, 70]. Moreover, if infection occurs during pregnancy, it may lead to severe neurological birth defects and anomalies [66]. The emergence of VEEV epidemics is based on a combination of ecological and viral genetic factors. Enzootic VEEV strains are not able to achieve a sufficient viremia for equine amplification. However, a single mutation in the viral genome can lead to changes in the viral envelope improving equine amplification. Because alphaviruses replicate with low genetic fidelity, it is likely that mutations competent for equine amplification occur regularly within sylvatic cycles. Then, the transport of mutants strains competent for the equine amplification in areas with susceptible equids and mosquito vectors allows the emergence of epidemics [1]. The last major VEE epidemic, which involved ca. 100,000 persons with an estimated 300 deaths, occurred in

Venezuela and Colombia in 1995 [71, 72]. In these areas, natural emergence will occur periodically, as long as equine herd immunity is not maintained at adequate levels by vaccination or natural acquisition of immunity from enzootic exposure. The risk of epidemic emergence may be increasing by the conversion of large areas of tropical forest to ranching and other forms of agriculture, increasing opportunities for infection of bridge vectors competent to the generation of an equine amplified cycle. Furthermore, urban peridomestic mosquito vectors such as *Ae. aegypti* [73] and *Ae. albopictus* [74] are capable of transmission after oral doses comparable to human viremia titers, making an *Ae. aegypti*-borne epidemic VEEV cycle possible [1]. Prevention and control of epizootic/epidemic VEEV depends on effective use of veterinary vaccines, but equine vaccination in many countries is not widespread. Therefore, during epizootic/epidemic transmission, mosquito control is an important adjunct to vaccination [7].

3. Strategies for arbovirus control

Because they are not an essential part in the zoonotic arbovirus life cycle, arbovirus disease control based on humans and domestic animals cannot eradicate the arbovirus. Consequently, the reservoir in wild species places a limitation in the control disease emergence, and only understanding the interactions involved in the biology of the virus, hosts, and ecology will lead to effective control and prevention strategies [4, 5]. With effective vaccination and sustainable vector control programs, it is possible to control or even eliminate human transmission cycles. In fact, vaccination can increase herd immunity, making it easier to sustain reduced virus transmission with vector control. On the other hand, vector control can complement a vaccine by lowering the risk of infection, making vaccine delivery goals easier to achieve [75].

The YF vaccine has been used extensively in West Africa and has been instrumental in eliminating the urban transmission cycle in South America. However, despite its efficacy and low-cost production, epidemics continue to occur due to inadequate vaccination coverage, as demonstrated by the recent YF outbreak in Angola and Democratic Republic of Congo [76]. Adequate and continuous vaccination programs along with high levels of herd immunity are of paramount importance for the control of YF. In Africa, together with childhood immunization, mass preventive vaccination campaigns to protect elderly people need to be implemented [77]. Moreover, in South America, people of coastal areas are largely unvaccinated and therefore exposed to the risk of YFV coming from the near enzootic regions [75]. Finally, YF cases reported from travelers from Angola to China highlight the need to implement the WHO International Health Regulations in order to protect travelers and to avoid the introduction of YFV in naïve areas of Asia where the vector is widely present [76]. Japanese encephalitis was controlled in Japan, Taiwan, and Korea using inactivated vaccines, which also contributed to control infection in China [10, 78]. A live attenuated JEV vaccine was used to reduce the risk of infection in children in China, as well as being part of the large children immunization campaign in India [10]. At the end of 2015, the first dengue vaccine was licensed (CYD-TDV vaccine Dengvaxia). The results of a large phase III study in 10 endemic countries in Asia and South America showed a complex performance of the vaccine with efficacy dependent on serotype, as well as previous immunity and age of the subject [79, 80]. Two other live dengue virus vaccines are in phase III trials and many other dengue vaccines are in phase I and II trials [75]. Research on vaccines against CHIKV has been slow, as CHIKV causes major epidemics only every 10–30 years, limiting the interest of the pharmaceutical industry for a financial return [75]. However, two vaccines against CHIKV have recently completed phase I clinical trials, both are strongly immunogenic after 2–3 doses and are currently in phase II trials [81, 82]. Among more than 40 Zika vaccines developed, DNA, RNA, and inactivated virus [83–85] versions started clinical trials and the first live-attenuated vaccine has been demonstrated to be safe and efficacious after a single dose in mice [86]. However, there are some concerns about potential interactions with immunity generated by other flavivirus natural infections or vaccines leading to more severe manifestations of the disease, as well as the immune trigger in the development of Guillain-Barre syndrome [87]. Currently, there is no specific licensed anti-arbovirus agent, and patient management is therefore mainly supportive. Passive immunotherapy is a promising approach for the management of newborns exposed to CHIKV. The anti-CHIKV human immunoglobulins purified from convalescent donors exhibit strong anti-CHIKV effects in vitro and animal models [88], and are now evaluated in the prevention of mother-to-child CHIKV transmission in newborns born to viremic mothers [87]. Novel antiviral therapies are also being investigated. Drug repurposing strategies have identified potential inhibitors of *Flaviviridae* replication. Ivermectin strongly inhibits the replication of YFV, DENV, and WNV [89], while azithromycin inhibits the cytopathic effects induced by ZIKV in glial lines and in human astrocytes and is also considered safe for use during pregnancy [90]. Further new approaches aim to identify host factors and pathways that are critical for viral replication and to identify the putative inhibitors of these pathways as host-targeting antivirals [87].

The continued outbreaks of YFV and JEV demonstrate that even with a widely available and effective vaccine, it is difficult to control a vector-borne disease using only vaccination [6]. Overall, the best current perspectives for controlling the majority of vector-borne diseases rely on reducing the contact between the vector and susceptible humans and the most effective approach for this goal remains the elimination or reduction of mosquito populations [87]. Nowadays, many of the insecticides used in the mid-twentieth century eradication campaign are considered environmentally unacceptable, as well as being economically prohibitive and at risk of developing resistance in mosquito populations [87, 91]. Several alternative approaches are focused on reducing the abundance of mosquitoes or preventing the transmission of pathogens by the mosquito. Environmental management includes modification of the natural breeding habitat of mosquitoes and the adoption of human behaviors that reduce the incidence of the bite, such as the elimination of domestic oviposition and larval sites, the indoor residual spraying and fumigation, the use of insecticide-treated bed nets and screening windows together with lethal traps, which have been found to be effective in reducing *Ae. aegypti* populations and transmission of CHIKV and DENV [87, 91, 92]. Another approach involves genetic modification of vectors and the release of genetically modified male mosquitoes expressing a dominant lethal gene, determining the death of all progeny from mating with wild females (sterile insect technique, SIT) [87, 91, 93]. Moreover, also the vector competence can be reduced by limiting viral infection or transmission through the introduction of transgenic mosquito lines in the field [94, 95]. Biological control represents another possible intervention and includes the use of natural predators or pathogens against mosquitoes. The strategy that involves the release of mosquitoes infected by *Wolbachia pipientis*, an endosymbiont bacterium that is transmitted vertically, allows to suppress the viral transmission by interfering with the reproduction of the mosquitoes [6, 87, 91]. *Wolbachia* infection affects sperm preventing successful reproduction between infected and uninfected males and between infected males and females harboring different strains of *Wolbachia*, similar in method and effect to SIT [91, 96]. *Wolbachia* can also be used as a population replacement strategy, which consists in the release of female mosquitoes infected by *Wolbachia*, relying on high levels of maternal transmission [97]. The introduction of *Wolbachia* in the naturally uninfected field *Ae. aegypti* populations is currently used to confer resistance to viral infection, making infected mosquitoes poor vectors of pathogens of medical importance including DENV and CHIKV [98, 99] with similar effects characterized recently against ZIKV [100, 101].

The implementation of localized arthropod control measures during epidemics, for example, in high-density urbanized areas, can play an important but transient role in reducing the impact on humans and animals of emerging arboviruses if these are supported from surveillance systems, which differ at regional level and in many areas are completely absent [4]. Furthermore, it is essential to characterize and understand viral genetics, antigenic properties, virulence patterns, vector associations, and maintenance mechanisms to identify and control future arboviral outbreaks. The next public health needs include communication to the population and physicians of vector-borne diseases, the guarantee of vector control programs, and the maintenance of adequate surveillance systems with trained personnel, together with the availability of drugs, vaccines, and rapid diagnostic testing [5].

4. Conclusions

Arboviruses already have a well-known history of emergence and will undoubtedly continue to emerge in the future. There are many unidentified arboviruses that, due to their high mutation rates, may emerge as pathogens even if they are not yet present as epidemic strains in the wild environment. Recent progress in sequencing offers new opportunities to identify them during surveillance activities, especially in the tropics, where viral diversity is higher [3]. The greatest risk for humans derives from the ability of some arboviruses to adopt urban transmission cycles involving highly efficient and anthropophilic vectors, such as *Ae. aegypti* and *Ae. albopictus*, or enzootic peridomestic cycles involving *Culex* urban populations [1]. The ability to urbanize and cause an epidemic, exemplified by DENV, CHIKV, and YFV, could be acquired by many other viruses, including VEEV and MAYV, which have the potential to infect these urban vectors and whose exposure to urban populations in the tropics is already known. A more complete understanding of the molecular interactions associated with the emergence will be particularly useful in predicting the likelihood of this happening [3]. The public health emergency of ZIKV, the threat of the YF, and the re-emergence of DENV and CHIKV should serve as a wake-up call for governments, academics, and WHO to strengthen the control and research programs on arboviral infections [75]. A continuous international and interdisciplinary response is needed to improve the ability to anticipate, control, and mitigate the risk of emerging and re-emerging arboviruses. Research priorities should focus on surveillance systems, knowledge of factors responsible for adaptation to other vectors, and other determinants of infection and transmission, as well as on the development of antiviral molecules or candidate vaccine. The shared characteristics of these viruses could stimulate common research themes for the development of antiviral therapies and vaccines, while the co-circulation of these viruses requires the development of differential diagnostic systems, including more specific serological tests for seroprevalence studies. The socioeconomic and environmental factors driving the proliferation of vectors, particularly in cities of low-income countries, must be mitigated. An assessment of the available and developing vector control tools is needed to identify the most effective techniques and their combination with vaccination. Finally, new global alliances are needed, such as the global Dengue and the *Aedes*-related disease consortium, to enable the combination of the most effective and timely solutions against arboviral diseases [75].

Conflict of interest

The authors declare no conflict of interest.

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The Evolution of Entomological Research with Focus on Emerging and Re-emerging Mosquito-Borne Infections in the Philippines

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Abstract

This paper presented previous and current research efforts for medically important mosquitoes that serve as vectors of emerging and re-emerging diseases in the Philippines, in light of identifying the research gap that exists in the field of public health entomology in the country. This extensive review of the past and current research studies with regard to medical entomology and vector control also attempted to provide proper direction and insights for effective implementation of the country's vector control programs. All research studies conducted in the Philippines from 1958 up to the present that are related to the paper's interest and are available on Philippines' Department of Science and Technology and RITM databases were tracked. Results from this analysis imply that studies on public health entomology in the Philippines have evolved and have gone through various stages of development over time. However, the magnitude of research on medically important mosquitoes in the country is still insufficient for it to contribute comprehensively to integrated methods of vector management and totally eliminate mosquito-borne infections in the Philippines. It is recommended for researchers to work on the continuity of vector researches and explore further the diversity of the entomological aspects of the control of vector-borne diseases.

Keywords: *Aedes* mosquitoes, medical entomology research, Zika, chikungunya, Japanese encephalitis

1. Introduction

Mosquito-transmitted diseases continue to cause great problem to the public health situation of tropical countries like the Philippines. Dengue, the world's fastest-spreading mosquito-borne

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disease, brought burden to a total of 131,827 Filipinos in 2017 [1]. As climate change and global warming (which worsens every year) increase the likelihood and spread of many vector-borne diseases [2], the Philippines' public health has started to increase focus on other emerging and re-emerging mosquito-borne diseases such as the Zika virus, Japanese encephalitis, and chikungunya.

Zika virus (ZIKV) was mainly confined to the African continent until it was detected in Southeast Asia in the 1980s, then in the Micronesia in 2007, and, more recently, in the Americas in 2014, where it has displayed an explosive spread, as confirmed by the World Health Organization [3]. In the Philippines, the virus has been recorded as early as 1953 when a serological study detected 19 Zika-positive sera out of 153 samples tested [4]. In May 2012, amid the threat of ZIKV's global spread, a 15-year-old boy in Cebu City reported a subjective fever. By using real-time reverse transcription PCR targeting the gene that encodes the precursor of membrane protein, ZIKV RNA in the patient's serum sample was detected [5].

Meanwhile, two other neglected mosquito-borne diseases—chikungunya and Japanese encephalitis—recently made headlines in the Philippines because of unusual morbidity or mortality rates caused by the said viruses in the past few years.

In 2013, in the aftermath of Typhoon Haiyan, Region VI of the Philippines experienced two outbreaks of chikungunya fever in the provinces of Antique and Negros Occidental [6]. This was followed by another outbreak in Cavite in 2016 with more than 450 suspect cases. In the same year, a total of 6351 suspect chikungunya cases were reported throughout the country [7].

Japanese encephalitis (JE), on the other hand, caused nine deaths in the Philippines in September, 2017. This prompted the Department of Health to call on local executives and the public to intensify mosquito prevention and control measures at home and in the community, and to protect themselves from being bitten by mosquitoes, particularly in high-risk areas. The agency also started firming up plans to introduce JE vaccination among young children in 2018 [8].

The common epidemiological feature of these emerging and re-emerging diseases is that they are vectored by mosquitoes. Some mosquito vectors are specific to certain disease, while some are responsible for multiple diseases; and some control combinations are specific, while others are effective on several of them [9–11]. *Aedes* genus, for instance, are known vectors for numerous viral infections with *Aedes aegypti* and *Aedes albopictus* being the main vectors of the three diseases of interest in this chapter—dengue, chikungunya, and Zika virus.

In the absence of vaccine for many mosquito-borne diseases (except for Japanese B encephalitis and for dengue with limited reported efficacy and questions on its safety for those who have not contracted dengue), integrated vector management (IVM) remains the sole method to prevent transmission. IVM is the first line of defense against mosquito and other vector-borne diseases especially with the worsening effect of climate change, given that many vector-borne and zoonotic diseases (diseases involving vectors such as blood-feeding insects or animal hosts) exhibit some degree of sensitivity to climate [12].

The public health authorities in the country, including scientists and researchers must therefore pay attention as well on the aspect of medical entomology to look closely at the biological characteristics and behavior of disease vectors; and on how ecological and environmental factors affect their density and transmission for more holistic and integrated approach to vector control.

In the Philippines, current projects and researches on the entomological aspects of mosquito-borne diseases—from biological study of the vectors to their surveillance and control—are mainly conducted by the Department of Medical Entomology under the Research Institute for Tropical Medicine (RITM), the research arm on infectious and tropical diseases of the Philippines' Department of Health. Several private and public institutions in the country also conduct or support research with regard to public health entomology. These include the Philippine Council for Health Research and Development (PCHRD) of the Department of Science and Technology (DOST), the National Institute of Molecular Biology and Biotechnology, University of the Philippines Los Baños (BIOTECH-UPLB), the College of Public Health of the University of the Philippines Manila, and the University of San Carlos in Cebu.

This chapter attempts to present the previous and current research efforts for medically important mosquito vectors in the country in light of identifying the research gap that exists in the field of public health entomology in the Philippines; and to look for possible ways to come up with a continuous, sustainable, and integrated approach to vector research and their actual applications to reduce the burden of different vector-borne diseases in the country. This extensive review of the past and current projects or research in the country with regard to medical entomology and vector control is also critical to provide proper direction and insights for effective implementation of the country's vector control programs.

2. Methodology

To do the review, all relevant research studies conducted in the Philippines that are related to primary vectors of emerging and re-emerging mosquito-borne diseases in the country from 1958 up to the present were tracked (including unpublished university dissertations, as well as the recently concluded research projects conducted by RITM that are yet to be published). This chapter particularly paid attention to vectors of dengue, chikungunya, Zika virus, and Japanese encephalitis. Researches were divided into three main categories: vector biology, vector surveillance, and vector control.

All RITM-participated studies that are related to the subject of interest were included in the analysis. Details of the research studies that were not conducted or participated by researchers from RITM were obtained through the help of the online database Health Research and Development Information Network (HERDIN: http://www.herdin.ph/), the national health research repository of the Philippines which is managed by DOST's PCHRD. The research studies were acquired by using helpful keywords related to the subjects of interest of this chapter. A total of 153 studies from HERDIN and RITM list have qualified for inclusion in this chapter.

The flowchart below explains further details on the selection criteria of the studies that were included in this chapter (**Figure 1**).

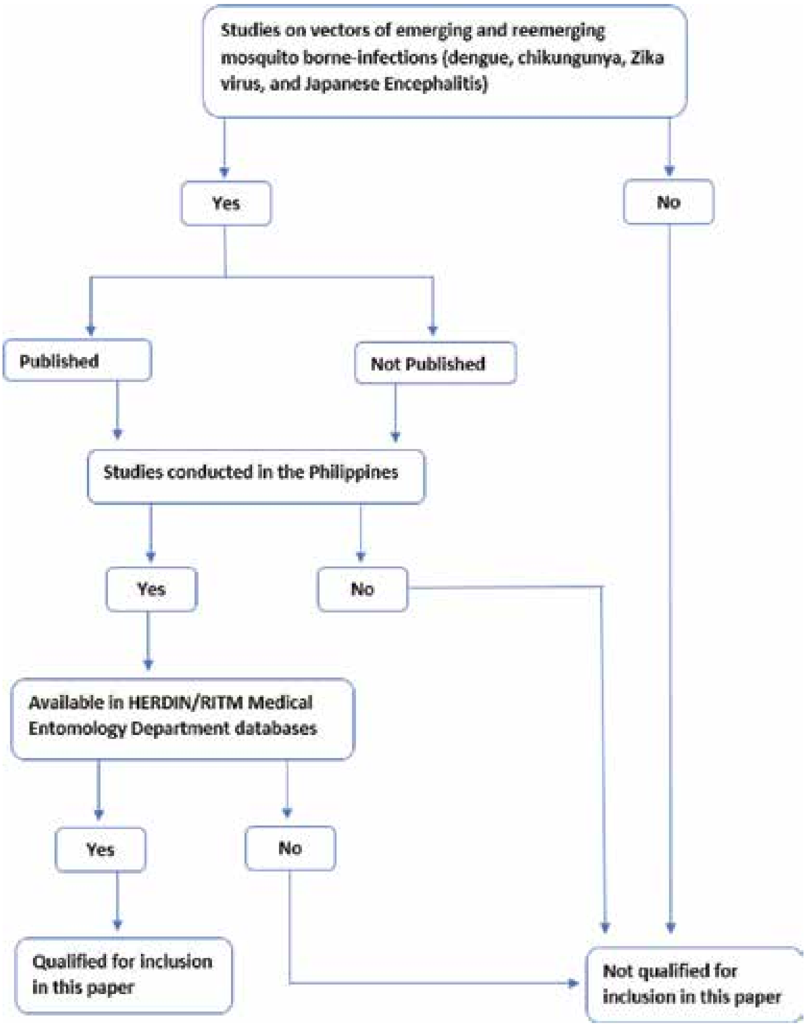

Figure 1. Flowchart for the selection of studies included in this chapter.

3. Results

3.1. Vector surveillance and control studies

The earliest recorded surveillance of mosquito vectors of public health importance in the Philippines was conducted by Ludlow [13] for her PhD dissertation which tackled the distribution of mosquito species in the Philippine Islands and the relation of their occurrence to the incidence of certain diseases in the country. Ludlow's studies of disease-bearing mosquitoes contributed greatly to the well-being of U.S. Army soldiers in the Philippines around the world during the time [14].

Meanwhile, Siler et al. [15] described in 1926 the definite dengue season in Manila and Lowland Luzon. The study suggested that conditions are favorable for mass reproduction of *Ae. aegypti* during dry season (March to May, inclusive) if a few heavy rains occur at intervals of 15–20 days; and during wet season (June to September).

In the late 1950s to 1960s, notable studies on mosquito vector surveillance and control were performed in the Philippines and its neighboring countries (**Table 1**) following a large epidemic of serious and often fatal cases of hemorrhagic febrile disease caused by mosquito bite in Manila in 1956 (with over 1200 cases and about 75 fatalities) and in Bangkok, Thailand (with nearly 2500 cases and about 250 fatalities) in 1958 [16].

The disease was described as a new disease and was referred to as the Philippine hemorrhagic fever but was later renamed dengue hemorrhagic fever (DHF) as more cases were reported in both Thailand and the Philippines [17]. However, according to Halstead [18], the association of dengue and chikungunya viruses in time and place with severe hemorrhagic disease has led many authors to assume that both viruses caused hemorrhagic fever.

Vector surveillance studies in response to hemorrhagic fever pandemic in Southeast Asia included the distribution of *Aedes* mosquitoes in Manila and Bangkok in 1960; observations of vectors of dengue hemorrhagic fever in the Philippines, Bangkok, and Singapore from 1956 to 1961; and epidemiological-entomological observations on Philippine hemorrhagic fever in 1968 [16, 19, 20].

Studies on vector control in the Philippines during this period mainly focused on potential larvicidal and adulticidal agents against mosquito vectors such as ordinary salt, benzyl isoquinoline alkaloids, and dichlorodiphenyltrichloroethane (DDT) [21–23].

Further studies on distribution of medically important mosquitoes in the Philippine islands were conducted the following decade (**Table 2**). In 1970, Baisas et al. [24] identified the distribution and abundance of medically important mosquito species in the Philippines for each

Research title	Year released
Newly recognized *Aedes aegypti* problems in Manila and Bangkok	1960
Entomological aspects of hemorrhagic fever epidemics in Bangkok, the Philippines, and Singapore	1961
Use of ordinary table salt against breeding of mosquitoes in artificial containers	1963
Control of the vector mosquitoes of hemorrhagic fever	1965
Susceptibility of common household pest mosquitoes to experimental infection with *Brugia malayi* microfilariae as compared to the principal vector	1966
A possible larvicidal Agent among the bis-benzyl isoquinoline alkaloids	1968
Epidemiological-entomological observations on Philippine hemorrhagic fever	1968
Distribution and seasonal abundance of mosquitoes in the University of the Philippines campus	1969

Table 1. List of vector control and surveillance studies in the Philippines, 1960–1969.

Research title	**Year released**
Determination of the distribution and abundance of mosquitoes in selected geographic areas	1970
Mosquitoes in Cebu City and adjacent area: an ecological survey	1971
On Philippine mosquitoes, VIII. The distribution of *Aedes aegypti* Linn. (Diptera: Culicidae) and its relationship to the spread of dengue hemorrhagic fever	1972
Mosquitoes in relation to public health in the Philippines with reference to the principal vector, species, and the diseases they transmit	1972
On Philippine mosquitoes, XII—Some ecological notes on two medically important mosquito species, *Aedes aegypti* and *Aedes albopictus*, in a selected geographic area of the UP College of Agriculture Campus in UP Los Baños, Laguna Province (Diptera: Culicidae)	1973
The mosquito control program at the Manila International Airport and vicinity (Philippines) with comments on problems encountered on the aerial transportation of mosquitoes	1973
On Philippine mosquitoes XIII—An inland survey of the distribution and relative prevalence of *Aedes aegypti* (Diptera: Culicidae) with reference to mosquito-borne hemorrhagic fever	1974
Epidemiological, virological, and entomological studies on dengue in the city of Manila	1979

Table 2. List of vector control and surveillance studies in the Philippines, 1970–1979.

month and designated zone in a span of 12 months. During the 12-month period surveillance, eight species implicated in the transmission of various diseases (malaria, filaria, dengue, hemorrhagic fever, Japanese B encephalitis, and chikungunya) were obtained. The study further implied that Japanese B encephalitis was most likely to occur in epidemic form at that time because of *Culex tritaeniorhynchus* and *Culex gelidus*.

Meanwhile, Schoenig [25] conducted an ecological survey of mosquito vectors in Cebu City and its adjacent areas in 1971 which found *Aedes aegypti* Linnaeus to be the primary species present in the area. He also came up with a taxonomic key on determining the species collected in the field.

From 1972 to 1974, Basio et al. [26–30] implemented a series of mosquito vector surveillance and control studies in the Philippines. These are composed of surveillance on mosquitoes in relation to public health in the Philippines with reference to the principal vector, species, and the diseases they transmit; a research on the distribution of *Aedes aegypti* Linn in the country and its relationship to the spread of dengue hemorrhagic fever; ecological notes on two medically important mosquito species, *Aedes aegypti* and *Aedes albopictus*, in a selected geographic area of the UP College of Agriculture Campus in UP Los Baños, Laguna Province; mosquito control program at the Manila International Airport (now Ninoy Aquino International Airport) and vicinity with comments on problems encountered on the aerial transportation of mosquitoes; and an inland survey of the distribution and relative prevalence of *Aedes aegypti* (Diptera: Culicidae) with reference to mosquito-borne hemorrhagic fever.

Toward the latter part of 1970s and earlier part of 1980s, further studies on entomological aspects of emerging mosquito-borne diseases in the Philippines and on control of their major vectors were carried out by local scientists.

Among these studies is a comprehensive vector surveillance study conducted by Salazar et al. [31] from 1978 to 1979, a survey of *Ae. aegypti* mosquitoes that used standard entomological procedures and calculations for adult and larval mosquito indices aside from obtaining information on the distribution and density of the species in the city of Manila. Salazar also investigated the entomological aspects of both dengue and malaria in 1984 [32].

In terms of vector control, additional aspects of mosquito reduction were explored in this period aside from utilizing insecticides, particularly in terms of generating insights on participatory approach of mosquito reduction in the community and modifying health-risk behaviors of the people living in the vicinities which are vulnerable to outbreak of mosquito-borne diseases. For instance, Cruz conducted a study on the effectiveness of community-based health program in *Aedes aegypti* control in 1982 [33].

A study on *Bacillus thuringiensis* (Bt), a bacterial microbe derived from soil, was also explored in search of safe and effective mosquito larvicide. In 1984, Jueco et al. [34] performed bioassay of *Bacillus thuringiensis (Bt) Israelensis* serotype H-14 against Philippine strains of *Aedes aegypti, Anopheles litoralis,* and *Culex quinquefasciatus* in some drainage canals in the city of Manila to test the susceptibility of the three species to the potential larvicide.

Padua et al. [35, 36] on the other hand, studied the *Bt* subspecies *morrisoni* [serotype H 8a: 8b] (PG-14) from 1982 to 1984 which was obtained from a soil sample in Cebu City. This isolate produced a spherical or irregular parasporal crystal, highly toxic to mosquito larvae but not to the silkworm, *Bombyx mori*, and adults of a daphnid. It was also negative for 13-exotoxin. All this is in contrast to the type strain. This isolate, being the first discovered from the tropics, is serologically different from Bt subsp. Israelensis, serotype H-14 [37].

Meanwhile, a study on Japanese encephalitis mosquito vectors in the Philippines rice fields by Llagas et al. [38] in 1989 presented information that are relevant to the understanding of the Philippine rice agro-ecosystem and its characteristics in relation to vector breeding.

Overall in 1980s (**Table 3**), the number of studies investigating the effectiveness of different interventions to reduce or eliminate the density of mosquito vectors or combination of vector surveillance and control studies is higher than studies on mere surveillance of mosquito vectors—the first time since research studies on medically important mosquito vectors in the country were implemented.

This trend continued to increase in the following decades (**Table 4**). In 1990s, researchers explored further on different aspects of mosquito control which include the use of different Philippine plants such as tubli (*Derris elliptica* Benth), guyabano (*Annona muricata*), and selected seaweed species as potential larvicide or insecticide against medically important mosquitoes [39–41]; the use of N,N-diethyl-meta-toluamide (DEET) formulations as mosquito repellents [42]; utilization of permethrin-treated curtains for control of *Aedes aegypti* in the Philippines [43]; further studies on different *Bacillus thuringiensis* strains as potential larvicide [44, 45]; and observations on the effectiveness of different community-based approaches on mosquito reduction including modifying the knowledge, attitude, behaviors, and practices of the people in the communities which are vulnerable to mosquito-borne disease outbreaks [46–48].

Research title	Year released
Studies on dengue hemorrhagic fever in the Philippines II. Entomological aspects	1980
A study on the effectiveness of community-based health program in *Aedes aegypti* control	1982
Bacillus thuringiensis isolated in the Philippines	1982
Isolation of a *Bacillus thuringiensis* (serotype 8a:8b) highly and selectively toxic against mosquito larvae	1984
Malaria and dengue hemorrhagic fever in the Philippines: entomological aspects	1984
Bioassay of *Bacillus thuringiensis* Israelensis serotype H-14 against Philippine strains of *Aedes aegypti, Anopheles litoralis* and *Culex quinquefasciatus*	1984
Strategies for control of Japanese encephalitis mosquito vectors in the Philippines rice fields	1989
Cemetery vase breeding of dengue vectors in Manila, Republic of the Philippines	1989

Table 3. List of vector control and surveillance studies in the Philippines, 1980–1989.

Research title	Year released
Ultrastructure study of *Bacillus thuringiensis*-treated *Aedes aegypti* larvae	1991
Comparison of the effectiveness of two DEET formulations against *Aedes albopictus* in the Philippines	1991
Distribution of *Aedes albopictus* mosquitoes in one urban and sub-urban communities in the Philippines; an ovitrap and larval survey	1991
Distribution of *Aedes Aegypti* and *Aedes albopictus* in one urban and sub-urban communities in the Philippines—an ovitrap and larval survey	1992
Seasonal abundance of dengue vectors in Manila, Republic of the Philippines	1993
Knowledge, attitudes, and practices of Filipino Mothers regarding the dengue fever syndrome: implications toward preventive interventions	1993
Antibacterial, antifungal and larvicidal properties of selected seaweeds in Bolinao, Pangasinan	1994
Biology and control of *Aedes* mosquito vectors of dengue/dengue hemorrhagic fever in the Philippines	1995
Community-based control of dengue hemorrhagic fever: a 5-year prospective intervention program (1991–1995)	1996
Toxicity effect of effluents from selected food-processing industries along Butuanon River on larvae of *Aedes* spp.	1997
Update: Japanese encephalitis virus Activity in the Philippines	1999
The insecticidal effect of tubli (*Derris* sp.) root crude extract on *Aedes* mosquito larvae	1999
Use of permethrin-treated curtains for control of *Aedes aegypti* in the Philippines	1999
A community field practice report in Sitio Bagong Pook, Tanza, Cavite: control and prevention of dengue fever	1999
The larvicidal effect of guyabano (*Annona muricata*) leaf extract on *Aedes aegypti* mosquito	1999
Effects of mutants of *Bacillus thuringiensis* subsp. Israelensis on mosquito larvae (*Aedes aegypti*)	1999

Table 4. List of vector control and surveillance studies in the Philippines, 1991–1999.

The advent of the new millennium brought along major ecological and environmental issues globally such as overpopulation, urbanization, and climate change which affected the public health situation of the world, including the proliferation of mosquito-borne diseases. In response to these phenomena, new approaches on vector surveillance studies were employed by researchers on public health entomology in the Philippines, especially in the latter part of the 2000s when scientists all over the world have started to form a consensus and agreed that human-induced climate change is really happening (**Table 5**).

Aside from conducting an integrated research on the aspects of both vector surveillance and control, research studies in the Philippines also started to identify and analyze factors which are deemed critical on multiplication of mosquito vectors and on increase in incidences of vector-borne diseases in tropical setting such as rainfall, humidity, and temperature. This is to contribute to a proactive vector management efforts amid the abnormal climatic patterns and extreme weathers that happen across the globe because of climate change, which the climate scientists claim as the "current normal."

Among the studies of this kind include the analytical study on the relationship between rainfall, temperature, and humidity and the number of dengue fever cases in admitted patients in Northern Mindanao Medical Center from 1998 to 2007 by Seeto et al. [49] in 2008; correlation of climatic factors and dengue incidence in Metro Manila, Philippines by Sia Su [50] in 2008; and Reyes's study on rainfall, temperature, relative humidity, and dengue cases in Metro Manila in 2009 [51].

Studies on biological methods for vector control were also explored in this period. Reyes et al. [52, 53] conducted two studies on the efficacy of Philippine species of *Mesocyclops* (Crustacea: Copepoda) as a biological control agent of *Aedes aegypti* in 2004 and 2005.

According to WHO, biological control is based on the introduction of organisms that prey upon, parasitize, compete with, or otherwise reduce populations of the target species. Against *Aedes*, a selection of larvivorous fish species and predatory copepods (small freshwater crustaceans) are effective against the immature larval stages of vector mosquitoes [54].

Research studies using the earlier approaches for vector control were further explored during this period such as screening of Philippine plants and trees for larvicidal activity or repellant against *Aedes aegypti* and other medically important mosquitoes; and observations on the behavioral change of the communities vulnerable to outbreaks of mosquito-borne diseases through information dissemination.

With regard to Japanese encephalitis vectors, Bertuso et al. [55] conducted a study observing the ecology of *Culex tritaeniorhynchus, Cx. Gelidus,* and *Cx. bitaeniorhynchus* in the province of Bulacan in 2006 with special reference to their aquatic habitat.

The trend on integrated approaches to the conduct of research on vector surveillance and control continued in 2010s (**Table 6**). Researchers utilized modeling and simulation techniques to understand in a more holistic way the implications of climate change and other environmental factors on the density of medically important mosquitoes and dengue incidences in different areas of the country. For instance, the recently concluded research project of RITM

Research title	**Year released**
People's knowledge and practice and *Aedes aegypti* infestation in Cebu City, Philippines and implications for community-based dengue control	2000
The larvicidal potential of extract from the leaves of lagnob (*Ficus septica* Burm.f.) on *Aedes* mosquito	2000
Identification of dengue larvae via larvitraps at Manila Central University (a preliminary study)	2000
People's knowledge and practice and *Aedes aegypti* infestation in Cebu City, Philippines and implications for community-based dengue control	2000
The efficacy of abate 1 sg and culinex plus s in controlling *Aedes albopictus* larvae	2002
Knowledge, attitudes, and practices among residents of Brgy. Tinajeros, Malabon Metro Manila regarding dengue prevention	2002
Screening of Philippine plants for larvicidal activity on *Aedes aegypti*	2003
An interventional study on the effectiveness of the basic training course on dengue prevention and control among barangay health workers in Piñan, Zamboanga del Norte	2003
The seasonal pattern of occurrence of *Aedes* mosquito dengue vector	2002
The association between local meteorological factors and hospital admissions of dengue hemorrhagic fever in Iloilo Province, Philippines	2002
Establishment of sensitive vector indicator for dengue surveillance	2002
The effectiveness of larval surveillance-integrative approach strategy in relation to prevalence and density of the *Aedes* larvae	2003
The effect of puppetry as an educational intervention approach on the knowledge, attitude and practices regarding dengue hemorrhagic fever prevention and control among grade school children in Lawaan Elementary School, Banonong, Dapitan City	2004
Students' perceptions about mosquito larval control in a dengue-endemic Philippine city	2004
Species of *Mesocyclops* (Crustacea: Copepoda) as a biological control agent of *Aedes aegypti* (Linnaeus)	2004
Evaluation of the present dengue situation and control strategies against *Aedes aegypti* in Cebu City, Philippines	2005
A preliminary study on the mosquito repellent effect of tea tree (*Melaleuca alternifolia*) oil	2005
Survey of freshwater Copepods (Crustacea) in selected areas of Luzon with dengue cases	2005
A comparison of an integrative learning method and problem-based learning method as dissemination tools about dengue hemorrhagic fever among public elementary school teachers in Zamboanga City	2005
Evaluation of the present dengue situation and control strategies against *Aedes aegypti* in Cebu City, Philippines	2005
Survey of dengue vectors in Barangay 674 "Estero de Tanque", Paco, Manila	2005
The effect of interventional program on the larval indices of *Aedes Aegypti* in selected Barangays Isabela City, Basilan	2006
Aedes sp. surveillance using ovitrap technique in Barangay Sta. Cruz, Makati City, Philippines	2006
Ecology of mosquito vectors of Japanese encephalitis in Malawak, Bustos, Bulacan [Philippines] with special reference to their aquatic habitat	2006
The mosquito attracting power of powdered: *Ruellia tuberosa* (waterbomb)	2006

Research title	Year released
The effect of interventional program on the larval indices of *Aedes Aegypti* in selected Barangays Isabela City, Basilan	2006
Dengue mosquito ovitrapping and preventive fogging trials in the Philippines	2007
Perceived self-efficacy to plan and execute an environmental action plan for dengue control among Filipino University students	2007
Dengue vector surveillance in barangay Gumatdang, Itogon, Benguet	2007
Aedes survey of selected public hospitals admitting dengue patients in Metro Manila, Philippines	2008
Entomological survey of dengue vectors as basis for developing vector control measures in Barangay Poblacion, Muntinlupa City, Philippines	2008
Larvicidal effect of *Lansium domesticum* Correa (Sapindales: Meliaceae) exocarps and seeds on 3-day old *Aedes aegypti* Linnaeus (Diptera: Culicidae) mosquito larvae	2008
An evaluation on the impact of the dengue control program on the knowledge, attitudes and practices of the residents of barangays Macasandig and Indahag, Cagayan de Oro City, 2007	2008
An analytical study on the relationship between rainfall, temperature and humidity and the number of dengue fever cases in admitted patients at the Northern Mindanao Medical Center from 1998–2007	2008
Correlation of climatic factors and dengue incidence in Metro Manila, Philippines	2008
Mosquito vectors and dengue cases in Manila	2009
Rainfall, temperature, relative humidity and dengue cases in Metro Manila, Philippines	2009
Enhanced development of dengue mosquito vector (*Aedes aegypti* Linnaeus) larvae feeding on maize (*Zea mays* Linnaeus) pollen under laboratory conditions	2009
Larvicidal activity of coconut fatty alcohol sulfate (CFAS) o *Aedes (stegomyia) aegypti* (Linnaeus 762)	2009

Table 5. List of vector control and surveillance studies in the Philippines, 2000–2009.

on the effect of weather patterns in predicting mosquito density and count of dengue cases in different locations in the Philippines used multiple regression analysis to come up with models containing predictor variables that contribute to the density of mosquitoes in the selected site. The study then came up with the best model on predicting mosquito density and count of dengue cases for particular locations using statistical computations.

Buczak et al. [56], on the other hand, built prediction models in 2014 for future dengue incidence in the Philippines that is capable of being modified for use in different situations; for diseases other than dengue; and for regions beyond the Philippines. This model predicted high or low incidence of dengue in the Philippines 4 weeks in advance of an outbreak with high accuracy, as measured by positive predictive value (PPV), negative predictive value (NPV), sensitivity, and specificity.

In Cebu City, Miksch et al. [57], used modeling and simulation techniques to understand how dengue spread in a community in 2015. The research team developed an agent-based model for simulating dengue epidemics which modeled human and mosquito agents with detailed agent's behavior, mosquito biting rules, and transmissions. Featuring a modular approach,

Research title	**Year released**
Insecticidal activity of *Cucurbita maxima* Duch. var. suprema (squash) leaf blades and *Piper nigrum* Linn. (Black pepper) seeds against *Aedes aegypti* mosquitoes	2010
Best practices in dengue surveillance: a report from the Asia-Pacific and Americas Dengue Prevention Board	2010
Antigen sandwich ELISA predicts RT-PCR detection of dengue virus genome in infected culture fluids of *Aedes albopictus* C6/36 cells	2010
Dengue vector surveillance methods in Muntinlupa City, Philippines	2011
Climate change and incidence of dengue fever (DF) and dengue hemorrhagic fever (DHF) in Iligan City, Lanao del Norte, Philippines	2011
Climatic factors affecting dengue fever and dengue hemorrhagic fever incidence in Makati City	2011
A study on the effect of utilizing school-based dengue education on the knowledge, attitude and practices of elementary students on dengue prevention and control in Tampilisan Central School, barangay Poblacion Tampilisan, Zamboanga del Norte	2011
Development of natural-based mosquito repellent lotion against dengue fever	2011
The effectiveness of *Ocimum basilicum* (sweet basil) extract as a mosquito (female *Aedes aegypti*) repellant: basis for information dissemination as a potential alternative measure for preventing mosquito bites	2011
The effectiveness of health teachings on the level of knowledge and degree of compliance on dengue awareness program as mandated by the department of health among selected residents in Barangay Labangon, Cebu City	2011
Evaluation of a peridomestic mosquito trap for integration into an *Aedes aegypti* (Diptera: Culicidae) push-pull control strategy	2012
Eco-bio-social research on dengue in Asia: a multicountry study on ecosystem and community-based approaches for the control of dengue vectors in urban and peri-urban Asia	2012
Effects of aqueous and pelletized admixture of *Piper nigrum* L on the oviposition behavior of *Aedes aegypti* mosquitoes and its larvicidal-ovicidal activity	2012
Community-based dengue vector control: experiences in behavior change in Metropolitan Manila, Philippines	2012
Operational efficiency and sustainability of vector control of malaria and dengue: descriptive case studies from the Philippines	2012
Multi-functional controlled release system for fragrant and mosquito-repellent finishing in cotton fabrics	2012
Philippine water bug effective biological control for dengue	2012
Field evaluation of ovitraps with *Piper nigrum* to assess its larvicidal and oppositional effects on dengue mosquito vectors	2012
Rainfall, temperature and the incidence of dengue in Central Visayas, Philippines are not correlated	2012
The key breeding sites by pupal survey for dengue mosquito vectors, *Aedes aegypti* (Linnaeus) and *Aedes albopictus* (Skuse), in Guba, Cebu City, Philippines	2012
The effect of climate change in the occurrence of dengue cases	2012
Review: geographical information systems for dengue surveillance	2012

Research title	Year released
Estimating dengue vector abundance in the wet and dry season: implications for targeted vector control in urban and peri-urban Asia	2012
A comparative study between hay infusion baited ovitrap with rain water baited ovitrap by counting the numbers of mosquito eggs	2012
Medically important mosquitoes (Diptera: Culicidae) identified in rural barangay Binubusan, Lian, Batangas Province, Philippines	2012
Baseline and key container survey for *Aedes aegypti* and *Aedes albopictus* in Albay Province, Philippines	2012
Medically important mosquitoes (Diptera: Culicidae) identified in rural barangay Binubusan, Lian, Batangas Province, Philippines	2012
Water quality and *Aedes* larval mosquito abundance in Caloocan city, Philippines	2012
The impact of climate change on the prevalence of dengue cases in the province of Albay	2013
Entomological survey of artificial container breeding sites of dengue vectors in Batasan Hills, Quezon City	2013
Natural transovarial transmission of dengue viruses in *Aedes aegypti* (Diptera: Culicidae) in Cebu City, Philippines	2013
Health promotive management interventions on the level of health care practices against dengue hemorrhagic fever among selected mothers in Barangay Guadalupe, Cebu City	2013
The effectiveness of fragrant pandan plant (*Pandanus amaryllifolius* Roxb.) prop root extract as a mosquito (*Aedes aegypti*) larvicide	2013
The larvicidal activity of brown algae *Padina minor* (Yamada 1925) and *Dictyota linearis* (Greville 1830) against the dengue vector, *Aedes aegypti* (Linn 1762) (Diptera: Culicidae)	2013
Effect of *Aedes aegypti* exposure to spatial repellent chemicals on BG-Sentinel™ trap catches	2013
Larvicidal effect of ampalaya (*Momordica charantia*) fruit juice on *Aedes* mosquito larvae	2013
Dengue knowledge and preventive practices among rural residents in Samar Province, Philippines	2013
Knowledge and practices of mothers of Sitio Riverside barangay Sambag II Cebu City on dengue fever: its disease transmission and prevention	2013
The relationship between the level of awareness on the prevention of dengue fever and their practices of full-time mothers in Sitio Malibu, Barangay Subangdaku, Mandaue City: a basis for information dissemination on the prevention of dengue fever	2013
Socioeconomic status and level of knowledge on environmental measures on dengue hemorrhagic fever among residents in Sitio Sudtungan, Basak, Lapu-lapu City: proposed guidelines to enhance awareness and prevention on dengue fever	2013
Laboratory observations on the use of *Diplonychus rusticus* as a potential biological control agent on Japanese encephalitis vector	2013
Preliminary screening of Citrus microcarpa (calamansi) seed oil extract as a potential larvicide against *Aedes aegypti*: a dengue fever mosquito	2014
Prediction of high incidence of dengue in the Philippines	2014
Knowledge, attitudes, perceptions and practices related to ovicidal-larvicidal traps for dengue control among households in one barangay in Quezon city	2014
Percent survival of dengue mosquito vector (*Aedes aegypti*) larvae feeding on rice (*Oryza sativa*) pollen under laboratory conditions	2014

Research title	**Year released**
Transovarial transmission of dengue virus in *Aedes aegypti*: a case in Quezon City, Philippines	2014
Analysis of climate variability and dengue occurrence in social-ecological systems: the case of Bay, Los Baños and Calamba in Laguna, the Philippines	2015
The effect of cogon grass (*Imperata cylindrica*) and carabao grass (*Paspalum conjugatum*) leaf extract on mortality of *Aedes aegypti* larvae	2015
The effectivity of Lanzones (*Lansium domesticum*) peelings' extract as mosquito repellant	2015
Isolation and identification of *Bacillus thuringiensis* from *Harpaphe haydeniana* and its entomotoxic evaluation against *Aedes* and *Culex* larvae	2015
An agent-based epidemic model for dengue simulation in the Philippines	2015
Identification of mosquito species in brown sugar and yeast mosquito trap	2015
CMOS RC oscillator using 0.35 micron for portable mosquito-repel circuit	2015
Effect of temperature, relative humidity and rainfall on dengue fever and leptospirosis infections in Manila, the Philippines	2016
Fabrication of a nanoparticle-based sensor for the detection of dengue virus-3 in *Aedes aegypti*	2016
Determinants of transmission risk and the role of vector pupal presence in the development of integrated approaches to dengue control in Muntinlupa City, The Philippines	2017
BG-Sentinel™ trap efficacy as a component of proof-of concept for push-pull control strategy for dengue vector mosquitoes	2017
Evaluation of a spatial repellent push-pull strategy for the control of *Aedes aegypti* using experimental huts in Western Thailand	2018
Effect of weather patterns in predicting mosquito density and count of dengue cases in six locations in the Philippines	2018

Table 6. List of vector control and surveillance studies in the Philippines, 2010–2018.

this method provides flexibility and allows functionalities that are easy to manage and to communicate. The model was parameterized and calibrated to simulate the 2010 dengue epidemic in Cebu City, Philippines. The study provided insights into the spreading process of dengue. It revealed that the changing mosquito population during rainy season has a great impact on the epidemic. With this, the study showed how further research on that matter using models and extended biological studies might lead to a better understanding of the dengue spreading process, and eventually to more effective disease control.

Meanwhile, Duncombe et al. [58] suggested the use of geographical information systems (GIS) for dengue surveillance, citing the advancement of GIS technology and its potential to greatly assist dengue prevention and control, as it allows further investigation of surveillance data through spatial statistical analyses and visualization of patterns and relationships between disease and the environment. The paper added that open access applications enable all countries to use this technology, including those nations with limited resources and that the advances in open access GIS technologies should be viewed as a catalyst for increased global collaboration, where information sharing and public health planning are prioritized to achieve common goals.

The use of more sophisticated biological and computational tools for vector control in the country such as molecular biology, nanotechnology, bioinformatics, or combination of these tools was also explored in the recent years. Among the studies that utilized these tools is the study by Contreras et al. [59] which fabricated a nanoparticle-based sensor using DNAzyme-functionalized dextrin-capped gold nanoparticles to detect the presence of dengue virus serotype-3 (DENV-3) in *Aedes aegypti*. In this research, the fabricated nanoparticle-based sensor can detect target concentration for as low as 0.1 μM using synthetic DENV-3 target and 5×10^2 PFU/mL using extracted RNA from *A. aegypti*. The nano-biosensor presented in this study provides a simple, faster, "greener," and portable way of detecting the DENV-3 in mosquitoes for epidemiological purposes.

Cruz et al. [60], on the other hand, devised a CMOS RC oscillator in 2015 that operates at frequency based on the wing-beat frequency of male mosquitoes and dragonflies, in order to produce ultrasonic signal that repels biting female mosquitoes. According to the researchers, this microelectronic CMOS oscillator can be further developed into portable and wearable mosquito-repel circuits, and can help improve the nonoccurrence of malaria and dengue in the country.

Meanwhile in RITM, the Department of Medical Entomology established partnership with the *World Mosquito Program* of Monash University in Australia to pilot test the introduction of *Wolbachia* (a naturally occurring bacteria from other insects) into *Aedes aegypti* eggs. The said bacteria reduce the ability of mosquitoes to transmit harmful human viruses such as dengue, chikungunya, and Zika when optimum density is present in female adults.

3.2. Vector biology and life history studies

One of the earliest peer-reviewed and comprehensive studies on biological characteristics of *Aedes Aegypti* in the Philippines is the study conducted by Del Rosario in 1961 which described some bionomic features of *Ae. aegypti* under laboratory conditions using an artificial colony. The study revealed that the development of *Ae. aegypti* from egg to adult takes about 2 weeks or more under ordinary room temperature (24–28°C). Oviposition follows in 4 or 5 days upon taking first blood meal (2 or 3 days after emergence). The female eats again 2 or 3 days later. Based on researcher's observations, *Ae. aegypti* species eat as many as eight times during its lifetime in the laboratory. The average interval between blood meals is 3.4 days. They laid eggs after almost every blood meal. However, there were instances where they had to take several blood meals before laying eggs. The number of eggs laid per oviposition ranges from 15 to 140 with an average of 57. The number of eggs by adults fed by chicken blood is significantly higher than those fed by human blood with an average of 76 [61].

Another study on *Ae. aegypti* revealed that certain laboratory strains of *Ae. aegypti* differ significantly and consistently in their choice of oviposition substrate. Based on the experiment conducted by Schoenig in 1968, the strain differences are not essentially affected by environmental influences and the stability of this reaction indicates genetic control. The researcher further noted that oviposition on a solid surface (paper) is the wild-type character. There is evidence that this character may be largely controlled by a single gene with incomplete dominance which linked to sex on chromosome 1. The study also indicates that behavioral character in mosquitoes can be measured and the genetic basis of mosquito behavior can be further investigated [62].

In 2012, a study on life history, fecundity, and blood feeding time of *Aedes albopictus*, another important vector of dengue viruses in the Philippines, was conducted by Aguila and Caoili under laboratory conditions (26.7 ± 0.9°C and 83 ± 5.7% RH). The controlled experiment revealed that the average development time of each life stages is as follows: eggs, 1.84 ± 0.8 days; larval stage: first instar, 2.31 ± 0.5 days; second instar, 1.11 ± 0.1 days; third instar, 1.12 ± 0.1 days; fourth instar 1.33 ± 0.2 days; pupal stage, 1.94 ± 0.1 days; and 3.91 ± 1.2 days for the adult longevity. The observed total developmental time from egg to adult was 13.55 ± 1.0 days. Female *Ae. albopictus* laid an average of 46.2 ± 32.3 eggs. Mortality factor from egg to pupal stage was K = 0.3808. Meanwhile, the researchers observed that the peak feeding time of *Ae. albopictus* regardless of age was at 07:00H, which is the first exposure period to the host. Additional peak biting time of 6- and 7-day-old females was at 10:00H, while that of 3-day-old females was at 21:00H and 03:00H. The study's results provide insights on effective mosquito management control strategy to prevent *Ae. albopictus* vectorial capacity anytime of the day [63].

Researchers also took advantage of bioinformatics and other innovative tools to gain further insights on the physiological features of vector mosquitoes. For instance, Sendaydiego et al. [64] identified the intraspecific divergence in wing shape and venation in *Aedes aegypti* using landmark-based geometric morphometrics. Results of the relative warp analysis showed some intraspecific variation in the wing outline of *Ae. aegypti*. The observed morphological disparity in wing shape suggests a possible morphological divergence among populations of *Ae. aegypti*.

In 2014, Alcantara constructed a homology model of *Ae. aegypti* chorion peroxidase enzyme and identified potential inhibitors of chorion peroxidase by computational method to predict the three-dimensional (3D) structure of *Ae. aegypti* chorion peroxidase. This study is significant on dengue vector control as development of ovicidal compounds targeting chorion peroxidase would complement existing larvicidal and adulticidal compounds for control of *Ae. aegypti* [65].

Table 7 shows the list of vector biology and life history studies in the Philippines from 1961 to 2014.

3.3. Distribution of vector research per decade, category

Studies on mosquito vectors of interest collected in this chapter were grouped according to decade they were released, ranging from 1958 up to the present. A total of 153 locally conducted studies were collected from RITM and HERDIN databases. The breakdown of number of studies conducted per decade is the following: 1 in 1950s, 11 in 1960s, 10 in 1970s, 9 in 1980s, 17 in 1990s, 39 in 2000s, and 66 in 2010s (**Figure 2**).

Except for 1970s and 1980s, there is an increasing trend on the number of studies conducted in the country over time. Decline on number of research in the 1970s and 1980s may be explained by the political turmoil and instability in the country during these decades which probably affected the funding of research in the Philippines. The country's political climate only stabilized in the latter part of the 1980s when transition in the Philippine government occurred, the first time in more than 20 years.

Research title	Year released
Studies on the biology of Philippine mosquitoes, I—some bionomic features of *Aedes aegypti*	1961
Studies on the biology of Philippine mosquitoes, II—observations on the life and behavior of *Aedes albopictus* (Skuse) in the laboratory	1963
Strain variation in *Aedes aegypti*	1968
Host-induced modification of dengue-2 virus surface antigens in *Aedes albopictus* cells	1973
Recapitulations on changes in dengue virus properties and the etiology of dengue hemorrhagic fever	1976
Notes on the karyotype of two Philippine Aedine mosquitoes	1989
Biology and control of *Aedes* mosquito vectors of dengue/dengue hemorrhagic fever in the Philippines	1995
Production of viral antigens in culture fluid of C6/36 mosquito cell line infected with dengue type 4 virus strains isolated from patients with different clinical severities	2010
Antigen sandwich ELISA predicts RT-PCR detection of dengue virus genome in infected culture fluids of *Aedes albopictus* C6/36 cells	2010
Life history and blood feeding activity of a Philippine population of *Aedes albopictus* Skuse (Diptera: Culicidae) under laboratory conditions	2012
Describing wing geometry of *Aedes Aegypti* using landmark-based geometric morphometrics	2013
In silico identification of potential inhibitors of dengue mosquito, *Aedes Aegypti* chorion peroxidase	2014

Table 7. List of vector biology and life history studies in the Philippines, 1961–2014.

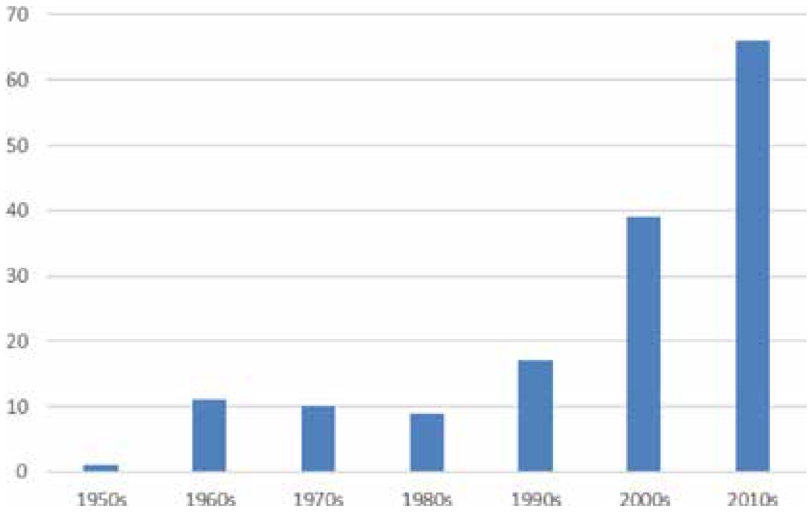

Figure 2. Distribution of mosquito vector studies per decade from 1950s to 2010s.

Research outputs following the decade of shift of administration in the country almost doubled from 9 in the 1980s to 17 in the 1990s. The increasing trend of research outputs on medical entomology further continued the following decades.

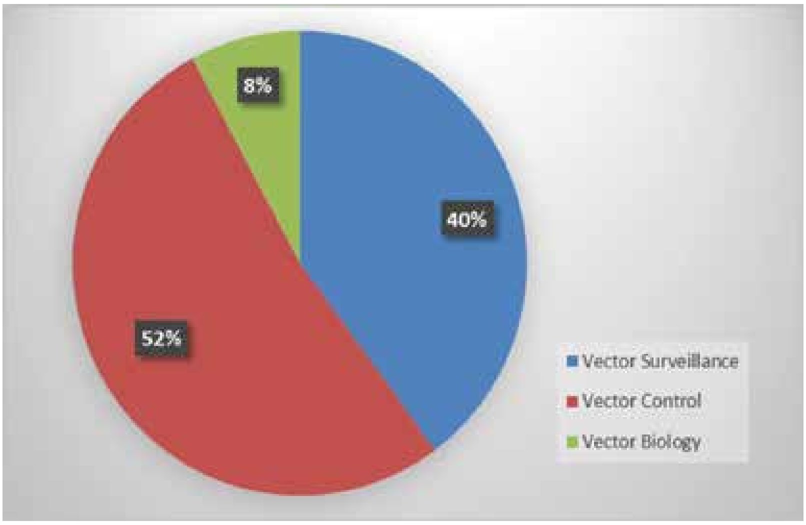

Figure 3. Distribution of mosquito vector studies according to category.

In terms of distribution of studies with regard to their respected categories, a total of 59 research studies (40%) fall under the Vector Surveillance Category, 79 studies (52%) fall under Vector Control Category, and 13 studies (8%) fall under Vector Biology Category (**Figure 3**).

The number of vector surveillance researches was prominent during the first decades covered in this study. By 1980s until the present, however, different aspects of mosquito vector control were explored by researchers either by means of chemical control, biological control, or environmental management, the third strategy includes modifying health-risk behaviors of the community which are vulnerable to mosquito-borne diseases outbreak.

Among the three categories of vector research, studies on the biological aspect of medically important mosquitoes seem to be lagging behind, comprising only about 9% of the total number of researches retrieved. By 2010s, however, more researchers have become interested on the biological characteristics of medically important mosquitoes in the country, with six research studies on this subject implemented in just a span of 6 years (2010–2015).

4. Conclusion and recommendation

The entomological aspect of the control and prevention of mosquito-borne diseases in the Philippines is oftentimes neglected by the public health researchers and practitioners. In essence, however, the field of medical entomology and its underlying science should be the first line of defense on management and control of vector-borne diseases in the country. Overall, it is safe to say that the studies on public health entomology in the Philippines have evolved and have gone through various stages of development overtime, as presented in this chapter. If in the earlier years, scientists were more focused on surveillance of medically important mosquitoes, the research concentration has shifted to vector control halfway of the period covered in this chapter. It also turns out that the research studies on public health entomology in the country, particularly on emerging and re-emerging mosquito-borne infections, are becoming more proactive and can serve as early warning for impact reduction, instead of merely responding during the period of outbreaks and epidemics. Specifically, public health entomology researches have looked at the broader point of view in terms of mass reproduction of mosquito vectors, taking into consideration different factors that affect their density such as globalization, climate change, overpopulation, and urbanization.

However, it can also be implied from this analysis that the number of studies that concern this chapter's interest remains low but thematically, these studies follow universal trends. Newer aspects of vector control research were explored—from the use of ordinary salt as mosquito larvicide to the optimization of breakthrough technologies such as genetic modification, molecular biology, and bioinformatics to dramatically reduce mosquito-borne infections in the country.

Nevertheless, the magnitude of research on medically important mosquitoes in the Philippines is still insufficient for it to contribute comprehensively to integrated methods of vector management and to totally eradicate mosquito-borne infections. Integrated vector management provides a sound conceptual framework for deployment of cost-effective and sustainable methods of vector control. This approach allows for full consideration of the complex determinants of disease transmission, including local disease ecology, the role of human activity in increasing risks of disease transmission, and the socioeconomic conditions of affected communities [66].

Reasons for lack of merit of Philippine-conducted vector research include the absence of interests of the researchers to publish their studies; the discontinuation of research topics that need further validation due to lack of financial support; or lack of initiative from the researchers to further pursue their studies until empirical evidences are found, especially those who only conducted research to complete their university dissertations. On the other hand, some research studies identified in this chapter are practically a repeat of studies which were previously done and this could have been avoided if an online reference or database providing a rundown of all aspects of entomological research conducted in the country is available.

Researchers should work on the continuity of vector researches and explore further the diversity of the entomological aspects of the control of vector-borne diseases. The diversified approach to vector research offers the public health authorities some leeway and convenience of having a variety of choices for intervention to vector reduction in different mosquito-endemic areas since approaches to mosquito eradication are oftentimes location specific. Despite emergence of sophisticated tools for vector control research, studies on cheap but effective solution for vector control should still be explored since in many cases, approaches to mosquito source reduction in affected areas need not to be too expensive.

It is thus recommended for the National Government to set up the country's Center of Excellence for Medical Entomology which will oversee the activities for public health entomology across the country, institutionalize a nationwide network of public health entomologists, spearhead the establishment of more satellite centers in different parts of the country to immediately address area-specific needs as they arise, and serve as the curator of medical entomology-related data and researches for a more organized manner of storage, retrieval, and application of these information on public health entomology and vector control.

But perhaps the most crucial part of public health entomology research is the communication and extension of these studies' potentials to the right people and concerned stakeholders. These include the public, policy-makers, mass media, local government units, and local health workers. After all, the end-goals of these researches are to be applied and utilized in the actual public health situations in the country, and in more fortunate scenarios, to serve as early warning to avoid the large-scale effect to public health of emerging and re-emerging mosquito-borne infections.

The stakeholders mentioned above need to be oriented on the importance of public health entomology and vector control so that they could support the conduct of further studies on the entomological aspects of mosquito-borne infections and even on the actual application of these researches through policy legislation and local government programs. As a science communication maxim says, "a research not communicated is like a research not done at all."

For instance, in a Dengue Vector Surveillance Workshop conducted by the Department of Health in 2014, insights were solicited among the regional health workers on why dengue vector surveillance (DVS) was not fully implemented in the country.

Inputs from the DVS workshop revealed that only 25% of the provinces and 6% of the municipalities/cities and barangays in the Philippines have completed the legislation to implement DVS in their localities. An alarming rate of 69% at the provincial level, 76% at the municipal/city level, and 94% at the barangay level has no legislation at all to implement the said activity. In terms of budget allocation, there is actually no city/municipal local government unit (LGU) and barangay LGU which has fully designated budget for the conduct of DVS, while only 6.25% of the provincial LGUs have complete budget for the said activity [67].

The Philippine Local Government Code mandates local government units (LGUs) to implement activities and programs for vector control at provincial, city, and smaller municipal levels down to the barangay ("village" unit). Theoretically, this mandate is an ideal setup since local government units are more familiar with the demographics of their localities, (including the residents) than those from the National Government. But the lack of awareness of most LGUs on the importance of vector control does not translate to policy legislations and informed decisions to include vector surveillance as one of their priorities.

In the same manner, there is a need to review the national government policies in reference to factors that contribute largely to emerging and re-emerging mosquito-borne diseases. There is also a need to increase awareness of the public, especially the young aspiring scientists and researchers, that selected Philippine agencies have highly significant budget for the conduct of researches to encourage them to devote time toward the pursuit of scientific evidences, including those from the aspect of prevention of emerging and re-emerging mosquito-borne infections.

The public, on the other hand, especially those who reside in areas which are endemic to mosquito-borne infections may also provide insights on their communities' practices for vectors' source reduction, for the control of these vectors' mass reproduction, and even on the vectors'

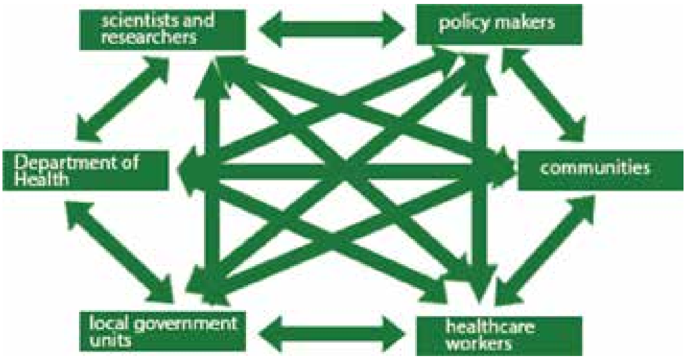

Figure 4. Framework for dynamic communication/exchange of information among the major stakeholders of public health entomology for the conceptualization, implementation, and actual application of medical entomology research.

behaviors, physical, and biological characteristics or their density fluctuation as people from the community are already immersed with the ecology where these mosquitoes thrive.

It is therefore important to note that the scientists and researchers are not the lone sources of information in order to come up with an effective and integrated vector management plan. A smooth and dynamic flow of communication among the key actors mentioned above (who should be all treated equally as source of information, **Figure 4**) will lead to the development of collective insights and informed decisions for the conceptualization, implementation, and actual application of innovative but cost-effective medical entomology research for the benefit of public health.

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Section 2

Policies, Plans and Programs

Mixed Methods Studies in Health Promotion: A Case-Study Based on the Life Situations of Young People of Refugee Backgrounds in Germany

Marlen Niederberger and Meike Keller

Additional information is available at the end of the chapter

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Abstract

Mixed Methods Studies, which combine qualitative and quantitative research methods, are widely used across disciplines. However, in health promotion, quantitative methods dominate in most cases and qualitative methods are considered as an 'add on'. By means of a Mixed Methods Study about the living situation of young people from refugee backgrounds, aged between 11 and 21 years, in an administrative district in Germany, in which quantitative and qualitative research methods are considered coequal, the issue of Mixed Methods Studies potential in health promotion is discussed. In this study, the perspectives of the young people from refugee backgrounds, their social workers from youth welfare office and local providers have been gathered. The young people from refugee backgrounds and their social workers have been consulted with a qualitative interview, whereas the local providers have been consulted in a standardised manner. The combination of qualitative and quantitative research methods to analyse the living situation of young people from refugee backgrounds gives a holistic and comprehensive insight in social, cultural and structural frame conditions, social policy's challenges as well as individual requirements. Such Mixed Methods Studies prove suitable for health-related research, especially when it comes to quickly changing structural conditions, a difficultly accessible target group and highly personal issues.

Keywords: mixed methods study, young people from refugee backgrounds, qualitative methods, quantitative methods, health promotion

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1. Introduction

Mixed Methods Studies—which combine qualitative and quantitative research methods—are now being utilised in many different disciplines [1, 6, 8, 18, 21, 26]. Standardised surveys are used in many cases, and qualitative interviews are then added as preliminary studies or for more in-depth research [40, 41]. The epistemological potential of Mixed Method Studies in which qualitative and quantitative research methods are combined with equal weighting is hardly ever considered or taken into account [25].

This potential for knowledge will be examined in this chapter based on a specific example project. On behalf of the administrative district of Göppingen (Baden-Württemberg, Germany), a Mixed Methods Study was carried out in 2016/2017 into the life situations of young people from refugee backgrounds aged between 11 and 21 years old [5, 37]. This Mixed Methods Study looked into the views of young people from refugee backgrounds, their social workers from the youth welfare office and the providers of programmes and services in the administrative district. Qualitative interviews were used to survey the young people from refugee backgrounds and their social workers. The providers of programmes and services were surveyed using a standardised questionnaire. The combination of qualitative and quantitative research methods provides a holistic and comprehensive insight into the contextual and framework conditions, as well as the socio-political challenges and individual requirements. This study demonstrated that Mixed Methods Studies in which qualitative and quantitative studies are given equal weighting represent a suitable strategy for researching issues dealing with health promotion, especially with respect to sensitive subjects and difficulty to reach target groups.

An overview of the use and dissemination of Mixed Method Studies in health promotion will firstly be provided. An example study on the life situations of young people from refugee backgrounds will then be used to discuss the potential offered by Mixed Methods Studies for health promotion when the qualitative and quantitative methods are given equal weighting.

2. Methods in health promotion

Health promotion utilises a very broad range of methods due to its interdisciplinary nature and the different approaches found in the fields of natural sciences, medicine, social sciences and psychology [6, 9, 18, 21]. The various disciplines each apply their own research methods depending on the research topic, the acquisition of epistemic knowledge and the available resources.

The terms qualitative and quantitative research methods are utilised across all disciplines [1, 4]. They are umbrella terms for a conglomerate of research methods, approaches and analyses. Quantitative research methods can be described as numeric, standardised, deductive and hypothesis testing methods that explain structures and processes from an external perspective [4]. Qualitative research methods can be described as inductive, interpretive and hypothesis generating methods that can be understood and reconstructed from an emic, internal perspective [1–5].

However, the fact that both qualitative and quantitative methods have their strengths yet also characteristic 'blind spots' is undisputed. These blind spots include, for example, replicability in the case of qualitative methods and the analysis of rarer or more extreme research groups in the case of quantitative methods. In order to also utilise the relevant strengths of quantitative and qualitative research methods and minimise any possible weaknesses, the use of so-called Mixed Methods Studies has become increasingly established over the last few years [6–9].

2.1. Definition of mixed methods studies

Mixed Methods Studies are now a standard feature of empirical research [10]. This is demonstrated by various discussions and methodological work in the social sciences and education [11], social work [12] and nursing, rehabilitation and care sciences [1, 4, 13, 14]. In relevant textbooks on these subjects, chapters have been added on Mixed Methods Studies [15, 16] or dedicated textbooks on this subject have been published [17]. Its international relevance is demonstrated by the Journal of Mixed Methods which was published for the first time in 2007, books such as the 'Handbook of mixed methods in social and behavioural research' [18] or the 'Handbook of Multimethod and Mixed Methods Research' [19], as well as the 'Mixed Methods Research Association' (MMIRA).

In general, mixed methods mean combining or integrating qualitative and quantitative research.

> *'Mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches […] for the broad purposes of breadth and depth of understanding and corroboration'* [20].

At a methodological level, there are various different research designs that differ according to their chronological order, the weighting of the qualitative and quantitative elements and the sampling strategies [11]. Three basic designs are typically found in current methodological discussions [9, 16, 21, 22] (see **Figure 1**):

- convergent or concurrent design: qualitative and quantitative substudies are carried out, at the same time where relevant, and their results are interpreted in relation to one another. The research is combined at the results level (merging the data).
- exploratory sequential design: a qualitative preliminary study is carried out and evaluated in this case. The results are then used to develop a quantitative study. The methods are combined here when applying the methods (building the data).
- explanatory sequential design: The central aspect here is the completion and evaluation of a quantitative study, followed by a subsequent qualitative study for the purposes of more in-depth research or to clarify any unexpected findings. The substudies are also combined in this case when applying the methods (explaining the data).

A common argument for the use of mixed methods designs is the ability to use the strengths of one method to compensate for the weaknesses of another. Accordingly, the mixed methods

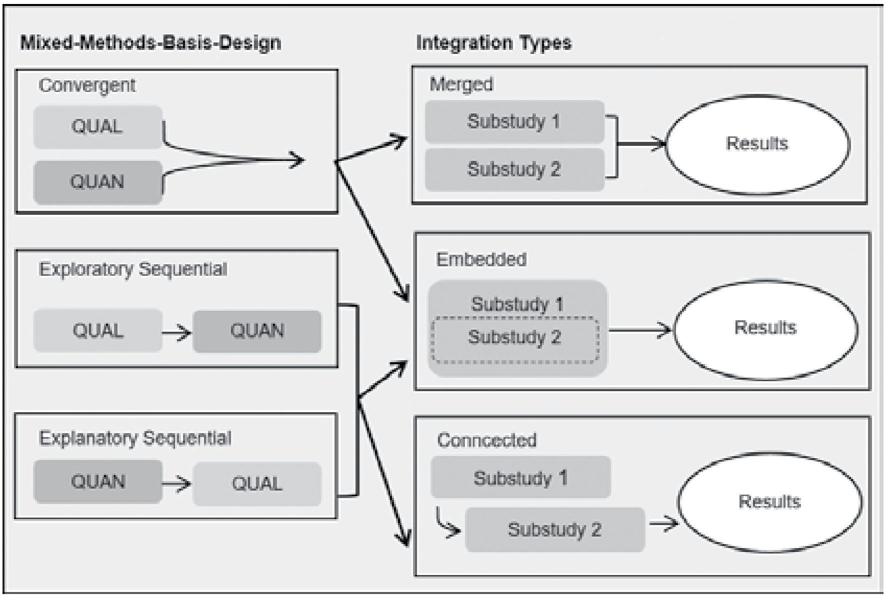

Figure 1. Mixed-methods-basis-designs (based on [9] explanation: QUAN = quantitative component, QUAL = qualitative component, components represent the qualitative or quantitative component, depending on their sequence in the research design.

design developed by Udo Kelle has become the established model in Germany. He emphasises that the methodological weaknesses of one method can be compensated for through a combination of two or more methods [11]. In a similar way, other authors postulate, for example, that it is possible to use mixed methods to gain a better understanding of the research issue [13]. Creswell [22] summarises the research potential of combining qualitative and quantitative methods as follows:

- obtain two different perspectives;
- obtain a more comprehensive view and more data about the problem than a single perspective;
- add to instrument data details about the setting and context;
- conduct preliminary exploration with individuals to make sure that interventions fit the participants and the site being studied;
- add qualitative data to experimental trials by identifying participants to recruit and interventions to use and carrying out follow-up to further explain the outcomes.

However, it is also emphasised that Mixed Methods Studies do not represent a new gold standard but rather ONE alternative from all possible empirical approaches [12]. The role that Mixed Methods Studies play in health promotion is described in the following section.

2.2. Mixed methods studies in health promotion

The potential for knowledge and insight provided by Mixed Methods Studies offers a diverse range of highly promising opportunities for research work in health promotion [6, 9, 18, 21]. Since the Ottawa Charter was adopted by the World Health Organisation in 1986, health promotion has been viewed as a concept that can be applied when analysing the health resources and potential of an individual, as well as at all social levels. It is a complex social and health policy approach that influences an individual person's life skills and the capacity to take action, empowers people to improve their health and yet also deals with sustainable changes to social, cultural, political and economic relationships.

Health promotion thus stands, on the one hand, for subject-related guidance focussing on, among other things, subjective perceptions, individual behaviour and personal skills, while on the other hand, it deals with social, political or economic relationships that provide the framework for a health-promoting lifestyle and are explicitly explained using the settings-based approach. For a holistic, empirical analysis in the context of health promotion, it is thus important to focus on all levels (micro, meso and macro). Health promotion is also subject to constant change. Changes to ordinances and laws (e.g. the German Prevention Act in 2016), technical innovations (e.g. health apps, prosthetic devices), trends in nutrition and consumption (e.g. vegan diets) or also new target groups (such as, e.g. more than 1 million refugees that came to Germany in 2015 [23]) alter the framework conditions and efficiency levels of health promotion interventions. Gathering knowledge about these causal and sometimes changing conditions is a strength of Mixed Methods Studies [6].

Mixed Methods Studies have been increasingly utilised in health promotion over the last few years [40, 41]. In the process, experimental designs have often been used [26]. Studies have been carried out using standardised questionnaires, diagnostic tests or instrument-based methods, always acknowledging the primacy of evidence-based practices [24]. In the context of this research, qualitative studies were mainly used in the form of preliminary studies or for more in-depth research into unexpected effects [25, 26]. The potential and possibilities offered by qualitative research methods were often not fully exploited in these Mixed Methods Studies [27].

The following section presents a Mixed Methods Study about the life situations and well-being of young people from refugee backgrounds and the potential offered by Mixed Methods Studies in which the qualitative and quantitative methods are given equal weighting will then be discussed based on this example. Other examples to illustrate this type of research can be found in Kelle and Krones [6] and Kelle et al. [1].

2.3. A mixed methods study on young people from refugee backgrounds

2.3.1. Background

Germany experienced an enormous increase in immigration due to asylum seekers in 2015. During this phase that was described as the 'refugee crisis', more than 1 million refugees and migrants travelled to Germany [23]. Germany is now faced with the political and social challenge of providing for and integrating these people from refugee backgrounds.

A particularly vulnerable target group in this context is young people and minors (in some cases unaccompanied) from refugee backgrounds. More than 300,000 children and young people [28] travelled to Germany from abroad in 2015, of which around 45,000 were unaccompanied [29]. A larger number of the unaccompanied minors who travelled to Germany were male [30]. The majority of the minors were 16 or 17 years old when they entered the country. The main countries of origin were Afghanistan, Syria, Iraq, Eritrea and Somalia. Other countries of origin were Morocco, Iran, Gambia, Guinea, Pakistan and Bangladesh [31].

Young people from refugee backgrounds are an important target group for academic research and society. Research into their life situations, well-being and needs is an important basis for successful and sustainable integration. A comprehensive empirical analysis thus needs to take into account relationships at a meso- and macro-level, as well as the subject-based perspective at a micro-level. In this context, Mixed Methods Studies, where qualitative and quantitative research methods are given equal weighting, offer great potential for multifaceted and in-depth analysis.

This type of Mixed Methods Study was carried out in the administrative district of Göppingen (Baden-Württemberg, Germany) in 2016/2017 (see **Figure 2**). The background to this study was a youth welfare planning process for young people from refugee backgrounds between the ages of 11 and 21 years old. The central research questions were as follows:

- How do the young people from refugee backgrounds living in the administrative district of Göppingen feel?
- What are their current life situations and, above all, what do the everyday lives and leisure time of young people from refugee backgrounds in the administrative district of Göppingen look like?
- What do they need in order to feel at home in the administrative district of Göppingen?

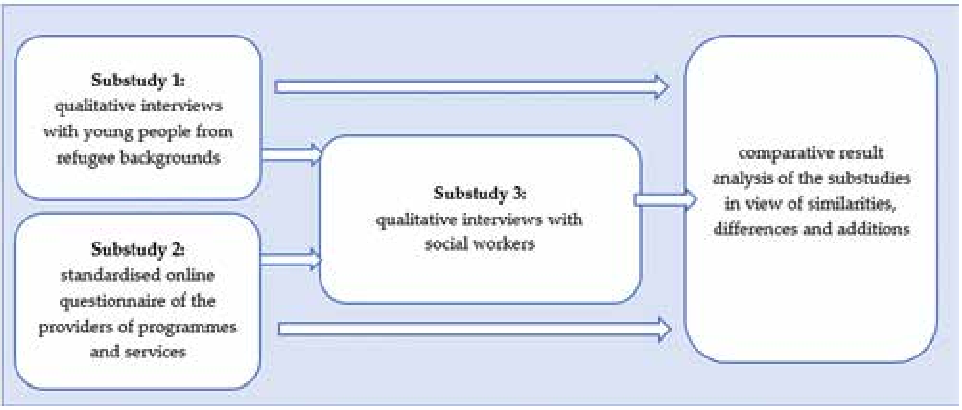

Figure 2. Mixed methods study about the life situations of young people from refugee backgrounds [5].

2.3.2. Methodological challenges

The central objective of this study was primarily to place the focus on the views of the young people from refugee backgrounds and gather information on their subjective points of view. Yet, this posed a challenge from a methodological perspective. Important reasons were as follows:

1. **The young people spoke no or very little German at the time of the survey**: The target group for the study were young people from the 'refugee crisis' in 2015 shortly after their arrival in Germany or their host municipality. As these people had only lived in Germany for a short period of time, linguistic restrictions were a priori assumed.
2. **The asylum procedures were still ongoing at the time of the study**, which meant that the young people were uncertain about whether they could remain in Germany and possibly felt a certain dependency on the German system. Other empirical studies have confirmed that, in view of the refugee's precarious life experiences during asylum that are controlled by outside forces, researchers tend to be perceived as powerful and presumably influential people by refugees [32]. People from refugee backgrounds are afraid that everything they say could have a potentially negative impact on the outcome of the asylum proceedings [32]. This highlights the ethical responsibility of the researchers to clearly explain the academic goals of the study, maintain academic and ethical standards and, where relevant, not to fuel any false hope about the outcome of the asylum process.
3. **The young people's experiences in fleeing their native countries demonstrated, on the one hand, their resilience and survival skills yet, on the other hand, opened up the risk of traumatic experiences.** Addressing these possibly traumatic experiences cannot be the task of a researcher but it nevertheless needs to be taken into account in the design and implementation of a survey. The interviewers were usually asked in the qualitative interviews to show a respectful level of interest when traumatic experiences were mentioned and, if relevant, to sensitively ask about them but not to probe the interviewees further [33].
4. **The young people from refugee backgrounds had only lived in the administrative district of Göppingen for a few months at the time of the survey.** Therefore, it was unclear how familiar they were with the administrative district or, for example, whether they were at all aware of any corresponding programmes or services for their specific target group (e.g. leisure activities).
5. **The young people presumably have little or no experience with academia and research.** The basic prerequisite for an insightful interview is the trust of the interviewee [34, 35]. When dealing with interviewees of a young age, their friends were allowed to be present for this reason. Others recommend participatory observation in advance for the purpose of getting to know each other and building up trust [34, 35]. This option was not possible within the framework of this study (also for reasons of limited resources). Therefore, it was unclear to what extent the young refugees would be willing to provide a previously unknown researcher with insights into their everyday lives during the interview.

These reasons explained the need to use a relatively open survey that promoted as much trust as possible. This is why a qualitative tool was used—a guideline-based, problem-centred interview, which enabled a certain level of comparability between the answers due to the use of key questions but also allowed space for reflexivity and the new and unexpected. It was not possible for the interviews to be conducted by multilingual interviewers in this study because it was not possible to find suitable people with the available resources at the time of the interviews. However, volunteer interpreters in the relevant native languages were available for the interviews. The interviews were conducted by Master's students in the field of health promotion, who were specifically selected due to their age and specialist background. They received intensive training in advance to develop their interviewing skills and remained in close contact with the research team and each other. The students documented their experiences in a postscriptum after each interview and discussed them within the group of interviewers. This primarily involved reflecting on their own role in the interview and giving their impression of the openness of the young people and their cooperation with the interpreter.

Non-linguistic tools were explicitly integrated into the qualitative interviews. The young people brought personal possessions along to the interviews and were asked during them to draw the so-called mind maps comprising important objects or people in their everyday lives. One goal here was to casually ease the interviewee into the conversation. In addition, the objects that were drawn or brought along by the interviewee were used as a contextual anchor for the conversation.

2.3.3. The survey process and random sampling

A total of 10 **qualitative interviews with young people from refugee backgrounds** were conducted. The interviewees were between 15 and 19 years old; nine of them were male and one was female. They came from various different countries (including Afghanistan, Syria, Iraq and Gambia). Four of the young people lived with their families and other refugees in shared accommodation, while six of them were unaccompanied minors living in accommodation provided by the youth welfare office. All of the interviews were carried out on a voluntary basis, were digitally recorded after obtaining the person's permission and the German sections of the text were transcribed word for word. The interviews were analysed using a qualitative analysis of their content, in which the most important categories were inductively filtered out of the material and then collected together and analysed [36, 37]. In the course of this inductive analysis, the interviews were considered on a case-by-case basis and also in comparison to one another. The categories were primarily designed to reflect the everyday lives and leisure activities of the young people from refugee backgrounds.

In parallel to the interviews of the young people from refugee backgrounds, a **standardised online questionnaire of the providers of programmes and services in the administrative district** of Göppingen was carried out. The objective was to take stock of the existing and planned programmes and services for the target group of young people from refugee backgrounds aged between 11 and 21 years old. This enabled the framework conditions, that is, the structural and local conditions, to be systematically recorded. There are more than 100 providers of programmes and services in the administrative district of Göppingen, of which there are 38 municipalities/cities, around 18 official asylum working groups, around 20 youth welfare providers and 20 schools with preparatory classes and six vocational colleges (as of October 2016). A total of 67 questionnaires were completed. Twenty-two questionnaires were received from the administrative district/municipalities, 18 from youth welfare providers, 11 from schools or educational institutions and 15 from ‘other sources’, which mainly comprised volunteer groups.

In order to supplement and consolidate the results of both analyses, **three qualitative guideline-based interviews with social workers from independent youth welfare agencies and the social welfare office** were conducted. Both groups of social workers are intensively involved with young people from refugee backgrounds and thus have a good overview of the current situation. However, the two groups of social workers have very different perspectives about the life situations of young people from refugee backgrounds. The social workers from the social welfare office are responsible for the accompanied young people from refugee backgrounds in community housing and those from the youth welfare office are responsible for the unaccompanied young people from refugee backgrounds who are cared for in children’s homes provided by the youth welfare office. In order to ensure the maximum level of comparability, the guidelines and categories used for the analysis were strongly based on the interviews with the young people from refugee backgrounds.

The study about young people from refugee backgrounds represented an explorative Mixed Methods Study in which the qualitative and quantitative methods were given equal weighting. The goal of the Mixed Methods Study was to gain a comprehensive, holistic and multiperspective insight for the purposes of analysing the life situations of young refugees. The different substudies were carried out in a coordinated but independent way. The two substudies involving the young people from refugee backgrounds and the providers of programmes and services were carried out in parallel, while the survey of the social workers was completed afterwards. The guidelines for the survey of the social workers were based on the findings of the previous studies. This meant there was a ‘mixing’ process on two levels: in the application methods because the guidelines for the survey of the social workers utilised the previous findings, and also in the analysis of the results in which the findings from the three surveys were considered in relation to one another and with equal weighting. Similarities, additions and differences were then identified with the aid of summary tables, the so-called joint displays (see **Figure 1** [37]).

2.4. Results of the mixed methods study on young people from refugee backgrounds

The in-depth results of this study on young people from refugee backgrounds cannot be presented here in detail (further information can be found in [37]). However, it is possible to summarise the key results of all three substudies in five points:

- The young people from refugee backgrounds generally feel happy in the administrative district of Göppingen.
- They want to remain permanently in the administrative district and build a ‘normal’ life with their own apartments, jobs and later their own families.

- In order to guarantee the permanent integration of the young people from refugee backgrounds, it is necessary to make (further) adjustments to the framework conditions. The providers of programmes and services require, among other things, money, rooms, employees with the necessary intercultural skills and volunteer support to offer broad and low-threshold programmes and services.
- The young people from refugee backgrounds require 'peaceful retreats', meaning places where they can withdraw and feel safe. These opportunities have not been available to them to a sufficient degree up to now.
- In addition, they require young and capable counterparts who can support them on their path and who are ideally at a similar phase of life to the refugees themselves.

Overall, the analysis of the current target-specific programmes and interventions identified the structures and processes at the meso-level of the providers of programmes and services. The evaluations of the interviews with the young people from refugee backgrounds and their social workers demonstrated the need for individual analysis on a case-by-case basis at a macro-level. They clearly demonstrated that a typical young refugee does not exist but rather it is necessary to reflect on individual life histories, relevancies and interpretative models. Specific differences in relation to gender and origin were particularly evident. In particular, accompanied young girls are difficult to reach with offers of potential leisure activities because they are already occupied with household and family duties. Young boys from Afghanistan and Syria appear to be comparatively active according to their social workers, while young boys from central African countries are more passive. The young people themselves often spoke in the interviews about anxiety disorders and concentration problems due to worries about their asylum application being rejected.

From a methodological perspective, the three substudies revealed convergent (=concordant) and complementary (=reciprocal) findings. However, the systematic comparison of the substudies also revealed different areas of tension (see [37]), the resolution of which is not part of the research assignment but rather the responsibility of the administrative district of Göppingen. Three areas of tension are presented here by way of example:

1. The standardised questionnaire for the providers of programmes and services demonstrated that a series of target group-specific measures have been delivered since the 'refugee crisis' and the majority of providers are also planning and implementing further measures. Yet, the young people from refugee backgrounds made it very clear in the interviews that they do not want any 'round-the-clock' care. Instead, they are looking for places to retreat that offer them the opportunity for calm and self-reflection.
2. The interviews with the young people from refugee backgrounds indicated that they visit a doctor relatively frequently. However, the medical reasons and necessities were difficult to comprehend in the interviews. The interviews with the social workers were an additional opportunity for acquiring relevant knowledge in this area. They made it clear that these young people perceive some illnesses, which are considered normal for young people who grow up in Germany, as life-threatening. The reason for this is that they had

not been aware of some of these illnesses in the past. This is particularly true of symptoms related to colds and flu, such as sniffles or coughing.

3. The social workers believe that the young people are better housed in the countryside because the social structures, particularly the leisure activities, are better developed and it is thus easier for the young people to come into contact with the local population. However, the young people would prefer to live in the city where there is something to do, the distances are short, there are places with free Wi-Fi and there tend to be spaces to retreat and learn (such as the city library).

In conclusion, the multiperspective analysis of the everyday lives and leisure activities of young people from refugee backgrounds delivered results that support and supplement one another. The identification of possible areas of tension during the planning and implementation of interventions and programmes/services for young people from refugee backgrounds appears to be particularly important so that they are met with an appropriate level of acceptance and willingness to implement them from all stakeholders involved.

2.5. Gaining knowledge and insights from mixed methods studies in health promotion

Mixed Methods Studies in which qualitative and quantitative methods have equal weighting offer great potential for health promotion. The prerequisite is that the choice of qualitative and quantitative research methods is appropriate to the subject matter, case-specific and based on epistemological principles. This does not ‘only’ mean qualitative preliminary studies in the form of standardised questionnaires. Even if the relevance of this design, especially for the development of questionnaires, is not disputed, it does not do justice to the possible insights that could be gained from Mixed Methods Studies in health promotion with a larger weighting toward qualitative studies. This potential exists at the following levels (also see here [5, 6]):

1. **For a holistic, comprehensive and multifaceted empirical analysis:** Mixed Methods Studies enable a holistic settings analysis by integrating micro-, meso- and macro-levels. At a meso- and macro-level, it is standardised processes above all that offer great potential because they take into account political regulations, structural conditions or demographic processes. The qualitative studies enable an analysis at a micro-level due to their greater focus on the subject.
2. **Analysing marginalised target groups who are difficult to reach linguistically:** Health promotion often deals with marginalised and/or difficult to reach target groups, such as children and young people but also people with certain illnesses or disabilities. Studying these target groups is often a challenge because this research requires a certain level of mutual trust, and purely linguistic-based studies quickly reveal their limitations. Greater weighting could be given to qualitative processes in these cases.
3. **To find out why interventions have a different effect than anticipated:** For example, the frequency of use and motivation of the participants can be studied quantitatively but qualitative

methods are needed to find out why they are perhaps used in a different way than originally hoped. In addition, a combination of participatory processes can be used to include those affected and other citizens in the development, implementation and evaluation of measures for health promotion.

4. **To identify complex and changing causal conditions:** Complex causal conditions can be studied using quantitative experimental settings. However, these processes reveal their limitations when structures change, new target groups appear or social change occurs. Qualitative methods offer great potential in this area because they are more open and place a greater focus on the subject.

5. **To analyse sensitive and personal subjects:** Especially in the health sector, the focus is often placed on intimate and personal issues, which generates problems related to social or cultural desirability when studied using standardised questionnaires. Qualitative interviews and group discussions (e.g. focus groups) which bring together social groups or persons from similar backgrounds can provide support in this area.

In general, this potential also exists in all areas of health promotion, for both status and need assessments and also for intervention and evaluation studies. This is because the effectiveness of health-promoting interventions is always also dependent on social and cultural aspects. These factors are associated with, for example, questions about the accessibility of the target groups or the lasting effects on attitudes, motivation and behaviour. In addition, purely satisfaction-based surveys using standardised questionnaires often paint a too positive picture because those surveyed tend to give socially desirable answers [1].

Mixed Methods Studies can generally call on the whole repertoire of qualitative and quantitative methods. Previous experience demonstrates that, in the case of marginalised groups in particular, the integration of qualitative observation methods is sensible because it allows for initial contact between the researcher and the research subjects [1]. In addition, participatory processes such as photovoice or community mapping appear very promising because they enable collective reflection processes in everyday life and the world of work to be studied [38]. Focus groups—an example of a qualitative group process—enable the social environment to be analysed by integrating representatives from the relevant groups [39].

3. Conclusions

Mixed Methods Studies in which qualitative and quantitative research methods are combined with equal weighting have proved themselves to be a suitable research strategy especially for subject-oriented, environment-based health promotion but also for specific settings-based questions. In the study about the living situation of young people from refugee background, the qualitative interviews enable the subjective perspective, and the standardised online questionnaire of the providers of programmes and services shows the institutional and structural conditions for a living in Göppingen. Mixed Methods Studies enable a holistic and multifaceted empirical understanding, can be used to explain the causes of certain actions, take into account the environment of those affected and capture the subjective sense behind actions or decisions. Depending on the survey method used, they also enable the participation of the target group and take into account a holistic settings-based approach in which a bottom-up- or top-down-oriented process is possible.

Mixed Methods Studies with a priori equal weighting of qualitative and quantitative research methods offer great potential not only for status and needs assessments but also for intervention and evaluation studies in health promotion. The associated multiperspective analysis enables the subject-oriented development of interventions that take into account contextual and framework conditions, social and technical innovations, and individual causal attributions. Therefore, the results of the Mixed Methods Study about the living situation of young people from refugee backgrounds can be used to develop and distinguish interventions for health promoting and integration. In addition, these types of studies allow for the participation of difficult to reach or marginalised target groups, such as refugees, people with disabilities and sick people. This makes the implementation of effective and more sustainable interventions more likely.

Conflict of interest

M. Niederberger and M. Keller declare that no conflicts of interest exist. All interviews were completed voluntary, made anonymous and the interviewees were informed about the further use of the data for academic research. The study was carried out in accordance with the principles of ethical research.

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Chapter 5

Developing Community Health and Cohesion Through Diversity: An Evidence Synthesis for Faith-Based Agencies

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Additional information is available at the end of the chapter

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Abstract

Aim: This chapter examines the relationship of increasing sociodemographic and organisational diversity to community health development. The particular focus is the contribution of faith-oriented agencies to the processes of community cohesion required to underpin public health improvements.

Context: The background is of rapid growth in the number of economic migrants and political refugees, their mobility and the impact on formal healthcare services seeking to constrain demand. Globally, a need to extend informal and non-statutory interventions, which promote public health, has been recognised.

Methodology: A narrative evidence synthesis was undertaken drawing on research literature and policy documents. Themes emerging were then applied as criteria to elicit key messages from a series of local case studies and service evaluations. The synthesis was undertaken in response to the following two research questions: '(How) can spiritual actors and agencies promote relational integration in both new communities and those with rapidly increasing cultural and demographic diversity?'; 'Which models of well-being practice are most appropriate for faith-based contributions to community health development in settings with such (increasing cultural and demographic) diversity?'.

Findings: The evidence synthesis confirms the potential benefits of and for spiritual agencies especially, in respect of creating communities with identities built on more open communication systems and socially interactive networks.

Conclusion: The topic summary is used to scope a future research agenda in which the profiling of different relationship networks and their development processes is indicated as a priority.

Keywords: diversity, community health, cohesion, faith, social enterprise, Winchester

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1. Introduction

In this chapter, we will explore some of the issues for public health that arise as a result of the rapid expansion in frontline well-being practices. This recent growth is a modern global phenomenon, associated with the common requirements of formal healthcare institutions for alternative sources of demand management and the equally urgent need to accommodate new migrants effectively into domestic economies. For public health the Marmot Reviews, and their endorsement by the World Health Organization in 2008 [1, 2], effectively legitimised the modern shift towards more pluralistic approaches. The independent sector, in a myriad of different formats, is recognised as an essential participant. Globally, it has now become a key partner for statutory public authorities through its contributions to health improvement and reductions in health inequalities. While recognising this international context, not least for the purposes of comparative evaluation and transferable learning, the following pages will, however, largely rely on research undertaken specifically for local agencies within the UK.

Of these local agencies, faith-based organisational initiatives have been most significant. These have been especially apparent in the county of Hampshire and the Winchester Diocese of the Church of England, where our Health and Wellbeing Research Group is located. The growth in the range and scale of wellbeing practices is inextricably linked to a policy of the Anglican Communion which seeks to take advantage of novel organisational options for 'missional social action'. At the heart of such 'action' is the expression of Christian values to promote community wellbeing in locations where social need is seen as most acute. In line with this policy, every one of the 127 parishes in the diocese, since 2014, has been required to identify a shortfall in community health and to bring forwards a social enterprise development in response. The result has been an unprecedented growth in voluntary services dedicated to community wellbeing [3].

While 100 plus Good Neighbour befriending schemes and up to 40 food banks are the most obvious examples in the diocese of the new faith-based social enterprises, the latter have also been characterised by a new diversity, including such as a young persons' beach night club and a rural property mediation service. This creative organisational diversity has developed in parallel with the increased sociodemographic diversity of the local communities themselves. This diversity, derived principally from the growth in economic migrants, has itself produced new wellbeing practices, with the expansion in modes of pilates, personal training and massage services the most obvious illustrations of this trend. The overall effect is captured in the changing profile of the High Street, where the concept of wellbeing now rivals that of hospitality in its practical expressions. Together, it is not uncommon for them to provide well over half of the service outlets and shops, with international exemplars in cities such as Melbourne pointing to the future scope for further growth through psychologically oriented interventions that include slumber, stress relief and a variety of counselling clinics and remedial muscular support services, such as myotherapy and naturopathy [4].

These two formative structural influences of both increased social enterprise and social mobility have helped to shape our research agenda over the past 3 years. A series of local evaluations and evidence syntheses have been undertaken, particularly for Christian charities and senior clergy. This chapter itself follows on from a request from two diocesan leaders in the Winchester area for guidance in relation to the research evidence and its possible applications in two types of locality where new diversities are apparent: major new housing settlements and neighbourhoods with long established cultures confined to those with white middle-class backgrounds. Both the two research commissioners are keen to discover 'new opportunities for community cohesion from diversity' and thence for enhanced public health.

This interest in new topics from those looking to augment divine revelation with empirical research findings is matched by our own professional researchers' interest in identifying new ways of data capture and analysis that will support the increasingly pluralistic approaches to public health practice. How, for example, can research help identify which profiles of wellbeing practices effectively enhance community cohesion and public health in different types of suburb? Do more diverse neighbourhoods develop distinctive and different relational networks and informal resources to support wellbeing?

Given our personal study interests, this last question is of particular significance to us as a subject in respect of those in the first and last years of life: those 'growing up' and those 'growing down'. As health science students, we have been very aware that, even in public health research programmes, it is trial-based methodologies that still hold sway, notwithstanding the shift to cluster and cohort studies and natural experiments. Such methodologies do seem to struggle with issues of context and communication. Trials do not identify the emergent and sometimes implicit values of newly diverse localities. Their fixed intervals for data collection are not well suited to an informed understanding over time of the very old and very young, who often simply cannot comply with standard written or oral scientific research requirements. Yet, it is such groupings as these which constitute the litmus test for verifiable developments of community cohesion through diversity.

This leads us to the purpose of this chapter. In the UK we hear quite a lot of talk to the effect that the changes in the health system amount to 'a return to the Victorian days' of the nineteenth century, in effect a 're-emerging' public health issue. The implied negative message is one of the clocks being turned back to times when state welfare policy was not universal and churches were the last resort safety nets for the poor and disadvantaged. This perspective points now to a new paternalism, ultimately designed to sustain established elites. But this is not where we are coming from. Our aim here is firmly within the policy framework espoused by the British NHS, which invariably emphasises 'equality and diversity', as demonstrated in the policy document extracts and references provided later in this chapter. These two principles are presented not just as inseparable but interdependent. Accordingly, our aim here is to present research findings which offer the potential to promote public health in communities characterised by diversity. Behind this aim is the aspiration that equivalent positive co-contributions in these communities from their different and distinct members become seen as standard habitual behaviour and normative as a result. For institutions such as the Church of England with its deeply embedded hierarchies, this can be especially challenging. This can be true for those in leadership positions within the Winchester Diocese, particularly given its strong pastoral care traditions across Hampshire. And, this can be true for their counterparts elsewhere.

2. Methodology

Through the detailed discussions with the diocesan leaders referred to above, the following research question was defined for the initial literature review:

'(How) can spiritual actors and agencies promote relational integration in both new communities and those with rapidly increasing cultural and demographic diversity?'

The discussions revealed an awareness that there could be risks as well as benefits in such a promotional role. Christian leadership and community health were certainly not taken to be synonymous. Notwithstanding this understanding, the assumption that the review would produce some positive findings led to a second supplementary research question. This is as follows:

'Which models of wellbeing practice are most appropriate for faith-based contributions to community health development in settings with such (increasing cultural and demographic) diversity?'

The findings in this chapter are from two sources. First, we detail those from a structured background literature review undertaken as a response to the enquiries from the diocesan leaders described above. To reflect our own personal subject interests and to provide a defined starting point, this begun by concentrating on the needs of those 'growing up and down' at the early and later stages of life in the context of increasing and increasingly diverse communities and then moved on to a synthesis of recent relevant policy documents. This shift of focus was a response to the relative paucity of research data available because of the novelty of public health-oriented social enterprises and the richness of the recent policy developments.

As our second source, we then summarise the applied learning now available in the various projects undertaken by members of the University of Winchester's Health and Wellbeing Research Group, with both local NHS and faith-oriented partners, in relation to community health and wellbeing. Mostly local case studies and service evaluations these often augment and illustrate in practice the policy developments referred to in the previous paragraph. The chapter concludes with a short topic summary and the scoping of a future research agenda. The review process is set out in **Figure 1**.

A systematic literature review/meta-analysis was not viable given the lack of empirical papers. An inclusive approach to judging the quality of papers was employed, whereby the two criteria for inclusion were subject relevance and potential for local application rather than the rating of research quality. The literature review employed a cascade approach structured by combinations of overarching terms as keywords: diversity, community health, cohesion, faith, spiritual, social enterprise and network. The Marmot Reviews referenced in this article, and the London government's explicit watershed acknowledgement that 'faith-based organisations in multi-ethnic communities are key factors 'in developing confident, active communities

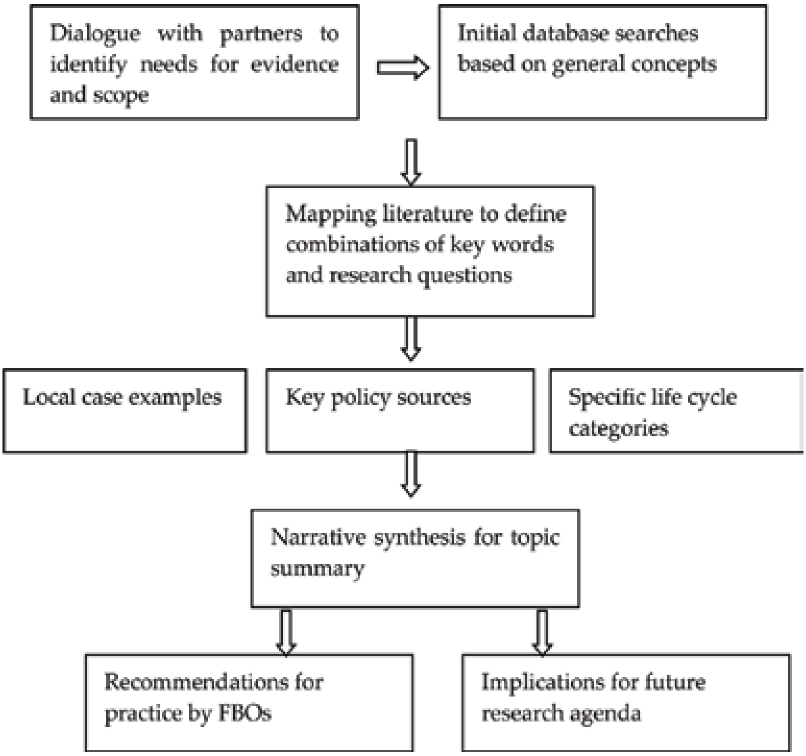

Figure 1. Scoping review process.

and social cohesion', were identified as the benchmark policy statements for this review [5, 6]. Accordingly, a post-2001 time frame was used for the UK literature search, with some tolerance in respect of international sources to reflect the impetus given to relevant research by the World Health Organization's Jakarta Declaration of the next century's public health needs in 1997 [7].

Finally, in terms of search criteria, selection was also framed by our particular focus on the early and later years of life. Initial searches on Embase, Medline, PubMed and the NIHR found very few research publications from recent medical research. Through expert advice from the university librarian, ESBO and SCOPUS were then employed as integrated databases which combine health and social care research and practice sources. At this stage it became apparent that the most prominent feature of recent publications was not a particular research project but the detailed policy documentation in respect of diversity and community health. This documentation has an international profile and includes both policy formulation and implementation papers. As a body of work, it was also largely unknown to those, such as our diocesan leaders, who are engaged in addressing the issues of a new diversity in housing settlements.

Accordingly, adopting a pragmatic approach to the review, the effect of our early findings at this stage was to redirect our focus to the material that could be of most utility: the wider policy sources and our own local evaluations of wellbeing sites. Our aim became a narrative synthesis of these informed by the initial literature review, with the topic summary set out at the conclusion of this chapter as the end product.

3. Findings

Our findings fall into three categories. First, the structured literature review pointed to significant changes in the life cycles of modern community development. In particular, it highlighted the importance and growth of informal relational networks and their alternative emphases on different modes of wellbeing. Secondly, the formative influence of detailed and often quite prescriptive policy documents has been confirmed as drivers of collaborative change for increasingly diverse communities through the creation of increasingly diverse agencies. And, finally, as our third finding, a miscellany of local lessons for operational practice have been identified in respect of critical cross generational roles in community cohesion and the specific role of those on the early and later years of life to these. The evidence suggests that, for all the three findings, those coming from faith backgrounds can make positive and distinctive contributions.

3.1. Life cycle

Communities like individuals have their own life cycles. Historically, the concept of 'life cycle' has been central to an understanding of what constitutes wellbeing. Accordingly, influential writers in the last century still identified the family and the neighbourhood (or local 'clan') as the basic building blocks for both individuals [8, 9]. This applied to what was largely understood as physical and psychological wellbeing in respect of both individuals' recovery from periods of illness and communities in their successive stages of ongoing and largely architectural regeneration. The research literature in this period on wellbeing interventions is characterised by studies of both relational networks and clinical conditions that possess well-defined boundaries, with the health status of (usually lonely) older people especially linked to relationships of geographic proximity [10, 11].

Our review of the research literature indicated, above all else, how increased diversity has helped to change the previously conventional understanding of both wellbeing and then its supportive relational networks. Crucially, as a result the life cycle for both forming and re-forming communities is changing, and essentially this fundamental change is characterised by shifts from often quite closed to much more open patterns of communication and by less structural and more socially interactive modes of identity development. For each of these shifts, the contribution of those at the initial 'growing up' and final 'growing down' stages of the individual life cycle appears to be crucial, through, for instance, hosting early years' parental clubs and classes and recruiting to seniors' befriending schemes.

Moreover, equally crucially, it is often the spiritually oriented organisations which are the key agencies in enabling these contributions to be effective in terms of the more recent holistic definitions of wellbeing. As multidimensional post-Millennium 'dynamic equilibrium' theories of wellbeing have gained traction [12, 13] so has the notion that relational networks must expand, in order that individual persons and the public at large can effectively meet accelerating challenges to physical, mental and social health. Through its case studies, the UK's Community Development Foundation identifies the celebration across newly diverse communities by faith agencies of religious occasions and festivals as a 'baseline' for empowerment and participation [14]. American counterpart bodies to the Foundation similarly record such religious approaches rooted in 'respect, empathy and active listening' as critical to the sense of 'mastery' and 'social connectedness' required for flourishing community health developments [15, 16].

Because of their values, faith-based agencies can be particularly adept at helping to redefine and extend the meaning of 'kinship' in diverse communities to a range of newcomers [17]. The older demographic profile of many church memberships can also be a 'community asset' as a means of face-to-face relationship building for informal networks, simply because older people are more likely to be experienced and comfortable in direct personal contact rather than digital communications [18]. They are also incentivised in emerging communities by the basic need for such contact to combat the risks of social isolation and loneliness [19].

In informal network developments which promote open communication such contacts are a source of identity for new communities and those facing cultural challenges. Shared stories and their associated experiences are vital, so that studies consistently point to the need for modern internally diverse communities to develop socially through 'events' rather than structurally through 'monuments' [20]. At Winchester our recent evidence synthesis for the local diocese found much to support the view that faith-based agencies and individuals are particularly well placed to supply the required 'creational narratives'. Their doctrines, backed by conviction, are full of appropriate language and imagery [21].

A note of caution, however, is required. We have noticed that while in practice we know of many examples of faith-based organisations (FBOs) hosting such as toddler groups, 'messy church', seniors' befriending schemes and the like, the academic literature focuses predominantly on developments in the formal as opposed to the informal wellbeing system. For example, this is particularly evident in state-sponsored early years' provision. Over recent years in the UK, a series of policy and practice reforms have aimed to improve outcomes and healthcare services for children and young people. There has been a joint focus on safeguarding children and reducing health inequalities via initiatives such as Sure Start, Children's Trusts, Childcare Partnerships and pre-school education [22]. This bias towards expressed policy as opposed to policy espoused by behaviour points to a future research need.

3.2. Policy sources

Within recent years, two main drivers have emerged for increased engagement with communities as a vehicle to improving health and wellbeing. These are overdemand and systemic strain on traditional NHS-based health services and a growing recognition of the importance of the social determinants of health, which cannot be addressed within the confines of a hospital or GP surgery [1]. These drivers for engagement with communities and citizens are laid out in the NHS 'Five Year Forward View' [23], Public Health England's (PHE) strategy and 'From Evidence into Action' [24]. To promote healthy lifestyles and positive health behaviours, the latter calls for 'place-based approaches and community development, harnessing the collective assets and resources available locally to address local needs'. Similarly, the Marmot Strategic

Review of Health Inequalities in England [25] called for the creation and development of healthy and sustainable places and communities. Like several of its international counterparts, the NHS Five Year Forward View recognises the unique contribution of charities and voluntary organisations with their opportunity to reach underserved groups and respond to local need.

As the responsible national agency, Public Health England [26] has identified a set of local health assets that support the positive health and wellbeing of the community. Shown below, these emphasise the importance of informal networks for social (and intergenerational) interaction, such as babysitting circles, alongside formal provision by the public, private or third sectors:

- The skills, knowledge, social competence and commitment of individual community members.
- Friendships, intergenerational solidarity, community and neighbourliness within a community.
- Local groups and community and voluntary associations, ranging from formal organisations to informal, mutual aid networks such as babysitting circles.
- Physical, environmental and economic resources within a community.
- Assets brought by external agencies—public, private and third sector.

Community-centred approaches to health and wellbeing recognise and seek to mobilise assets that already exist within communities.

Explicating this, South [27] identified a 'family of community-centred approaches for health and wellbeing', which are listed below. While the PHE report does not specifically mention FBOs, the FaithAction charity (a national network supporting faith- and community-based organisations involved in social action) highlights the 'very strong resonance' between the approaches recommended by a range of policy documents in respect of enhancing health and wellbeing through better engagement with communities and 'the activities of faith groups' [28].

Family of community-centred approaches:

1. Strengthening communities—this includes a range of approaches such as creating networks to enhance the wellbeing of those involved. An example given is the Men's Shed network, which is aimed at reducing the social isolation of men. These approaches work by building social cohesion, awareness and collective action.
2. Volunteer and peer roles—these approaches train individuals to provide information, support and advice and organise activities related to health and wellbeing within their (or other) communities. These can include volunteer health roles and health trainers/health champions.
3. Collaborations and partnerships refer to approaches in which partnerships are built with communities to improve planning and decision-making. These may involve participatory research, co-production projects and community engagement in planning.
4. Access to community resources—this involves the connection of people to resources in their communities such as information, advice, help and group activities. Such approaches may include social prescribing or community hubs.

FaithAction [28] has itself produced a report highlighting the particular role that faith-based organisations (FBOs) can play in the promotion of community health and wellbeing. One particular strength of FBOs relates to their access to communities at risk of marginalisation and/or specific disease profiles. In cases where language and other barriers exist amongst particular communities, members often do not engage with primary health services and miss out on preventative services such as health screening or advice. FBOs, through their engagement with these communities have valuable access and understanding of their needs and are valuable partners to health providers in working with these populations. This is of particular use where certain ethnic groups have a higher risk for certain diseases. Most of the evidence in this regard is situated in US-based Black American churches. A well-developed body of research shows the role that churches can play in promoting behaviour change for prevention/management of diabetes and cardiovascular disease, as well as encouraging the uptake of screening programmes. The literature in the UK is mainly situated with the South Asian community for similar reasons but is less developed than the evidence base in the United States. An example of one UK study is the development of an antismoking educational intervention for Bangladeshi and Pakistani communities—developed in conjunction with Muslim faith leaders for delivery in mosques, faith schools, women's groups and madrassas. The programme aimed to discourage smoking in homes was based on Koranic teaching about not harming oneself and others [29].

There is a further body of research that shows positive benefits to mental health, wellbeing and social capital in being regularly involved in religious activities. These benefits appear to be linked to increased social support and sense of meaning. FBOs also have a number of assets and resources suitable for health promotion, including established presence and networks within communities, buildings and culture of volunteering.

The authors do, however, note that there are examples of some negative FBO contributions relating to fundamentalism and exclusivity. Similar challenges are highlighted in a small-scale study of antipoverty projects in one city in the South of England. This found 'virtuous yet simultaneously exclusionary cycles' stemming from social action by faith groups. This related specifically to the preference by Christian organisations (who in this city were the predominant faith group) to partner only with other Christian projects—meaning that minority faith groups were excluded from ecumenical networks for social action. In this study, Hindu and Muslim faith groups struggled to mobilise resources to support local community projects—focusing rather on supporting the wider community of believers overseas in disaster relief efforts [30].

3.3. Local lessons

In this section of the chapter, we simply summarise some of the transferable learning available—but not necessarily published—from eight local research and consultancy projects either initiated or commissioned by local faith-oriented agencies. Three of these concerned services for families with young children, while each of the rest involved leading contributions from seniors either as clients or service providers. All the agency names have been withheld for reasons of confidentiality. The projects have been undertaken by members of the Health and Wellbeing Research Group at the University of Winchester.

Cross generational communications have long been promulgated as a potentially rich but underutilised resource for sapiential learning [31]. The findings in two of our projects supported this view. In the first active and trained older men served (with consent) as befrienders for families at risk of breakdown across a range of new and older housing estates. In these families the father was absent for reasons of custodial incarceration or partner separation. Perhaps, surprisingly, it was the fathers who scored this service the highest in terms of positive satisfaction, with some highlighting the prospective benefits of being able to draw on older mens' experience and contacts for future employment and training opportunities. A second project for families which have suffered parental loss is similarly highlighting the contribution of older persons as both sponsors and carers on a citywide basis.

Two further projects locate older people in pastoral roles. The findings here seem to confirm those of comparable previous past service evaluations and organisational analyses in terms of identifying the peculiar benefits of seniors' 'brief interventions' and 'moderating influences' [32, 33], because such young street partygoers or busy and stressed commuters perceive them as safe, non-threatening sources of wisdom and authoritative guidance. For these older people too, there is the perceived advantage of having spiritual vocation with prayerful peer support. The term 'moderating influences' also applies to our studies of governance in faith-based social enterprises. These specific contributions by 'experienced elders' have been important in the process of evolution through which exclusively faith-based trustees 'bridge' between their missional aims and the needs and demands of the wider community [34].

Our recent work focusing on the evaluation of health literacy resources for parents of children under 5 [35] highlighted the barriers faced by parents (white British and those for whom English is not the first language), with low literacy/health literacy. This represents a paradox that those who are most in need of health literacy resources are least likely to access them [36]. Vulnerable groups have the need of additional support to access, understand and apply resources, but identifying these needs is challenging as these communities are reticent to engage with research [37]. Researchers who are serious about engaging with minority groups will need to address any cultural, language and practical barriers that exist. As outlined above, FBOs and community groups already engaging with these groups are likely to possess useful insights. The current work within our Health and Wellbeing Research Group is focused on identifying how to effectively engage vulnerable parents/children in research, by learning from the existing good practice of community and faith-based organisations already working in these domains.

4. Discussion

4.1. Topic summary

We now need to draw together the learning acquired from our data capture and analysis. This has to begin by acknowledging that policy development has outstripped research when it comes to setting the agenda for communities affected by modern trends in diversity. Empirical studies are in short supply. The pace of change is such that the process of producing a clear summary that describes well-defined elements of the topic's subject areas, as the starting point for the commissioning of future research, is a difficult challenge.

In responding to this challenge, we return to what became our main aim of identifying the potential for public health of increasingly diverse communities. In pulling together our literature review findings with local practice examples, we are in the position to provide a narrative synthesis of this potential. This now follows.

What we can assert with confidence, in a topic summary, from the evidence so far is that diverse communities can be cohesive and that this cohesion can be a source for health promotion. Two key factors have been identified as positive factors in achieving this cohesion. The first key factor is the development of more open communication systems in and across communities, and the second key factor is the expansion of more socially interactive means of identity development within them. These two determinants possess corresponding factors which have been dominant but are now required to be less influential if diversity and cohesion are to be enhanced: the focus on internal communications and physical structures for community development.

We can also postulate that while many agencies are able to contribute to local health improvements, the two core positive features of diverse but cohesive communities do provide particular opportunities for those with a faith orientation. The research so far supports this assertion, which aligns for example with some recent studies from the United States [38, 39]. Faith-oriented agencies are particularly well placed in terms of values and vocational commitment to facilitate and integrate the growing range of informal networks and wellbeing service outlets which posited the policies that we have noted for place-based public health. Above all their spiritual orientation means that there are no boundaries to the reach of their relationships with people located across all sociodemographic categories, political affiliations and economic classes.

4.2. Implications for research

Geared to alleviating health inequalities, evaluations of the effects of all community-based health and wellbeing interventions must pay particular attention to accessing with sensitivity the views of those most at risk of being disadvantaged. For the significance of spiritual actors and agency researchers must be prepared to learn from faith-based and other organisations already working in these domains. The two-way exchange between faith and empiricism can only help to address inherent and novel cultural, language and practical issues arising in new communities. A number of scholars have begun to address these issues in other areas of research (e.g. [40]). Those seeking to enhance community health and cohesion through new forms of diversity can be encouraged by the findings of past studies while recognising the pressing need now for further supportive research.

While there is a growing body of research in respect of relational network developments which can effectively support older people, there does appear to be a particular gap in terms of early years' studies. Whether more charity or business-oriented, FBOS are clearly now a fact of life and further research is needed across all age ranges, 'growing up' and 'growing down' are included. There are methodological challenges here for researchers. Traditional ‘closed system’ experimental approaches will not suit community interventions that take place within the complex systems of social relationships that increasingly characterise more diverse communities. The cohesion of these depends on a better understanding of what they are and how they can grow. The opportunities for ethnographic and realist research approaches [41, 42] are abundant, and it would be the prudent leader of a faith-oriented social enterprise who incorporates action research or participant observation into his or her toolkit.

It is a limitation of this chapter that it has only scratched the surface of such qualitative enquiry methods in its exploration of the new profile of wellbeing interventions. Our research process for this process has been essentially iterative, responding both to the particular agendas of our partners and the sometimes unexpected direction provided by the sources accessed. Local case studies from arbitrarily selected locations can only ever be, at best, indicative and generalisable findings in respect of our two initial questions regarding the contribution of faith-based agencies are still out of reach. But the topic summary above does provide a platform on which more in-depth studies can now be formulated.

5. Conclusion

We have described the unique role that faith-based agencies can play through their existing presence and infrastructure within communities and their associated social (or religious and spiritual) capital. Relevant policy and practice guidance have been identified which iterates a range of models to maximise engagement of existing health services with faith-based and third sector organisations, and evidence for some of these models has been presented. As has been stated earlier, policy has outstripped research in this area, and there is much scope for further research and evaluation in the area of faith-based contributions to health and wellbeing.

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Chapter 6

Combating Cancer Through Public Health Practice in the United States: An In-Depth Look at the National Comprehensive Cancer Control Program

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Additional information is available at the end of the chapter

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Abstract

Cancer is the second leading cause of the death in the United States (U.S.). The National Comprehensive Cancer Control Program (NCCCP) is a national, public health practice program funded by the U.S. Centers for Disease Control and Prevention. The NCCCP has been planning and implementing interventions to reduce the burden of cancer since 1998. Interventions are implemented across three areas primary prevention, early detection, and survivorship using health systems and environmental changes to promote sustainable cancer control. The aim of this chapter is to provide a summary of the NCCCP, and highlight specific examples of interventions and successes to aid cancer planning in other countries. Cancer plan analyses show that all NCCCP participant cancer plans address reducing tobacco use for cancer prevention and 98% contain activities to increase colorectal cancer screening. The vast majority implement activities to improve the quality of life following a cancer diagnosis (94%). Relatively fewer cancer plans contain activities to reduce radon exposure (42%), promote human papilloma virus vaccination (62%), and incorporate the use of genomics in cancer control (56%). The examples of NCCCP activities demonstrate success in controlling cancer and other non-communicable diseases through public health practice.

Keywords: comprehensive cancer control, cancer plan, primary prevention, cancer screening, cancer survivorship

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1. Introduction

1.1. Cancer and public health in the United States

Cancer is a major public health concern in the United States (U.S.); it is currently the second leading cause of death among U.S. men and women after heart disease [1]. Cancer has long been a commonly diagnosed disease in the U.S. with over a million new cases diagnosed each year [2]. While age-adjusted rates of cancer have for the most part decreased in recent years, the actual number of cases diagnosed has increased and is projected to continue to increase in future years, mostly due to the aging of the U.S. population [2, 3]. Projections also suggest that cancer will soon surpass heart disease to become the overall leading cause of death in the U.S. [1]. The U.S. Centers for Disease Control and Prevention (CDC), the nation's health protection agency, administers several national programs to reduce the burden of cancer [4]. In 1992, the National Program of Cancer Registries (NPCR) was established to systematically collect information on all cancers diagnosed in the United States (NPCR registries cover 96% of the U.S. population). NPCR, in collaboration with other agencies, releases the official federal cancer statistics on an annual basis [2, 5]. In 1990, the National Breast and Cervical Cancer Early Detection Program (NBCCEDP) was established to provide breast and cervical cancer screening and diagnostic services to low-income, under- and uninsured women who would otherwise have no access to these services [6]. From 1991 to 2012, the NBCCEDP has served more than 4.5 million women, and more than 65,000 breast and cervical cancer diagnoses occurred through the program during this time [6].

Because cancer is a group of diseases with various risk factors and outcomes, it was determined that a more broad-based and coordinated public health approach that incorporated risk reduction, early detection and post-diagnosis care may be necessary to address cancer in the U.S. As such, in 1998, CDC established the National Comprehensive Cancer Control Program (NCCCP), which provides funding to state and local health departments throughout the United States for the formation of a coalition of public health practitioners, clinicians, academicians, and other key stakeholders residing in or administering to that population [7]. This coalition uses their first-hand knowledge of the key factors and issues that their population faces with regard to cancer to develop a formal, written cancer plan which guides the cancer control activities within the area [7]. Cancer plans are updated at specified time intervals and are available along with a search tool for public use on CDC's website [8].

In addition to an increasing U.S. cancer burden, cancer is an emerging public health challenge in developing countries because of the aging and expansion of the population and increased prevalence of cancer risk factors such as smoking, obesity, and physical inactivity [9]. While global public health efforts in developing countries have traditionally centered on the prevention and treatment of communicable diseases, the global burden of disease has been changing, with approximately 70% of worldwide deaths in 2015 due to non-communicable diseases [10]. Cancer accounted for 22% of all non-communicable deaths globally in 2015, and over 75% of these deaths occurred in low and middle-income countries [10]. While the burden of cancer is substantial in all countries, high-income countries are increasingly addressing cancer rates through improvements in risk factor prevention, screening and early detection, and treatment. Conversely, cancer rates in many low and middle-income countries are increasing due to increases in preventable risk behaviors such as smoking, obesity, and physical inactivity [11]. The global movement for cancer control is gaining momentum. Since 2011, the World Health Organization (WHO) has called for improved agenda setting for cancer control among all member states (including low-income countries), to offset the large economic burden caused by cancer in all countries [12]. WHO cancer control strategies include planning, reduction of non-behavioral factors such as environmental and infectious risks in all countries, as well as progress in cancer treatment and effective health systems in more affluent countries [12]. **Figure 1** lists additional cancer control strategies for all countries by income level, suggested by the U.S. Institute of Medicine, the Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries, and the Union for International Cancer Control [13]. The NCCCP is a long-standing example of a successful national cancer control program that incorporates these strategies. The NCCCP brings together an extremely diverse set of U.S. state, tribal, and territorial participants under one national umbrella program. As such, it serves as a rich resource for the global incorporation of cancer control measures across myriad populations with different structures and challenges. This aim of this book chapter is to provide a summary of the NCCCP, and highlight specific examples of interventions implemented and successes achieved. Our intention is to provide a snapshot of activities that have been implemented at given times over the 20-year history of the program, in order to aid other countries in their cancer control activities. The examples discussed below may also aid

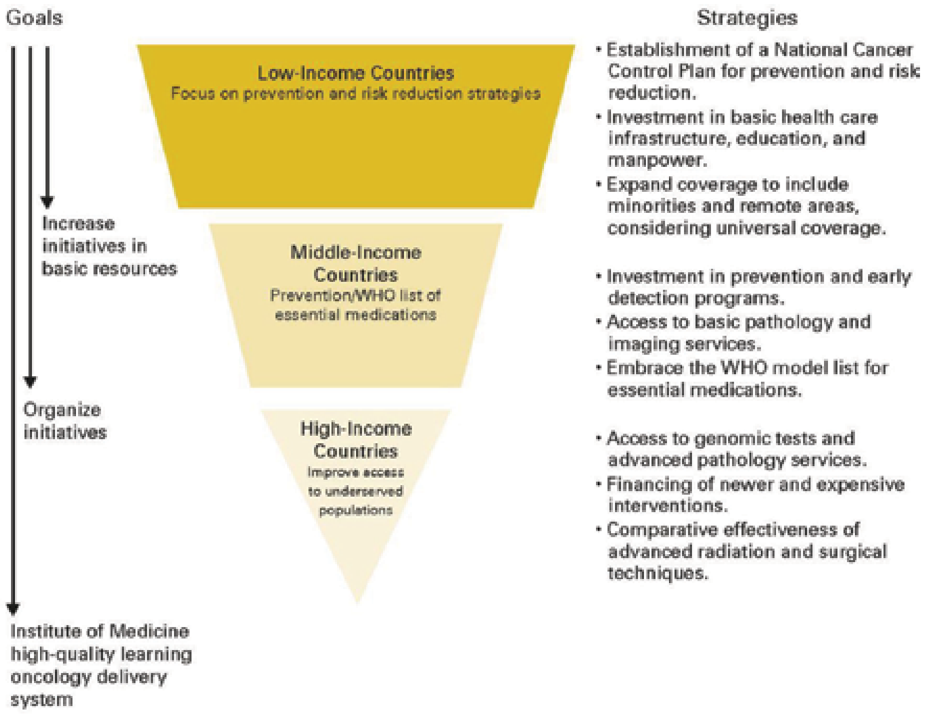

Figure 1. Global strategies for controlling cancer by income level of country. Reprinted with permission from authors and the American Society of Clinical Oncology [13].

those doing non-communicable disease planning, as many risk factors for cancer are shared with other non-communicable diseases [12].

1.2. Sources and methodology

PubMed (https://www.ncbi.nlm.nih.gov/pubmed/) was searched for the key words "comprehensive cancer control" in order to retrieve published articles pertaining to the NCCCP. Articles were limited to those published from U.S. authors and those published since 1998, the year the NCCCP was established. Article abstracts were scanned in order to determine whether the content was related to the NCCCP specifically, or to other general or broad efforts not pertaining to this CDC-funded program. All articles found to be NCCCP-specific were read for content and those that contained analyses of cancer plans or activities implemented as part of cancer planning were chosen for inclusion as an example of activities in this book chapter (see Section 3 below). In addition, CDC's main cancer website https://www.cdc.gov/cancer/ was searched for NCCCP-related content, and all content that contained activities implemented as part of cancer planning was also included in the examples section. Articles or website material retrieved that pertained solely to NCCCP development and/or evaluation were generally excluded from the examples section, but were used in some cases to describe the NCCCP (see Section 2 below). The examples provided in Section 3 do not represent a comprehensive environmental scan or systematic review of all initiatives undertaken by NCCCP participants, as only published literature found on PubMed or CDC's NCCCP website were used as sources. Many NCCCP participants have their own websites with further information that may be useful for cancer and non-communicable disease planners. NCCCP participant information is available on the CDC website [8].

2. The National Comprehensive Cancer Control Program

In 1998, the NCCCP was established and provided funding to five U.S. states and one tribal health board–Colorado, Massachusetts, Michigan, North Carolina, Texas, and the Northwest Portland Area Indian Health Board [NPAIHB]. These areas already had existing cancer plans and were in different stages of implementation [14]. The new CDC funding allowed for expansion into certain areas such as survivorship, pediatric cancers, genomics, and blood cancers [15]. It also established an avenue for providing coordinated, technical assistance from the national perspective and exchange of ideas and practices among the participants. The program quickly grew over the next few years to include 63 participants in 2005 (all 50 U.S. states, the District of Columbia, Puerto Rico, six American Indian/Alaska Native (AI/AN) tribes and tribal organizations, and six U.S. Associated Pacific Islands Jurisdictions [USAPIJ]) [14]. CDC funding specifically allowed for NCCCP participants to establish or maintain diverse cancer coalitions made up of key cancer stakeholders in each participant's area, for the coalition to determine their area's individual priorities for cancer prevention and control in a formal cancer plan, and to establish an ongoing infrastructure to implement priorities contained within the cancer plan [10]. As of 2005, more than half of the 63 NCCCP participants were receiving funding solely to build capacity and infrastructure, while the more advanced participants were receiving funding to implement specific cancer control activities [14]. Also in 2005, CDC began offering additional funding on a competitive basis to NCCCP participants to implement specific activities related to ovarian, prostate, skin, colorectal cancer. As of 2018, the NCCCP has 66 funded participants: all 50 states, the District of Columbia, Puerto Rico, eight AI/AN tribes or tribal organizations, and six USAPIJ. There is a great deal of diversity among each of these funded entities in terms of cancer burden, racial and ethnic structure, levels of income inequality and poverty, and access to cancer care and services. All these factors influence the level of funding each participant receives from CDC.

Evaluation efforts at the national level in the early years of the program, including the development and fielding of a performance measurement system and cancer plan assessment tool, provided valuable information regarding technical assistance needs and improvements that could be made across all participants [16–18]. Results from surveys in 2009 and 2010 showed that a majority of programs had successfully implemented at least one community- or organization-level change strategy; however, not all programs were using only evidence-based interventions, and there were few participants linking their activities to cancer impact [19]. Recognizing that participants needed assistance in these areas, as well as in communicating their efforts, CDC developed an overarching set of strategic priorities to guide the cancer public health practice of all NCCCP participants, regardless of their unique nature and cancer burden [20]. These priorities (**Table 1**) provide a roadmap for participants to follow, while still allowing for flexibility at the participant level for development of specific strategies that work in their area. At the national level, the priorities allow for provision of standardized technical assistance and tools, a more objective and consistent way to assess participant performance, and a more uniform and systematic way to disseminate information and successes regarding programmatic activities. The priorities span the cancer continuum (primary prevention, early detection, and survivorship), and place special emphasis on addressing health disparities and inequities in each of these continuum areas [20]. The priorities also define the methodology participants are encouraged to use to address these areas, specifically the implementation of systems and environmental change approaches, and emphasize participant-level evaluation as critical part of programmatic success [20]. The priorities were released in 2010 and were readily incorporated into planning by NCCCP participants. Soon after the release of the priorities, informal assessments showed programs tended to focus on implementation activities in one priority area (for example, some participants were implementing only primary

1. Place emphasis on the primary prevention of cancer during planning and implementation to reduce risk and environmental exposures.
2. Promote the early detection of cancers for which population-based screening is recommended.
3. Address the public health needs of cancer survivors.
4. Reduce cancer disparities by planning and implementing interventions in line with priorities 1-3, but tailored for specific underserved and/or in-need populations.
5. Use systems and environmental change approaches resulting in sustainable cancer control.
6. Measure all outcomes and impact through formal evaluation.

Table 1. The National Comprehensive Cancer Control Program Priorities.

prevention strategies listed). As of 2018, all 66 NCCCP participants have demonstrated the capability to implement activities in all priority areas. Current funding agreements require that all NCCCP participants at least three interventions in each of the cancer continuum areas and at least one strategy in these areas has to be aimed at reducing cancer disparities [21]. Additionally, participants use a specific library of interventions and data indicators, compiled by CDC, as a tool to plan and implement their interventions [21].

3. Examples of National Comprehensive Cancer Control Program implementation activities and success

3.1. Evidence for initiatives and interventions

As of 2017, all NCCCP participants were required to use 60% of their funding for implementation of interventions (with the other 40% being applied to personnel and staffing costs) [21]. All NCCCP participants, regardless of their unique cancer burden, are required to implement evidence-based initiatives and interventions (EBIs) to prevent and control cancer in their population [20]. Several U.S. organizations provide resources for these interventions. The United States Preventive Services Task Force (USPSTF), an independent, volunteer panel of national experts in disease prevention and evidence-based medicine [22], synthesizes all data in a given area (e.g., cervical cancer screening), and provides evidence-based recommendations about clinical preventive services that NCCCP participants follow. CDC's Guide to Community Preventive Services (The Community Guide), the National Cancer Institute's (NCI) Research-tested Intervention Programs (RTIPs) and Using What Works: Adapting Evidence-Based Programs to Fit Your Needs, and the Cancer Control P.L.A.N.E.T. (Plan, Link, Act, Network with Evidence-based tools, co-sponsored by CDC, NCI and others [23]), all provide EBI resources and tools for NCCCP participants [20]. A 2012 survey showed that 75% of NCCCP directors from states, tribes and/or USAPIJs reported using EBIs to address cancer plan objectives [24]. Most directors had used web sites for The Community Guide (95%) and Cancer Control P.L.A.N.E.T. (75%) [24]. Brief descriptions and specific examples of the types of activities are described below, categorized by each cancer continuum-related NCCCP priority area. These implementation examples are from a variety of NCCCP participants in different settings and with different resources. More detailed information on these implementation activities can be found in the cited reference or by contacting the individual NCCCP participant [8].

3.1.1. Emphasizing the primary prevention of cancer

Primary prevention for cancer includes reducing exposure to cancer-promoting environmental influences, reduction of genetic and behavioral risk factors, and vaccination against viruses that can cause cancer [25]. Many cancer risk factors and viruses also cause other diseases, and therefore emphasizing primary prevention in NCCCP plans has a broader impact on improving health [4]. Many of the strategies and interventions in these areas are specifically recommended to reduce the global burden of cancer [9, 12].

Implementation of activities that address behavioral risk factors is a key approach most NCCCP plans address the primary prevention of cancer. Lung cancer is the leading cause of death in the U.S. [2], and tobacco use is responsible for about 90% of lung cancer diagnoses [27]. A 2013 assessment of NCCCP cancer plans showed that all plans incorporated at least one evidence-based tobacco control strategy [26]. On average, plans included five Community Guide recommendations related to tobacco, with activities focused on supporting smoking bans and restrictions (87%), mass media campaigns combined with other interventions (81%), provider reminders and provider education (19%), and promoting reduction of client costs for cessation therapies (49%) [26]. The Arkansas Cancer Coalition (ARCC) educated local legislators and the public about the benefits of raising taxes on tobacco products, including specific information regarding the expanded health programs that tobacco tax revenue could offset in Arkansas (estimated to be nearly $180 million for Arkansas) [27]. The Cherokee Nation Comprehensive Cancer Control Program implemented the *Tobacco Tour*, which educated young members of their tribe about the dangers of tobacco use, using culturally appropriate story-telling methods [28]. The education program also included a presentation from a six-time cancer survivor and former smokeless tobacco user, who shared intimate details about his experience with tobacco-associated cancer which strongly resonated with the students [28]. Over a four-year period, the *Tobacco Tour* reached more than 4400 children and adolescents in the Cherokee Nation's 14-county Tribal Jurisdictional Service Area in Oklahoma [28].

Radon is the second leading cause of lung cancer, and the leading cause of lung cancer among non-smokers [29]. Many NCCCP participants are increasingly incorporating activities to reduce exposure to radon, a radioactive gas ubiquitously present in the lower levels of U.S. homes and buildings [29]. A 2010 review of cancer plans identified radon-related activities in 27 (42%) plans [29]. An updated review in 2017, showed that the number of NCCCP participants addressing radon had increased; nearly two-thirds of all NCCCP cancer plans contained radon-related strategies [30]. Specific examples of radon activities implemented included increasing education, promoting radon testing and remediation of houses, partnering with other national agencies that address radon, and promoting adherence to existing local statewide radon policies [29, 30]. Iowa has the highest average radon concentrations in the U.S.; the Iowa Cancer Consortium led a collaboration to increase levels of awareness, testing, and (if necessary) mitigation, and to introduce a comprehensive radon control policy in Iowa by engaging partners and stakeholders across the states. Following their multi-pronged intervention, the number of radon tests increased by 20%, and the number of mitigations completed by certified mitigators increased by 108% [31].

It was recently reported that approximately 631,000 persons per year in the United States receive a diagnosis of a cancer associated with overweight and obesity, representing 40% of all cancers diagnosed [32]. There are several evidence-based nutrition and physical activity strategies for reducing cancer risk due to obesity. A 2016 review of NCCCP cancer plans showed that nutrition and physical activity content was consistently included in all cancer plans, with 89% contained specific goals or strategies in these areas [33]. The most common strategies were related to education (71%), followed by school wellness (61%), worksite-wellness, (47%), and community physical activity (39%) [33]. Examples of strategies in plans included promoting the building of safe sidewalks and bike paths between community schools and residential areas, promoting increased time requirement for physical activity during physical education classes in school, increasing healthy food access (farmer's markets, community gardens, etc.), and encouraging children to decrease time spent with video games and TV and to substitute physical activity [33]. Indiana's Cancer Consortium implemented a *"Complete Streets"* initiative aimed at making city streets accessible and attractive to pedestrians and cyclists as well as automobile traffic. They provided coordinated education to the public and decision makers about the importance of planned environments, and partnered with the state transportation department, street design and engineering, pedestrian, and bicycle interest groups to facilitate its implementation. The intervention increased opportunities for Indiana residents to be physically active and reduce their cancer risk [34]. The Iowa Comprehensive Cancer Control Program designed a local initiative to reduce cancers that are disproportionately higher among African-Americans in Iowa [34]. The *"Body and Soul"* program was adapted from RTIPs [35], and tailored for the Iowa population, to increase awareness of healthier choices in nutrition and exercise [34]. In the first year, Iowa worked with 2 churches to support health awareness among its members [34]. More than 1,300 African-American residents across Iowa participated in the program in one year alone, and it is currently estimated that the program has now reached approximately 9700 African-American Iowans [34].

Intense, intermittent exposure to ultraviolet (UV) light from the sun is strongly linked with melanoma, which is one of the deadliest forms of skin cancer in the U.S. [2, 36]. New Mexico, Florida, and Arizona used systems and environmental change strategies and the establishment of partnerships (adapted for their individual needs) within schools and educational community to control sun exposure among school children [36]. New Mexico provided two or more presentations per year in schools delivering specific messages to avoid the sun between 10 am and 4 pm, wear sun-protective clothing when exposed to sunlight, and use sunscreen with a sun-protection factor of 15 or higher [36]. More than 3600 students demonstrated positive behavior changes following educational presentations, including playing in the shade, wearing a hat, using sunscreen, and wearing sunglasses. [36]. Additionally, many teachers, who serve as important role models for school children, reported positive changes in their own behavior related to sun safety [36]. New Mexico also implemented 55 systems and environmental changes including modifying recess times to avoid peak UV exposure, allowing students to wear hats outside, and providing shade structures or planting trees [36]. It is estimated that a total of 56,000 school-age children, school staff and community members have been reached through these efforts in New Mexico [27]. South Dakota worked with two worksites who hired seasonal workers to work outdoors to limit UV exposure in the workplace [34]. These worksites adopted local policies to provide employees with sunscreen and lip balm, and employees were also encouraged to wear wide-brimmed hats, long sleeve shirts, lightweight full-length pants, and sunglasses, as well as work in shaded areas and avoiding peak sun hours when possible [34]. Workers (n = 450) reported an increase in their knowledge of sun safety and using some form of protective behavior; wearing wide-brimmed hats and sunglasses, and spending more time in shady areas when possible were the most commonly reported sun protection behaviors [34]. The largest positive behavioral changes were observed among white men younger than 24 or aged 45–54 [34].

Vaccination against certain viruses can prevent cancer [25]. Cervical cancer and hepatocellular (liver) cancer are strongly linked to infection with human papilloma virus (HPV) and hepatitis

B virus (HBV), respectively [25]. Routine vaccination against HPV at age 11 or 12 years of age has been recommended in the United States since 2006 for females and since 2011 for males [37]. NCCCP participants have played a key role in increasing uptake of the HPV vaccine. A 2017 cancer plan review showed that 62% of plans incorporated at least one activity since 2013 to address low HPV vaccination coverage in their areas [38]. Most plans (86%) reported community education activities, while 65% reported activities associated with provider education [38]. Systems-based strategies such as client reminders or provider assessment and feedback were reported in about of quarter of plans [38]. The North Dakota Comprehensive Cancer Control Program (ND CCCP) partnered with local public health units to facilitate an in-school vaccination program [34]. Public health units in four North Dakota rural counties launched school clinics in 20 middle and high schools to provide HPV vaccinations to students during school hours [34]. Each of the counties involved met or exceeded a 10% increase in vaccination rates, with one county reporting an increase of 18% [34]. The South Dakota Comprehensive Cancer Control Program (SDCCCP) had similar success partnering with a major integrated healthcare system within the state to increase the state's HPV vaccination rates [34]. Over a one year period starting in 2015, SDCCCP partnered with the health system to send out client reminders and provider feedback in seven primary care clinics [34]. More than 41,500 reminders were sent out and more than 3000 doses of HPV vaccine were administered as a result [34]. Community-based activities including panel discussions with cancer survivors and providers and showings of the "Someone You Love: The HPV Epidemic" documentary [39] were also implemented to raise awareness. At the end of the one-year implementation time, the seven participating clinics reported a 14 percentage point increase in HPV doses given to those who had not previously been vaccinated [34].

HBV vaccination is currently recommended for all infants, unvaccinated children aged <19 years, persons with diabetes aged 19–59 years, and all those who are at high risk for HBV infection [40]. A 2012 review of 66 cancer plans for liver cancer and HBV content revealed that 35% addressed liver cancer prevention through HBV-related strategies [41]. Specific strategies reported were to implement a culturally-appropriate campaign for high-risk Asian and Pacific Islander communities to increase their awareness about hepatitis B and preventive measures, and to liaise with the local sexually transmitted infections program to share data and incorporate cancer awareness in its activities [41]. Cherokee Nation and Idaho have actively engaged in promoting HBV vaccination by distributing over 2000 patient education resources, holding community meetings about risks associated with liver cancer, and developing and delivering provider education sessions on HBV vaccination.

Genomics is becoming an increasingly important field in the U.S., particularly with regard to its usefulness in precision medicine [42]. CDC has held several workshops and meetings to promote incorporation of genomic and genetic testing awareness and uptake into public health practice [43, 44]. Particular focus areas have been increasing awareness of and surveillance for cancer-promoting genetic mutations such as BRCA1/BRCA2 and those associated with Lynch syndrome that predispose individuals to breast, ovarian, colorectal, uterine, and other cancers [44]. A 2005 review noted that 56% of state plans analyzed had begun to implement genomics components described in their plan [45]. Most states emphasized educating health care providers and the public about the role of genomics in cancer control, and many considered awareness of family history to be an important aspect of cancer planning [45].

Approximately 67% of states with family history components in their plans had begun to implement initiatives in this area [45]. Alaska, Michigan, New Jersey, Puerto Rico, Tennessee, Texas, West Virginia, and Wisconsin held a series of structured, educational workshops, using resource materials from CDC's *Inside Knowledge* gynecologic cancer awareness campaign [46] to teach women about ovarian cancer risk factors and symptoms [47]. Educational sessions were implemented over a one year period and were tailored to the particular population. Following the workshops, almost 80% of women correctly identified genetic mutations as a risk factor for ovarian cancer, and the number of women reporting being confident in speaking to their doctor about genetic testing increased 30% [47].

3.1.2. Promoting early detection of cancer

Early detection for cancer involves screening for early malignancies or premalignancies and often treatment or removal of these lesions before they can spread to other parts of the body [25]. This area of addressing cancer is perhaps the most recognized by U.S. cancer specialists and the general public [25]. Early detection requires a solid clinical infrastructure to perform screenings and assess clinical and pathologic results of testing, so it can be more difficult to achieve in low-resource areas. CDC provides mammography and Pap smear screening services through its NBCCEDP [6], and the majority of providers in NBCCEDP-funded jurisdictions reported adequate technological resources for screening women [38]. As a community-driven implementation program, the NCCCP assists with promoting early detection by increasing knowledge and awareness of cancers that can be screened for, and implementing health systems changes to deliver screening among those who are eligible. NCCCP practitioners are required to partner and collaborate in a formal leadership team with NBCCEDP practitioners at the state and local levels as a requirement of CDC funding [21]. This helps ensure streamlining of screening activities between the programs.

Population-based early detection or screening is currently recommended by USPSTF for only a few types of cancer: mammography for breast cancer, pap smear for cervical cancer, colonoscopy (and other tests) for colorectal cancer, and the use of low-dose computed tomography for lung cancer screening [22]. Cancer plan reviews have shown that the vast majority contain cervical cancer content with 80.4% containing educational activities with a focus on individual behavior change [48]. Clinician behavior change was included in 41.2% of plans, and 11.7% identifying specific systems or environmental changes to bring about this change in clinicians [48]. This work does extend to NCCCP-funded areas of relatively low resources, such as the USAPIJs. In Yap USAPIJ, comprehensive cancer control practitioners held educational workshops to increase knowledge of cervical cancer screening and showed an approximate 25% increase in knowledge of Pap smear screening recommendations among the 326 women attending the workshops [44]. And a cross-sectional survey of 72 health care providers from five of the six USAPIJ funded by the NCCCP showed that most providers reported cervical cancer prevention as a priority in their clinical practices (90.3%) and used Pap smear screening (86.1%) [49].

Nearly all NCCCP cancer plans (98%) discuss interventions related to colorectal cancer screening [50]. Many (44%) included interventions to promote colorectal cancer screening in the workplace [51]. The Montana Cancer Control Program (MCCP) partnered with several insurance agencies in their state to promote colorectal cancer screening through several educational articles sent out in routine communications by the insurers, and postcards sent individuals reminding them that their insurance coverage allowed them to get screened [27]. About 92,000 Montanans were reach through these efforts [27]. Similar interventions by the Idaho Comprehensive Cancer Alliance resulted in an 8% increase over a 4 year period in persons reporting they received a colonoscopy [34].

Population-based lung cancer screening for long-term, heavy smokers is a relatively recent USPSTF recommendation compared to the other early detection recommendations discussed above [22]. As such, many NCCCP participants are beginning to collect baseline data in order to determine the interventions and types of interventions needed to increase adherence to this recommendation. Recently, the Maine Comprehensive Cancer Control Program conducted a survey to find out how many health facilities offered screening and the barriers to adopting screening [34]. While 1,131 lung cancer screenings were provided in results reported from their 2015 survey, most (84.4%) were performed in the two most populated counties included in the survey [34]. Barriers to screening identified included limited staffing, lack of patient and provider education, screening costs, and data reporting requirements of the Centers for Medicare & Medicaid Services (CMS) [34]. Armed with these data, Maine is preparing interventions to increase lung cancer screening across their state. They are developing appropriate interventions to lessen these barriers, and have adopted the lung cancer screening module of CDC's Behavioral Risk Factor Surveillance System (BRFSS) in 2017 to measure the results of their efforts [34].

3.1.3. Addressing the public health needs of cancer survivors

Survival from commonly diagnosed cancers (such as breast and colorectal cancers) has increased steadily in most developed countries, and considerable increases in prostate cancer survival have occurred in many countries in South America, Asia, and Europe [52]. People living with cancer have several unique needs that can be addressed through public health practice [53]. Cancer survivors often face long-term adverse physical, psychosocial, and financial effects from their cancer diagnosis and treatment [53, 54], and have elevated risks for developing subsequent, new cancers as well as other chronic diseases compared to those who have never had cancer [54]. The number of cancer survivors in the U.S. has steadily increased over the last 3 decades [54]. A 2016 study indicated there were over 19 million current U.S. cancer survivors [55]. Many of the evidence-based interventions for primary prevention and early detection equally apply to survivors. NCCCP participants have adapted these interventions for their survivor populations, given the increased health risks present in this group compared to those who have not had cancer. Additional survivor-specific activities are also often implemented. A 2013 assessment of NCCCP cancer plans showed that 94% contained cancer survivorship content [56]. The most commonly incorporated survivorship activities were providing communication, education, and training (91%), followed by developing programs, policies, and infrastructure (90%), ensuring access to quality care and services (77%), and supporting surveillance and applied research (75%) [56]. Common examples of implementation in these areas included incorporation of CDC's cancer survivorship BRFSS module to characterize health behaviors (such as tobacco use and cancer screening among cancer survivors), development of fact sheets explaining individual cancer diagnoses, collaboration with community resources such as the YMCA's Cancer Survivor Program [57] which encourages exercise among survivors, and the fielding of needs assessments to determine where to allocate resources to ensure access to quality care and services [56]. Specific examples of activities in New Mexico, South Carolina, Vermont, Washington state, and the Fond Du Lac Band of Lake Superior Chippewa tribe are: (1) promotion of doctor and patient use of survivor care plans to better understand care prescribed and received; (2) use of patient navigation programs to help survivors gain access to clinical services; (3) use of psychosocial distress screening among cancer survivors to identify and treat concurrent illnesses stemming from their cancer diagnosis; and (4) facilitation of communication among cancer survivors through peer support groups and workshops to help survivors feel less marginalized and better equipped to handle their diagnosis [58]. Recognizing that a cancer diagnosis affects not only the individual, but also those in close proximity to the survivor, NCCCP participants also provide support to families and caregivers as part of addressing the survivors' needs. In 2007, the Alaska Native Tribal Health Consortium (ANTHC) began a grief camp for Alaska Native children who lost a family member due to cancer. The ANTHC developed and implemented Camp Coho, a one-day camp that provided culturally appropriate messages of grief support to children, including using art therapy, healing circles, and assigning children a peer to provide one-on-one support. Post camp surveys indicated that 75% of children no longer felt alone in their cancer loss after attending the camp [27]. The Wyoming Comprehensive Cancer Control Consortium (WCCCC) created a similar camp experience to bring children who themselves were diagnosed with cancer and their parents and sibling caregivers together [34]. Camp Courage Wyoming was established as a yearly camp in 2012, to allow families to build a statewide, long-lasting survivorship support network [34]. During the weekend long camp, cancer counseling and support group services are available, and families can attend educational workshops taught by physicians specializing in childhood cancers [34]. Attendees reported that the opportunity to talk with others about the challenges associated with having a child diagnosed with cancer has been very valuable [34]. Building on the knowledge gained from participant survivor activities, and in an effort to accelerate survivorship activities across all NCCCP participants, CDC began providing additional funding on a competitive basis to a small number of participants in 2015 to enhance surveillance of survivors and their behaviors, implement community-clinical linkages that would promote receipt of quality care for cancer, and increase provider education about survivorship needs and assist providers with completing and distributing survivor care plans [59].

3.2. Guidance of the National Comprehensive Cancer Control Program

The NCCCP is guided at the U.S. federal government level by CDC's Division of Cancer Prevention and Control (DCPC) [60]. Formal collaborations across CDC ensure complementary programmatic efforts [61]. For example, a consortium of national networks to enhance the quality and performance of the NCCCP in specific populations who traditionally experience health disparities is jointly supported by DCPC and CDC's Office on Smoking and Health. CDC also maintains a formal partnership with several national organizations listed in **Table 2** [62], who provide specific resources to assist NCCCP with interventions. These comprehensive cancer control national partners have helped build and sustain coalition capacity through a variety of technical assistance activities [62]. For example, the American Cancer Society drafted and published

- American Cancer Society
- American Cancer Society Cancer Action Network
- American College of Surgeons Commission on Cancer
- Association of State and Territorial Health Officials
- Cancer Support Community
- **Centers for Disease Control and Prevention**
- The George Washington University Cancer Center
- Health Resources Services Administration
- Intercultural Cancer Council
- LIVESTRONG
- Leukemia and Lymphoma Society
- National Association of Chronic Disease Directors
- National Association of County and City Health Officials
- North American Association of Central Cancer Registries
- National Cancer Institute
- Susan G. Komen for the Cure
- Truth Initiative
- YMCA of the USA

Table 2. Comprehensive Cancer Control National Partnership Members.

a series of guidelines for cancer survivor care, including colorectal cancer care [63], and George Washington Cancer Institute develops and disseminates social media messages about cancer EBIs for NCCCP participants to distribute during particular cancer awareness months.

4. Conclusion

Cancer is an ongoing public health concern in developed countries and an emerging concern in developing countries [9, 12]. Many countries are beginning to recognize the importance of comprehensive cancer control and are beginning to design national cancer control programs to improve cancer survival and quality of life through evidence-based strategies [64, 65]. Early efforts have reported several challenges including the lack of access to care, contamination of the environment, and cancer fatalistic attitudes among individuals in China, lack of informed healthcare staff, and sociocultural barriers in India, and inadequate assessment of cancer burden, negative societal attitudes towards cancer prevention, and lack of partnerships and engagement in Russia [66]. Many countries (both developed and developing) have cited the need for better assessments of cancer burden, determination of risk and protective factors, early detection and screening, interventions in vaccination, tobacco cessation efforts and palliative care, coordination and measurement of impact [67, 68]. The U.S. NCCCP provides a successful model, addressing all these factors in a coordinated, impactful, and collaborative approach for these countries to learn from and adapt. The varied examples of successful implementation activities presented above provide a platform to assist other countries with cancer planning. As countries begin to design and implement their national cancer control programs, they may wish to adapt a similar design to the NCCCP, that is, a community-based implementation program, with guidance and assistance from national levels. This particular design has been most effective for the U.S. in addressing multiple populations with widely diverging attitudes and infrastructure, and has contributed to the NCCCP's success over the last 20 years. All countries involved in national cancer planning could learn from the

NCCCP in their efforts to control cancer across diverse populations. Bringing key stakeholders together with first-hand knowledge of the cancer-related challenges in a given population is an essential first step. Allowing stakeholders themselves to write and implement a specific plan, based on their knowledge and all available data from the population, led to successful interventions in the NCCCP. Focusing on the implementation of similar cancer prevention and risk reduction strategies may be a good first option for many countries [13].

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Conflict of interest

The authors have no conflicts of interest.

Disclaimer

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Taking it to the Pulpit: Repositioning FBOs as Critical Agencies in the HIV/AIDS Response in South Africa

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Additional information is available at the end of the chapter

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Abstract

In spite of significant gains achieved in the fight against HIV/AIDS, it remains a huge public health challenge in South Africa. Therefore, there is a need for continuous concerted efforts involving critical agencies like faith- based organizations (FBOs) that are already prominent in health care. The chapter examines how FBOs involved in HIV/AIDS response can be repositioned and further empowered. Though FBOs remain very critical and relevant to the national response in the country given their grassroots reach and influence; there is ambivalence on the value of such roles and how they relate to the national response. The main findings include: FBOs are not fully integrated into the national response framework; in spite of laudable strides, FBOs still embody a negative influence on the response especially in terms of the use of condoms; FBOs lack capacity in such crucial areas as networking and partnership; however, they are active in rural enclaves and in the prevention and care aspects of the response. There is a need to strengthen these FBOs, align their initiatives to both the national framework and orthodox knowledge regarding the pandemic. This chapter recommends programs to build the managerial and technical capacities of these FBOs

Keywords: : HIV/AIDS, faith-based organizations, response framework, capacity, South Africa

1. Introduction

Despite considerable strides made in the fight against HIV/AIDS in Africa, it still remains a formidable challenge in the areas of public health and general development in the continent. This entails that there is no gainsaying the need for continued concerted efforts at addressing the menace of the pandemic. Without doubt, Faith-Based Organizations (FBOs)

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have emerged as critical agencies of health provisioning in Africa especially with reference to HIV/AIDS. Thus, these FBOs appear as imperative avenues for fighting the pandemic in Africa. In view of the foregoing, the aim of this chapter is to assess the role of FBOs in South Africa in the response and more critically how such roles can be repositioned and enhanced to contribute more meaningfully to the overall national response. Thus, this chapter argues that while significant progress has been made in the fight against HIV/AIDS in South Africa,[1,2] there is still a need for a much more concerted approach which should reposition and harness the value of Faith-Based Organizations (FBOs) as mediators in social life of citizens. In other words, its aims include to examine the roles of FBOs in the HIV/AIDS response, how such roles are integrated within the larger national response framework, the opportunities/niches which these FBOs embody, as well as the constraints or limitations suffered by these FBOs and how their undoubted visibility can be enhanced in improving the response.

There is no gainsaying the fact that FBOs play critical roles in the health behaviour and health choices that people make in South Africa and the whole of the continent. This stems both from the remarkable level of religiosity among South Africans especially those who are largely marginal to the socioeconomic spheres of the society and the widespread prominence of these FBOs. As social indicators and even cursory observation would reveal, those who are most vulnerable to HIV/AIDS and also bear a high burden of the pandemic are people from the above category who are mainly poor, uneducated and more often than not excluded [3–5].

While South Africa has obviously weathered the storm of AIDS mainly through the global emphasis on ARVs and a much improved prevention program emphasizing safe sex, condom use, marital fidelity, knowledge of HIV/AIDS status, and reframing of AIDS as not a death penalty, there is still much work to be done not only to sustain the progress made but to ensure that the optimism expressed about overcoming the pandemic in the last few years is met. There is no doubt, as anyone familiar with the checkered history of South Africa with the AIDS pandemic would concede that FBOs were critical in the efforts of people to deal with the pandemic especially in terms of caregiving and provision of psychological and physical support to those afflicted and affected by AIDS; the role of FBOs in this regard seems both expected and in line with a consistent mediation in the health decisions of people in Africa [3, 6, 7].

Interestingly, while FBOs in Africa as a whole have responded to the pandemic, much of the response has been largely moralistic and often showing rejection of the core foundations of the campaign especially with regard to condom use and the issue of premarital sex [7]. The above calls attention to the need for AIDS policy planners and intervention agencies in South Africa to reflect on ways through which the FBOs can significantly benchmark their AIDS services and stance on the orthodoxy regarding the pandemic.

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[1] Almost 20% of all HIV-positive people in the whole world live within South Africa's borders [1].

[2] While HIV prevalence among young South Africans is regarded as one of the highest in the world, there has been a significant decline from 10.3% in 2005 to 5.6% in 2016 (see, [2]). However, there is still a long way to go before Eureka.

In spite of the implicit recognition of the value of FBOs in the national response especially through the existence of faith-based sector in the South African National AIDS Council (SANAC), there remains to emerge a sustained and systematic thorough-going effort to fully integrate, deepen, and recalibrate the actions of the FBOs in the response. In other words, there is yet to really emerge a broad-based national and committed effort to locate these FBOs and their diverse actions squarely within the broad response framework as well as the obvious paucity in efforts to empower, strengthen, and effectively streamline the FBO contribution to the response.

The Christian AIDS Bureau for Southern Africa (CABSA) has arisen to inject the needed impetus and collaborative energy into the FBOs role in the HIV/AIDS response [8]. However, while re-emphasizing the important role of FBOs in the response, the CABSA's Executive Director, Lyn van Rooyen, argued that there is a need for FBOs to rethink their role in relation to the HIV/AIDS response [9]. But while the role of the FBOs in the response remains largely undoubted, what has remained mainly unknown is the connection between these roles and the largely national or state level response. In other words, how does the role played by these FBOs intertwine, feed in and integrate with the comprehensive response framework and whether such roles are defined and structured by the guiding rubrics of the national strategy especially in the rudiments of prevention usually captured in the ABC acronym (abstinence, be faithful, and condoms).[3]

Even though a good number of studies [10–12] have been carried out on the health roles of FBOs in Africa, there is no doubt that there is still the need for more information and knowledge about the range of HIV/AIDS services provided by these organizations and more critically how and at what juncture these services interface with those from formal agencies. But even beyond the above is the need to understand the trajectories of the FBOs driven response and how these have been consistent or otherwise with the perceived dynamism of the general state-driven response.

Therefore, as has been argued, "generalizations about FBOs' HIV/AIDS prevention responses are unhelpful as they create an inaccurate picture of FBOs' HIV/AIDS response efforts" ([13], p. 314). In other words, there is a need for nuanced knowledge about the FBOs contribution which takes cognition of peculiarities, alignment and consistency with the broad national response framework and integration within such a broad framework. But in order to achieve the needed integration and consistency with the broader national response, there is a need for a better understanding of the peculiar predicaments these FBOs face and how these FBOs and their efforts can be better repositioned to squarely connect with the national response framework.

2. Profile of the FBOs engaged in the response

According to the Pew Research Center [14], the religious affiliations of South Africans range from preponderance of Protestantism to a significant (rapidly increasing) presence of Islam.

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[3] At a recent fora with FBOs, SANAC expressed concern that there is the substitution of ARV treatment with holy water and other faith-based commodities which are not scientifically proven to be effective against the pandemic [8].

In its estimation, the religious affiliations or spread of South African population (i.e., those who profess any form of religion) are protestant (41%), African Independent Churches (AICs) (27%), Catholics (11%), and Islam somewhere between 1.6 and 3% [14]. Be that as it may, Faith-Based Organizations in reality in South Africa represent a plethora of entities ranging from places of worship to even quasi-development or social organization with a mission of faith. These entail that FBOs are of various types and share a broad commonality in the faith nature or centeredness of the organization concerned or its parent body.

However, this chapter adopts a very generous definition of FBOs involved in the HIV/AIDS response. This definition is robust and involves different sizes and types of FBOs operating at local, provincial, and national levels. Therefore, FBOs in this case refer to a broad set of faith-based organizations or institutions including national religious structures like the South African Bishops Conference, faith-based non-governmental organizations like Youth for Christ, community-based or local parishes and congregations, church-based or aligned social service agencies, and other social service agencies and projects tied to faith-based organizations or churches (see also [5]). In spite of the above general conceptualization, it is necessary to mention that the real work of intervention whether in terms of care or prevention or even access to treatment is more readily crystallized at the community or local level. For instance, while the national FBO body or coalition like the Bishops Conference may issue proclamations and provide general guidelines, the nitty-gritty of dealing with those affected and infected usually lies with the different parishes, congregations, and similar spatially delimited church groups or organizations. While both levels of efforts are complementary and important, the response patterns and interactions play out mostly at the local and community levels.

As cursory observation would reveal, there is a preponderance of these FBOs in the urban areas of the country. This entails that accessing of HIV/AIDS services would be particularly challenging for rural dwellers especially when one takes cognizance of the fact that the formal response structures are equally not well entrenched in the rural enclaves. Further characterization of FBOs here depends essentially on the material available in the South African National AIDS Database [3]. The database shows 162 FBOs involved in the response of which 96% are Christian and 40% are Muslim. Among the Christian FBOs, the distribution was Catholic 14%, Dutch Reformed Churches 11%, Pentecostal/Charismatic 11%, Anglican 7%, Methodist 6%, and others 8%. Apart from the above denominational and demographic characteristics, these FBOs can equally be characterized as networks and coalitions (4%), faith-based NGOs (16%), and projects/special initiatives (47%). Incidentally, these categories are hardly mutually exclusive and overlaps occur. In spite of these, the highest number of FBOs engaged in the response is in the project-oriented categories (47%), followed by faith-based NGOs (16%) and social service outlets (13%), while the lowest of less than 5% is found among networks and coalitions which suggest glaring capacity and integration challenges generally.

In spite of the above, the FBOs are usually concentrated in the area of prevention rather than treatment and management. In other words, the bulk of the activities of the FBOs are awareness, counseling, and to an extent testing. But they usually shun from the provision of core medical care and hardly focus on condom seen largely as inconsistent with the scripture and liturgy of these organizations. In a curious sense, the FBOs seem to have replaced condom promotion with abstinence. Hence, they are much more comfortable with preaching and privileging abstinence rather than focusing on condoms.

3. Overview of the history and roles of the FBOs in the general response

The role of FBOs in Southern Africa in providing care and support to those infected and affected by HIV/AIDS has been globally acknowledged [15–17]. In other words, there is a recognition, even where self-referent, that African FBOs are critical or important role players in the HIV/AIDS response especially in care giving (see, [18–21]) and also in the areas of prevention and awareness creation. At the same time, even while recognizing the roles of these FBOs, some authors have equally indicated these organizations as acting in ways that often undermine the overall response [21–23]. In other words, while there is no doubt that these FBOs do certain things in terms of the pandemic, there is ambivalence in terms of the net effect of such contributions and how the various roles of the different FBOs conflate with the overall national strategy and broad efforts.

The role of the FBOs in the response in South Africa is equally underpinned by the realization that the real push for a systematic and state-wide recognition of the pandemic and needed response came from civil society groups and leaders who had to confront the unyielding denialism of the government regarding the pandemic between 1998 and 2008. In fact, this denialism under the then government of Thabo Mbeki gave rise to the non-acceptance and disavowal of the link between HIV and AIDS. A good survey of the history and politics of AIDS in South Africa between 1994 when democratic governance commenced and 2008 would certainly highlight the undaunted fight of civil society groups including FBOs for the mainstreaming of HIV/AIDS in national health framework and provisioning [1, 18, 24].

Apart from using the media and strategic awareness creation and coalitions, there was even utilization of legal means including the popular court case on the need of the state to provide nevirapine for PMTCT, the abdication of which these groups argued was really unconstitutional [1, 25]. In that historic case, the High Court in Pretoria found in favor of civil society arguing that a countrywide PMTCT program is in reality an ineluctable obligation of the South African State [24]. Incidentally, the then Health Minister, Tshabalala-Msimang appealed the court decision but lost in a historic case that generated great criticism and public opprobrium for the state. Going forward from the change in 2002, the government eventually signed off on a new National Strategic Plan (NSP) on HIV and AIDS and STIs (2007–2011) produced by SANAC. Given an onslaught of internal dissension, international condemnation, and even ridiculing of the government, it was a matter of time before the state made a volte-face. The change came in 2002 when a cabinet statement offered acceptance of the link between HIV and AIDS, the rolling out of PMTCT in the nine regions of the country, and the launching of the Strategic STI (including AIDS) Plan (2002–2005) among other measures [1, 24]. Following that was the approval eventually by the cabinet in November 2003 of an Operational Plan for Comprehensive HIV and AIDS Care, Management and Treatment for South Africa as a whole [1, 24]. However, the first broad-based National Strategic Plan (2007–2011) that was led by SANAC but which involved dialog and consultation with stakeholders and the political class finally emerged in 2006 [1, 24].

Currently, there is a new National Strategic Plan for HIV, TB, and STIs (2017–2022) which is the fourth plan in this regard and embodies the aspiration to build on the progress that has been achieved in the national response so far [26]. The fact that the present plan aims at "saturation of high-impact prevention and treatment services and strengthened efforts to address the social and structural factors that increase vulnerability to infection" ([20], p. xiii) means an increased opportunity for non-governmental groups including FBOs to find credible niche and relevance in the response. Interestingly, goal 6 of the Plan which is, "promote leadership and shared accountability for a sustainable response to HIV, TB and STIs" embody the desire to capture, strengthen, and create spaces for role performance by the private sector, labor and civil society organizations in the national response.

4. Methodology

This chapter derived its information from documentary sources of data and the extant literature. The review of literature for this chapter was based on the following general criteria:

Database: The literature search focused essentially on databases known for housing information and journals on social sciences and health, public health, HIV/AIDS, and religion and health in Africa. Thus, the following databases were utilized: South Africa Database on HIV/AIDS, Google Scholar, ProQuest, Medline Plus, UWC Online Library, and Cochrane Library.

Data type: Primary and secondary data, that is, papers that were derived through field work studies or surveys and those that were generated through documentary data or literature review.

Terms/concepts used: Terms and concepts use for the literature search included HIV/AIDS, Africa, South Africa, religion, Health; Faith-Based Organizations in Africa response to HIV/AIDS in Africa, and UNAIDS.

Geographical focus: Africa, Southern Africa, and South Africa.

Inclusion criteria: Papers and articles utilized for the review were selected on the basis of the following criteria: focus on HIV/AIDS and religion; HIV/AIDS and FBOs in Africa; published between 2000 and 2017; social science articles on FBOs and health-seeking behaviour in Africa; role of FBOs in HIV/AIDS and health provision in Africa.

Exclusion criteria: The following criteria were used in excluding material in the review process: papers dealing with HIV/AIDS in other regions of the world; extreme-dated papers, that is, papers published before 2000; gray literature and opinion articles; papers focusing only on biomedical aspects of HIV/AIDS in Africa.

The above guided the literature review for this chapter and provided information and insight for a thorough-going overview of the FBOs response to the HIV/AIDS pandemic and the teasing out of both the structural impediments to the optimal utilization of these FBOs and the unique opportunities they still portend, especially in reaching the teeming number of those either vulnerable or marginal to the socio-economic spheres of the society. Therefore, while there is undoubtedly a good volume of published materials in the above regard, this chapter prioritized those focusing on the role and involvement of FBOs in the response to HIV/AIDS, the state of the response in South Africa, as well as the nature of FBOs involved in the response.

5. Results and discussion

The results and discussion in this chapter would be organized under two main headings, namely opportunities and niches of FBOs in the HIV/AIDS response and the constraints/ impediments to the FBOs response.

5.1. Opportunities and niches of FBOs in the HIV/AIDS response

As obvious from the foregoing discussions, FBOs in South Africa and even the continent at large play critical roles in the health-seeking behaviour of people including HIV/AIDS. However, the role of the church in the above capacity often raises concerns regarding the nature of such involvement and its consistency with biomedical standards and procedures. In spite of this, the FBOs in South Africa offer opportunities and/or possess niches relevant to the response. Some of these are examined subsequently.

5.1.1. Grassroots/community reach

Perhaps, the greatest niche of the FBOs is captured in their grassroots or community reach and engagement capacity. In this case, the FBOs usually mobilize and engage with people and communities at the grassroots and have utilized this capacity to render services and support to those affected by the pandemic [7, 13, 15]. Specifically, the FBOs have been largely prominent at this level in the areas of care and support, counseling, and providing psycho-moral support of various types. The believability of the FBOs from the point of view of the people and the high faith imbued in these organizations give them the ability not only to intercede but mediate the response in ways that can be really effective if properly managed and channeled along the broader state level response framework.

As has been argued, “FBOs are at the centre of community life in much of South Africa and have extensive reach into the most remote and isolated parts of the country. These organizations hold positions of trust, which give their actions and words considerable potency. They have frequent opportunities to interact with their congregations and communities and have the ability to influence social norms and behaviours through moral teachings” [27]. Therefore, the relevance and value of the FBOs are further enhanced by the realization that these organizations have very robust community level roots and presence. These position them as critical agencies at the community level in addressing and mediating health challenges of members and others at that level. In other words, both their visibility and acceptance at the community level far outweigh those of the formal health system or state-driven HIV/AIDS agencies. Hence, they remain important agencies for influencing and impacting both health-seeking decisions and access to health care of people especially at community and rural enclaves.

5.1.2. FBOs and understanding of sexuality and sexual behaviour

There is without doubt a need to seriously nuance our understanding of the role of FBOs and religiosity as a whole on sexuality and sexual behaviour in African societies. This is especially the case in view of the fact that evidence from studies in developing countries of the world places religiosity and religious organizations in an ambivalent position in relation to sexuality and sexual behaviour [28–32]. Therefore, these studies reveal that while people especially youth who profess religion or are religious are less likely to have sexual partners and be initiated into sexual activities, they are also prone to be less sensitive to the need for protection when they become sexually active. However, studies from Africa would tend to neutralize the influence of religion on sexual activity by young people who are religious in relation to the other members of the society [6, 33–35]. But these studies did not dispute the undoubted influence of the church in personal life and social behaviour of Africans.

5.1.3. Protection from early sexual activity and promiscuity

Also, religious organizations and churches spend energy on moral principles and the denouncement of promiscuity. The undeniable fact is that religion plays a role in protecting young people from early sexual activity, sex adventurism, and general promiscuity, all of which may be positive to the HIV/AIDS elimination drive. But the way and manner the church goes about performing the above roles with specific reference to HIV/AIDS would seem really important. In other words, the church can function as both the linchpin of the response in communities and at the same time ironically perpetrate practices and values that ultimately seem antithetical to the response especially in terms of dealing with those who are affected and infected and also in decreasing vulnerability and eliminating risky behaviour by young people [6, 7, 27].

Even though efforts have been made starting from 2003 to understand and document the activities of these FBOs in the response as part of a general view of community level activities around the pandemic, it is ambivalent whether the outcomes of such evaluations and assessments have become effectively utilized in strengthening the national response to HIV/AIDS. Perhaps, concrete attempts at doing the above would have entailed the enhancement of the capacity of the FBOs.

5.2. Constraints/impediments to the FBOs response

Definitely, the concern in this chapter apart from the main focus of proffering measures for strengthening the FBOs contribution to the response is also the need to overcome some of the inadequacies and actions or mis-actions of these organizations which ultimately portend negative consequences for the response. These may include subjecting the HIV/AIDS core messages to wrongful and slanted biblical interpretations, over-utilization of religious doctrines in evaluating HIV/AIDS prevention messages and overtly moralizing tendencies which interfere with what the church can and cannot do within the response. Some of these issues are addressed subsequently.

5.2.1. Funding limitations and technical incapacity

While the South African government and its agencies often fund FBOs run or owned social service agencies and projects involved in the response, they hardly commit to the churches or congregations or response initiatives embedded in them. The end product is that while the former do not have adequate funding in spite of what comes from statutory agencies, the latter are usually dependent on donations and goodwill from church members and thus always in acute need of funding in order to function effectively [7].

Even where funding exists especially in terms of programs of international multi-lateral development agencies, FBOs have not been very successful in accessing these funds. In other words, while some of the FBOs have accessed such funds, many have been unable due to capacity challenges to make optimum use of this channel of funding. The FBOs often lack the technical capacity to develop project proposals and even position papers often necessary to attract or compete for such funding. Poor networking and partnership also hinder these groups. Incidentally, fundamentalist and isolationist (seen here as resistance to external influence and values) leanings of FBOs also come in the way of their ability to reach out.

Therefore, scarcity of fund is generally seen as militating against the effectiveness of the FBOs. Many of the FBOs involved in different aspects of the response experience funding challenges followed by lack of equipment or infrastructure [5]. The above challenges can be easily appreciated against the background of the nature and primary goals of FBOs which cast them as non-profit and not engaged in business or economic ventures for making money. FBOs largely depend on free-will donations and offertory of church members. In many cases, even the specialized or dedicated HIV/AIDS units of churches or denominations are equally dependent on the goodwill donations of members and whatever money allocated from the general church pool. In spite of the assistance of government and international agencies, HIV/AIDS response in light of the heavy burden from it remains more or less resource guzzling. Therefore, the extent and depth of coverage or response effectiveness depends on the availability of funding and the necessary equipment and infrastructure without which actions toward addressing the pandemic are severely encumbered.

5.2.2. Conflation and sin-oriented approach

There is also the nagging issue of conflation and sin-oriented definition of the pandemic by a good number of the FBOs. This orientation hinders the effectiveness of FBOs in the response. In such a situation, there arises conflation of sexuality and morality and the treatment or perception of AIDS as the fruit of sin [27]. In other words, there is often the tendency among the FBOs to indirectly and in some few cases directly blame the victims. AIDS is thus seen as an issue which underlines both immorality and sinful predilection of those affected [4, 21].

A crucial bulwark in the FBO response to the pandemic lies especially in the adoption of a moral kaleidoscope in the perception of the pandemic. In almost all instances, the church sees HIV/AIDS as more a reflection of individual moral laxity and irresponsibility than just the occurrence of disease. Often times, the emphasis is placed on ascertaining how the individual became infected rather than on prioritizing service. Therefore, even though the Catholic church or most of the Pentecostal churches are berated for unshifting and loud stance on condoms, the FBOs generally suffer from the above moralization of the pandemic and are also encumbered by patriarchal and hierarchical structures that while preserving the church as a consistent and fixed embodiment of spirituality reproduces gender inequality that enhances vulnerability and the inability of women to access HIV/AIDS services [7].

5.2.3. Traditional conservatism

Perhaps, equally constraining, the role of the FBOs in the challenge of the pandemic is the nature of the church as a largely conservative and very slow-changing entity. There is no doubt that the response in South Africa like in so many other countries in the continent calls for dynamism and working in concert and collaboration with other stakeholders. The noted conservatism of the church and the abhorrence of "outside" interference may actually make it difficult to integrate FBO response activities into a broad systematic response framework [13, 15, 36].

5.2.4. Non-integration into larger service delivery networks

An important evaluation of the roles and activities of FBOs in the HIV/AIDS response in South Africa has been carried out by CADRE [31]. The evaluation profiled these FBOs and outlined such technical issues as funding, capacity, and networking in the FBOs and underlined the significant roles of these FBOs especially in the areas of care and prevention. However, the report located a couple of challenges confronting these organizations, ranging from the scope or extent of reach and funding but more critical is the finding of the evaluation that the activities of these FBOs do not appear to be integrated into the larger service delivery networks [5]. In other words, these FBOs while performing critical functions are not systematically connected to the larger response framework and are dogged by funding and technical challenges. Thus, while these FBOs remain undoubtedly imperative to the response, their effectiveness has not been maximized or systematically harnessed. Therefore, the picture of the mid-2000s painted in the evaluation remains largely the same till now. In fact, there is the feeling that these FBOs in the euphoria of the remarkable strides achieved in the response in the country have become almost lethargic and have not advanced much in terms of improved capacity.

5.2.5. Other constraints

The capacity of FBOs to perform in the response is also limited by the fact that what apparently appears like FBO agencies involved in the response are in reality a case of these agencies taking on the added responsibility of dealing with HIV/AIDS. In other words, HIV/AIDS responses are often embedded in organizations that predated the pandemic with clear mandates beyond HIV/AIDS. These militate against the development of a clear-cut HIV/AIDS-focused capacity even in the long run in these FBOs [5, 7]. Even more perturbing is that often times, one perceives the FBOs in the response in the form of tiny islands cut off from each other and from the big sea. In this sense, there is a dearth of effective networking and coalition across FBOs in the response. This really militates against capacity development as each FBO's effort becomes disparate from the others, and there is hardly meaningful integration, sharing of resources, sharing of lessons learnt, and interdependence even on delimited scope.

6. Conclusion: Strengthening and mainstreaming FBOs response to HIV/AIDS in South Africa

The FBOs are usually very important components of the social life of a large number of South African citizens who are really marginal to the socio-economic spheres of the society. These citizens see the church as more or less the mainstay of their existence. Thus, FBOs are fulcrums of their economic, political, and health decisions and crucially condition their beliefs about diseases including HIV/AIDS and the desired cum approved (scripturally or denominationally) response. Incidentally, the citizens who belong to this category are also those mainly at risk and highly vulnerable to HIV/AIDS. It stands to reason therefore that re-aligning these FBOs to the orthodox response framework and improving their capacities as health mediators would in the medium run greatly improve the HIV/AIDS response in the country as a whole.

It was in recognition of the role of the FBOs that the SANAC encourages regular dialog between the FBOs and Civil Society Forum (CSF) of the SANAC. But such dialog should be deepened and made regular in order to address some of the noted predilection of the FBOs in responding to the pandemic including using holy water in place of ARV [8]. In fact, as cursory observation would show, FBOs in the continent (not only South Africa) have often promoted the use of such commodities as holy water, holy oil, holy sand, and anointed spiritual items in perceived treatment of the pandemic. These items are usually seen as general spiritual agencies of miracle cure.

Before enumerating ways through which the FBOs can be repositioned and strengthened in terms of further contributing to the HIV/AIDS response, there is a need to point out that the beginning of effective mainstreaming and integration of the FBOs into the national response framework should be against the appreciation of the variety of FBOs operating in the country. In other words, there is a need to take cognizance of the peculiarities, denominational/religious bends, and defining characteristics of these groups. Thus, a one-size-fits-all approach would not suffice. Therefore, there is a need for tailored engagements that aim at creatively harnessing the strengths of these FBOs as mass organizations. Strategies to be considered include the following:

1. Facilitating the FBOs to reconcile liturgical stands with the reality of the pandemic. Specifically, in this regard, efforts would include the acceptance of condom and the unavoidable reality of premarital sex and marital infidelity.

2. Improving the awareness creation of the FBOs—while huge success has been achieved on awareness in general in the country as a whole, the FBOs lag behind, and often a good number of them avoid the topic of AIDS altogether and adopt a more or less ostrich approach. Therefore, there is a need to take awareness to the church and the pulpit. But even more critical is to ensure that awareness messages whether captured in main liturgical modes or in the communication outlets of the church need to be informed by a good knowledge of the pandemic and location of South Africa within the global response.

3. Empowering the churches to establish formal organs within the church hierarchy dedicated to the HIV/AIDS pandemic response. Such organs should be manned by members who have good knowledge of the pandemic and have the time to dedicate to the response. Members of such church organs would need to be empowered through capacity training by the agencies of the state in charge of the response to the pandemic.

4. Partnership and networking: The partnership and networking envisaged here should be between the FBOs and state agencies on one hand and a form of triple network involving the FBOs, state agencies, and NGOs/CSOs engaged in intervention programs at various levels of the response.

5. Given the ubiquity of FBOs in South Africa, there is no gainsaying the fact that these organizations have the reach and presence even in the remotest areas of the country where the impact or presence of the state and its agencies are almost invisible. The reach of these FBOs can be critically harnessed especially in creating and sustaining awareness about the pandemic and even in functioning as first responders to those affected by the pandemic. FBOs would be critical in the coverage of rural areas and even densely populated urban townships.

As Keikelame et al. [27] have rightly opined, "South African FBOs need to engage more vocally in advocacy to address the social and contextual factors that increase HIV vulnerability, such as poverty and gender inequality." In other words, these organizations should use the good will and acceptance they enjoy among the people to engage in actions and dialog that aim at whittling down and eradicating practices and values which engender or perpetuate both poverty and gender inequality especially gender-based violence which has in recent years become a social plague in the society. When women and minorities are treated as second-class citizens or as inferior members of the society, they are easily denied or deprived the opportunity to make informed decisions, oppose sexual predation, and abuse in the communities.

Equally worth noting is that even though most FBOs in South Africa are opposed to both premarital and extra-marital sex by members, the messages given out often vary between churches or sects [37]. In this case, there is a difference since the approach in Zionist and mainline churches seems to be that while promiscuity is bad, abstinence is unrealistic and that premarital sex with only one partner is admissible (which contrasts with the loud and clear directives against premarital sex and the condom among Pentecostal and Catholic churches) [37]. Thus, the messages between FBOs may differ and call for the acute realization of this difference in the process of interfacing and integrating FBOs response as a whole and within the broader state-wide response.

As Mash and Mash [6] have contended, there is a need for the church to take up the challenge of empowering young women and recognize the need to protect their sexually active youth members. This challenge should go beyond the orbits of the church membership to include all spheres of influence of the church in the lives of both members and non-members. The call to evangelize should now embody the call to add value to the national response in an integrated and systematic manner that does not denigrate, devalue, or distort the philosophy and knowledge foundation of the national response.

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An Exploratory Study on the Association Between Social Capital and Self-Rated Health of South Korean Women with Disabilities

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Additional information is available at the end of the chapter

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Abstract

The purpose of this chapter was to explore the relationship between social capital and self-rated health status as assessed in the activities of the everyday life of South Korean women with disabilities. For this purpose, the authors analyzed the 8th data of the panel survey of employment for the disabled (PSED) that included a sample of 275 women with disabilities who are paid worker. The authors found that working environment, working hours, personal development possibilities, communication- and interpersonal-relationships, the fairness of performance assessment, welfare benefits, training opportunities, and job satisfaction differed significantly in relation to the self-rated health status of women with disabilities. The authors also found that for working hours, communication, and interpersonal relationships, significantly higher self-rated health status was found for satisfied compared to the satisfaction group. For personal development possibilities, welfare benefits, and training opportunities, self-rated health status was significantly higher for the satisfaction group than the dissatisfied group. For fairness of the performance assessment, self-rated health status of the satisfaction group was significantly higher than in the dissatisfied and the normal group. Therefore, in order to improve the self-rated health of South Korean women with disabilities, it is necessary to provide working environment considering their disability characteristics and various training opportunities in their workplace.

Keywords: women, disabilities, social capital, everyday life, health

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1. Introduction

1.1. Women with disabilities in South Korea

The number of registered people with disabilities in South Korea has steadily increased from 2,148,686 in 2005 to 2,683,477 in 2011 and then to 2,726,910 in 2014 [1]. Women with disabilities constitute 42% of this total [2].

Women with disabilities are in a very vulnerable position in terms of health care due to complex interactions between a number of factors [3]. As we know, the burden of domestic labor, as well as childbirth and childcare is traditionally placed on women. Moreover, the entry of women into the labor market due to industrialization and family nuclearization, which are the characteristics of modern capitalist societies, adds to the burdens of social and economic activity, in addition to domestic work [3–5]. In particular, and unlike other English speaking countries, inequality of gender roles based on patriarchal values is very deeply rooted in South Korea. This presents various conflicts and problems between the roles traditionally required for women and the new roles that modern capitalist society demands [6–9]. This situation for South Korean women can be a very negative factor in terms of their health. However, despite the impact of these stressors on women, health policy in South Korea mainly focuses on maternity issues, specifically, pregnancy and childbirth [4]. Of course, such a phenomenon can be seen as critical when considering that the total fertility rate in South Korea is the lowest in the world, being 1.21 births per woman in 2014 [4]. However, since South Korea's extremely low birth rate problem is not the only cause health conditions for women of childbearing age, the excessive emphasis on the health of women during the fertility period is not only detrimental to the effectiveness of the policy but also the equity of the health policy for women of all ages.

Disability can have a negative impact on the most basic conditions required for the management of health [10, 11]. In general, people with disabilities have very low access to medical facilities, due to physical and/or environmental constraints. Previous research has indicated that factors affecting the accessibility of people with disabilities include architectural elements within health care facilities [12], medical equipment [13–16], and the degree of understanding of disability in health care facilities staff [14]. Further factors associated with disability can negatively affect an individual's health care. This is evident in the health promotion policy of South Korea. Article 1 of the National Health Promotion Act, which was enacted in 1995, states "The purpose of this Act is to improve the health of the citizens by providing them with the correct knowledge about health with which they can enhance the awareness of the value of and develop a sense of responsibility for health, and by creating a given condition where they can spontaneously lead a healthy life." In other words, it means that individuals can acquire various health-related information provided by the national healthcare system to prevent them from being managed [17, 18]. However, due to the abovementioned problems of accessibility [12–16], combined with low levels of health literacy due to the low educational level [1], and issues relating to compliance, people with disabilities may experience problems in acquiring health-related information, and this can make management difficult. In addition, the health promotion policy which mainly focuses on people with disabilities in South Korea remains at the same basic level as the production of relevant statistical data [4]. Therefore, it is very important for the national policy to promote the health of women with disabilities across all age groups located in this blind spot of South Korean health care.

1.2. Self-rated health

Self-rated health is an individual's subjective, internal judgment of their health and psychological status. Self-rated health may predict mortality as found in major health surveys such as the National Health and Nutrition Examination Survey and National Health Examination Follow-up Study in the United States in the 1990s [19, 20]. Since then, the importance of self-rated health has increased in various fields of study, including not only mortality rates but also in assessing the outcomes of clinical treatment, and satisfaction with the use of medical services after treatment [21–23]. The further advantages of assessing subjective health status include the potential to identify internal information, which may be affecting the current health status of an individual [24], and that the questions required to identify current health status are simple to complete. Thus, this method is very useful for understanding the health status of socially vulnerable groups such as the elderly and the disabled with low accessibility to medical facilities and/or health-related information [20, 25, 26]. In South Korea, 53.4% of the total disabled population, and 63.3% of women with disabilities have negative perceptions about their self-rated health status [1]. Nevertheless, research on the self-rated health of women with disabilities is very limited.

1.3. Self-rated health and social capital

Over the past two decades, various researchers have looked at social capital as a major factor influencing self-rated health [27–31]. This concept of social capital is based on the definitions provided by Putnam (1993) and Coleman (1994). According to Putnam (1993), social capital is a micro level concept aimed at improving the efficiency of society by facilitating coordinated actions [32]. Coleman (1994) on the other hand, defines social capital as a macrolevel concept aimed at improving the efficiency of society by facilitating coordinated actions [33]. Measures of social capital based on these definitions have focused specifically on "trust" within the context of interpersonal and intergroup relationships. For instance, interpersonal trust has been assessed by asking questions, such as, "Generally speaking, would you say most people can be trusted? [30]," "[Can] most people can be trusted [31]," and "Generally speaking, would you say that most people can be trusted, or that you can't be too careful? [29]." On the contrary, intergroup trust has been assessed by asking questions, such as, "Would you say that most of the time people try to be helpful, or are they mostly looking out for themselves? [30]" and "How much can you trust people [31]."

However, although the notion of social capital focusing on trust considers the role of interpersonal or intergroup factors, it does not take into account the actual conditions under, which such trust can be formed [26]. What does actual condition mean that trust can form here? According to Bourdieu (1986), social capital should be defined as "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition […] these relationships may exist only in the practical state, in material and/or symbolic exchanges which help to maintain them [34]." Therefore, to examine the actual conditions in which trust can be formed either within interpersonal or between intergroups, it is necessary to consider the "field [34–36]" in which these activities are specifically carried out, that is, everyday life [26].

1.4. Everyday life for women with disabilities

This study focused on the outdoor activities of women with disabilities in order to examine an area of everyday life for which the social capital of South Korean women with disabilities could be assessed. In the case of people with disabilities, external activities are restricted unless necessary due to the physical and environmental constraints [26, 37]. According to the Korea Institute for Health and Social Affairs (2014), the major outdoor of activities of South Korean women with disabilities are (1) commuting to school and commuting to work (30.8%), (2) walking and exercise (26.0%), and (3) seeking medical consultation (13.0%) [1]. Therefore, this study focused on women with disabilities who commute to work within the economically active population (age range 18–60 years old). This was based on the fact that this is one key area of everyday life for women with disabilities. The purpose of this study was to investigate the relationship between social capital (i.e., social action, interpersonal relationships, and trust) and self-rated health, in the everyday life of South Korean women with disabilities. Specifically, we hypothesized that greater social capital would be associated with better self-rated health.

2. Method

2.1. Data and sample

In this study, we used data from the panel survey of employment for the disabled (PSED) in South Korea, with a specific interest in the major everyday life areas of women with disabilities concentrated on economic activities. The PSED is a survey of the panels representing the people with disabilities in South Korea and a longitudinal survey that conducts follow-up surveys every year from 2008 to present. Basic data on the participation of people with disabilities in the labor market were obtained. The survey included demographic characteristics, disability characteristics, economic activity status, waged/non-waged work/unemployment, effort and support for employment, vocational ability, employment attitude and environment, daily life, and quality of life. We used the survey data of the 8th PSED to examine whether social capital was related to the economic activity of women with disabilities. These data were collected from May to July 2015, and were collected from 3983 to 5092 registered people with disabilities aged 15–75 years old at the time of the survey [38]. The sample used in this study was first screened for the basis of economically active population age (18–60 years) among 1530 women surveyed, followed by self-employed (69), unpaid family workers (73), and economically inactive population (1113) were excluded from the survey. In addition, the total sample for the analyses was 275 women with disabilities who are paid worker.

2.2. Measures

The dependent variable was self-rated health. This was measured by the following question: "What is your overall health status at the moment?" Response options ranged from

1 (very poor) to 4 (excellent). The independent variables were the relating to the social capital of women with disabilities in the workplace, namely, ten factors that can give credibility to workers with disabilities. These were: job stability, working environment, working hours, personal development possibilities, communication and interpersonal relationships, the fairness of performance assessment, welfare benefits, training opportunities, acceptance and understanding of people with disabilities, and overall job satisfaction. Each variable was measured through the following questions: "How satisfied are you with the job stability of your current job?" "How satisfied are you with the working environment of your current job?", "How satisfied are you with the working hours of the job you are currently working on?", "How satisfied are you with the possibility of personal development in the job you are currently working for?", "How satisfied are you with communication and interpersonal relationships in the job you are currently working for?", "How satisfied are you with the performance assessment of the job you are currently working on?", "How satisfied are you with the welfare benefits of the job you are currently working on?", "How satisfied are you with the job training opportunities you are currently working for?", "How satisfied are you with the current acceptance and understanding of the people with disabilities of the job you are working on?", and "Given the overall details, how much do you satisfied with your current job?" In the original data, the response to each item was measured as 1 (very unsatisfactory) to 5 (very satisfied), but in this study, we re-coded these to 1 (unsatisfactory) to 3 (satisfactory) to reduce the number of cases difference between response groups. In the case of the performance assessment item, if there was no specific performance assessment system, it was judged whether the compensation system corresponding to the personnel affairs department was operated fairly [38].

The purpose of this study was to explore the relationship between social capital and self-rated health status of women with disabilities. Therefore, we focused on the differences in self-rated health status according to the level of thought and satisfaction of their job. To do this, we conducted one-way ANOVA to see whether the mean difference between the groups was statistically significant. Before performing ANOVA, it was verified whether the data for each variable met the assumptions of independence (the error between the population and the population is independent of one another), normality (the distribution of the population corresponding to each group is the normal distribution), and equal distribution (the variance of the population corresponding to each group is the same). The variables for understanding and acceptance of people with disabilities, and job stability were excluded from the final analysis because they did not satisfy the assumption of equal distribution.

3. Results

Analyses were conducted using SPSS 22.0, which includes descriptive statistics and one-way ANOVA analysis.

Table 1 shows the descriptive statistics results for the demographic characteristics of the study sample. In terms of type of disability, 152 were with external physical disability, 104 were with sensory disorder, 8 were with mental disorder, and 11 were with internal physical disability. With regards to educational attainment, 29 were received no education, 79 completed

Variable	M	SD		N (%)
Self-rated health	2.45	.62		
Average age	54	10.22		
Average income ($)	10,372	7551		
Type of disability			External physical disability	152 (55.3)
			Sensory disorder	104 (37.8)
			Mental disorder	8 (2.9)
			Internal physical disability	11 (4.0)
Education attainment			Uneducated	29 (10.5)
			Elementary	79 (28.7)
			Middle	47 (17.1)
			High	92 (33.5)
			College	28 (10.2)
Marital status			Unmarried	26 (9.5)
			Married	142 (51.6)
			Divorced	36 (13.1)
			Separation by death	65 (23.6)
			Separation	6 (2.2)
Working hours for one week[1]			Less than 18 hours	31 (11.3)
			18~36 hours	51 (18.5)
			More than 36 hours	193 (70.2)
Continuous service years			1–5 years	162 (59.0)
			6–10 years	66 (24.0)
			11–20 years	39 (14.0)
			21–30 years	5 (2.0)
			More than 31 years	3 (1.0)
Periodic job			Yes	29 (89.5)
			No	246 (10.5)
Contract of employment			Yes	79 (28.7)
			No	196 (71.3)
Regular work			Yes	69 (25.1)
			No	206 (74.9)
Possibility of continuous work			Yes	69 (25.1)
			No	206 (74.9)
Total				275 (100.0)

[1] Based on the week before the survey.

Table 1. Demographic data and descriptive statistics for the sample.

Variable	Group	M	SD	F	P	Scheffe
Working environment	Dissatisfied group(a)	2.21	.550	5.594	.004*	—
	Normal group(b)	2.39	.613			
	Satisfaction group(c)	2.59	.564			
Working hours	Dissatisfied group(a)	2.35	.629	6.663	.001*	b < c
	Normal group(b)	2.33	.638			
	Satisfaction group(c)	2.61	.572			
Personal development possibilities	Dissatisfied group(a)	2.26	.727	7.291	.001*	a < c
	Normal group(b)	2.42	.597			
	Satisfaction group(c)	2.72	.536			
Communication and interpersonal relationship	Dissatisfied group(a)	2.31	.208	6.242	.002*	b < c
	Normal group(b)	2.34	.051			
	Satisfaction group(c)	2.61	.054			
Fairness of performance assessment	Dissatisfied group(a)	2.10	.553	9.371	.000*	a,b < c
	Normal group(b)	2.41	.613			
	Satisfaction group(c)	2.71	.589			
Welfare benefits	Dissatisfied group(a)	2.20	.586	14.553	.000*	a < c
	Normal group(b)	2.46	.623			
	Satisfaction group(c)	2.74	.538			
Training opportunities	Dissatisfied group(a)	2.11	.614	11.768	.000*	a < c
	Normal group(b)	2.45	.599			
	Satisfaction group(c)	2.78	.584			
Overall job satisfaction	Dissatisfied group(a)	2.07	.616	7.398	.001*	—
	Normal group(b)	2.38	.631			
	Satisfaction group(c)	2.62	.567			

*p < .005.

Table 2. One-way ANOVA results by group (dissatisfied, normal, and satisfied).

elementary school, 47 completed middle school, 92 completed high school, and 28 completed college. For marital status, 131 were unmarried, 142 were married, 36 were divorced, 65 were separation by death, and 6 were separation. Regarding working hours for 1 week, 31 were less than 18 hours, 51 were between 18 and 36 hours, and 193 were more than 36 hours. In terms of continuous service year, 162 were between 1 and 5 years, 66 were between 6 and 10 years, 39 were 11 and 20 years, 5 were between 21 and 30 years, and 3 were more than 31 years. With regards to periodic job, 29 responded "yes" whereas 246 responded "no." For contract of employment, 79 responded "yes" whereas 196 responded "no." Regarding regular work, 69 responded "yes "whereas 206 responded "no." In terms of the possibility of continuous work, 69 responded "yes" whereas 206 responded "no." Regarding the average age and average annual income were 54 years old and 11,072,600 Korean won (KRW; equivalent to $ 10.372 USD), respectively. In terms of descriptive analysis for the key variable, the average for self-rated health was 2.45 (SD = .62).

Table 2 shows the results of the one-way ANOVAs. We analyzed whether, there is a statistically significant difference in the mean value of self-rated health status according to the level of thought and satisfaction of their job. As a result, there were statistically significant differences in the mean value for self-rated health according to all analyzed variables, that is, working environment of the employment of the women with disability ($F = 5.594$, $p < .004$), working hours ($F = 6.663$, $p < .001$), personal development possibilities ($F = 7.291$, $p < .001$), communication and interpersonal relationships ($F = 6.242$, $p < .002$), fairness of performance assessment ($F = 9.371$, $p < .000$), welfare benefits ($F = 14.553$, $p < .000$), training opportunities ($F = 5.594$, $p < .004$), and overall job satisfaction ($F = 5.594$, $p < .004$).

Scheffe tests were conducted to determine whether there were any differences between the groups for each variable (see **Table 2**). As a result, the difference in self-rated health status between the dissatisfied group (a), the normal group (b), and the satisfied group (c) of the overall satisfaction level of the working environment and the job was statistically significant. However, the comparisons did not show any differences between groups. For working hours, the self-rated health status of the satisfaction group was significantly higher than for the normal group ($b < c$). For personal development possibilities, self-rated health status was significantly higher for the satisfaction group than the dissatisfied group ($a < c$). For communication and interpersonal relationships, significantly higher self-rated health status was found for satisfied compared to the satisfaction group ($b < c$). For fairness of the performance assessment, the self-rated health status of the satisfaction group was significantly higher than in the dissatisfied and the normal group ($a, b < c$). For welfare benefits, self-rated health status was significantly higher for the satisfaction group than the dissatisfied group ($a < c$). For training opportunities, the self-rated health status of the satisfaction group was significantly higher than the dissatisfied group ($a < c$).

4. Discussion

The purpose of this study was to explore the relationship between social capital and self-rated health status as assessed in the activities of the everyday life of South Korean women with disabilities. These data were obtained from the national survey on persons with disabilities (2014), which mainly concentrated on economic activities [1]. Based on this, we examined whether there was a difference in self-rated health status according to the levels of job satisfaction and related variables as a measure of social capital in women with disability.

We found that working environment, working hours, personal development possibilities, communication-and interpersonal-relationships, the fairness of performance assessment, welfare benefits, training opportunities, and overall working satisfaction differed significantly in relation to the self-rated health status of women with disabilities.

In order to, investigate the difference of self-rated health status according to satisfaction level of each variable, Scheffe test was performed after dividing the response item of each variable into three groups of dissatisfaction, normal, and satisfaction. As a result, the difference in self-rated health status in terms of both overall working satisfaction and the working environment were significant, but there were no differences between the groups for these variables. This suggests that these variables are closely related to self-rated health status, but not in terms of the level of satisfaction. Personal development possibilities, welfare benefits, and training opportunities were found to be higher in relation to self-rated health status for the satisfied group than in the dissatisfied group. These variables may be associated with direct and indirect comparisons with peers, so the items in a variety of conflicts can be caused by it, to a higher self-rated health status of the satisfied group more than dissatisfied groups for each variable. For working hours, communication and interpersonal relationships, higher self-rated health was found for the satisfied group compared to the normal group. It should be noted here that the difference in self-rated health status between the normal group and the satisfaction group, rather than the dissatisfied group, was statistically significant. This may mean that dissatisfaction with working hours, communication-and interpersonal-relationships may lead to resignation or disruption in human relationships, which may be less relevant to current self-rated health status. It is important to note that these results may indicate that invisible conflicts (i.e., the application of flexible working systems considering the characteristics of disability, microaggression, etc.) that occur are closely related to self-rated health status [37]. For Fairness of performance assessment, self-rated health was higher in the satisfaction group than in the dissatisfied and the normal group. Responses to this item included whether the compensation system corresponding to the personnel affairs department was fairly operated if there was no performance assessment system to the job. This question thus considers whether respondents felt that evaluation and compensation were properly performed. It is worth noting here that even if the personnel department thinks that it is not fair (dissatisfied group) and fairly unfair or justifiable (normal group), it is closely related to the self-rated health status of women with disabilities.

Importantly, we found that social capital is positively associated with self-rated health, which is partially consistent with past study findings. Social capital may affect health behaviors through social control over divergent health-related behavior, such as trust between individuals, and reciprocity [30, 39–41], and has an influence on the self-rated health at the community levels [31]. In addition, social capital may influence health outcomes, psychological health, self-rated health [26–29], and mental health [42].

One limitation of this study is that the number of women with disabilities is relatively small for analysis. As a result, it has been difficult to determine the extent and causality of the relationship between social capitals on the self-rated health status of women with disabilities. A further limitation is that we did not take into account the types of disability or various types of jobs undertaken by women with disabilities. Subsequent studies should consider such variables in order to more specifically examine the relationship between social capital and self-rated health status of women with disabilities.

5. Conclusion

South Korea's unequal gender role recognition based on patriarchal Confucian values still exists today. As a result, women in South Korea are experiencing various conflicts and problems that arise between the role of domestic work traditionally demanded of them, and the new role of wage labor required by modern capitalist society. This double distress has a very negative effect on the health status of South Korean women [4, 5]. Nevertheless, despite the impact of these stressors on women, health policy in South Korea mainly focuses on maternity issues, specifically, pregnancy and childbirth [4]. In addition, their disability characteristics can have a negative impact on the most basic conditions for their health care, such as access to health care facilities or the acquisition of relevant information. Moreover, the health promotion policy, which mainly focuses on people with disabilities in South Korea remains at the same basic level as the production of relevant statistical data [4]. Thus, women with disabilities in South Korea are experiencing the triple distress of domestic work, wage labor, and disability, which means that women with disabilities in Korea are located in vulnerable areas of health care. Considering this situation, it is the most realistic and timely alternative for improving the health of women with disabilities in South Korea by examining the self-rated health status and social capital factors influencing it.

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Conflict of interest

No potential conflicts of interest are reported by the authors.

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Chapter 9

Dilemmas and Impasses in Public Health Policies Directed at People Who Make Use of Alcohol and Other Drugs in Brazil

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Additional information is available at the end of the chapter

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Abstract

The first Brazilian public policies directed at people who make use of alcohol and other drugs focused on criminalization and punishment. In 1932, medicine and its strategies of governmentality began to work within this field. The Penal Code of 1941 brought the ideal of abstinence to the Brazilian public arena, which was then broadly disseminated by the legislation up until 2006, when a new mental health policy began to be implemented for this population. In this chapter, we analyze the tensions between models that focus on care and those that have a safety perspective in programs for users of alcohol and other drugs in the central region of the city of São Paulo. We analyzed public domain documents: documentary material on the legal landmarks of policies; revision of literature; and news in Brazilian media about governmental actions in this area. Results of the analysis indicate that the tension between harm reduction models and the abstinence model persisted in governmental actions over the years. Regarding the central region, there was a diversification in the offer of treatment models and approaches. But these models took form as a market dispute: for sellable goods, employability of professionals, and the interests of the pharmaceutical industry.

Keywords: Brazilian public health, alcohol and other drug policies, harm reduction, abstinence, mental health

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1. Introduction

Brazil is a South American country with continental dimensions and a population of over 208 million inhabitants, in a territory of 8,516,000 km^2 divided into 5 regions, 26 states, and 1 federal district where the capital is located. Its population of young people between 14 and 29 years of age is of approximately 51 million. This vast territory is made up of big cities and 5570 municipalities [1].

Portuguese colonization began in 1500, and although independence took place in 1822, the country did not become a republic until 1889. Throughout history, democracy in the country suffered many ruptures, with the last military government lasting over 20 years; the Federal Constitution of 1988 was a landmark for the country's new political organization. Portuguese is the official language, and completely hegemonic, spoken in all regions, but there is a vast ethnic and cultural diversity. Within the last decade, Brazil has rated among the biggest world economies, ranging between seventh and ninth place. With commodities sought by the international market, besides biodiversity reserves and large cities, Brazil can be considered an economic powerhouse, although one with structural difficulties and international interests that block development. Minerals, oil, agriculture, livestock farming, the energy sector, the automobile industry, aviation, and other goods make up the large internal and external offer of the Brazilian economy, with bilateral trade on all continents.

In a country marked by deep social inequality, with a heritage of traits that trace back to colonialism, slavery, and authoritarianism, the 1988 Federal Constitution—a result of a number of social movements—was a milestone for the new democratic political order of the nation, instituting an increase of processes that guarantee and give access to rights, especially in regard to social policies, such as in the case of the Brazilian Unified Health System (Sistema Único de Saúde—SUS). The movements known as sanitary reform and psychiatric reform soon became an international reference [2] and their establishment took place amid disputes between segments defending State actions in health and segments defending private sector health care.

In the field of policies relating to the use of alcohol and other drugs in Brazil, it is possible to observe two lines of state actions. One, punitive, which focuses its actions in the public safety arena, and another, in public health, which prescribes treatment and health-care actions for those who make problematic use of alcohol and other drugs. In this chapter, our aim is to discuss the tensions and polarizations between different health-care models, both those guided by the perspective of reducing harm and those guided by an ideal of abstinence and safety, using as a basis health-care actions aimed at people who make use of alcohol and other drugs. We present as an *analyzing event*[1] the actions undertaken over the past 4 years in the Luz neighborhood in the center of São Paulo, an area known as Crackland ("Cracolândia"), when different intervention programs were set up "competing" for the local population and drug users. Two programs are the focus of this analysis: the Open Arms Program (Programa de

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[1] Analyzing events: critical events that allow a clarification of the forces at play in a determined situation, as well as arguing for certain naturalizations [3].

Braços Abertos), implemented in 2013, developed by the municipal government, and the Fresh Start Program (Programa Recomeço), also implemented in 2013 and developed by the state government.

From a methodological point of view, we used the following strategies: (1) revision of legal regulations that refer to mental health policies and drug policies, aiming at understanding the Brazilian panorama. These are public domain documents available in the databases of the ministries of Health and Justice. We focused on documents from the period between 2006 and 2013, when the country underwent changes in drug legislation, as well as outlining care relating to alcohol and other drugs within mental health policies (2) revision of literature on governmental actions carried out in the city of São Paulo, in particular the research conducted by public agencies on the impact of service programs and media news on the actions developed by the territory's government. In this manner, the chapter was developed with basis on a revision of literature with the introduction of an analytical angle derived from this institutional analysis—the analysis of critical events that allows for a clarification of the power plays at work in a determined situation, as well as arguing for certain naturalizations [3].

We shall begin by presenting a brief historical overview of policies and laws that relate to drug use in order to situate within history how actions of welfare, health care, and safety became part of the governmental agenda. Next, we shall present the perspective of the prevailing Brazilian health policies so as to demonstrate the ramifications of this perspective within the programs developed in the municipality of São Paulo. We present a contextualization of the area where the programs are developed, and of how the public powers intervened with the neighborhood's population by means of government strategies over the past decades, producing disputes and tension between the models that guide these actions.

2. Brief historical overview of the laws and public policies that relate to the use of alcohol and other drugs

The first policies and laws that relate to drug use in Brazil were guided by the punitive model and configured within the field of public safety. In 1830, the Municipal Chamber of Rio de Janeiro established a court fine for the *"vagrant blacks"* that were caught smoking marijuana, and in 1890 the Brazilian penal code expressed, in an explicit manner, the prohibition of the use of substances considered poisonous, stating the need to create complementary guidelines [4]. In 1932, the sphere of health was incorporated in the Brazilian legal framework relating to drug use. From then on, as medicine and its sanitary model for society began to influence and guide Brazilian legislation in a number of sectors, it is possible to observe a link between those heath policies that prescribed treatments, often guided by the ideal of abstinence and social isolation by means of hospitalization, and legal mechanisms of repression and prohibition of drug use in many of the laws and public policies relating to the use of drugs [4, 5].

The policies that derived from international conventions and American politics, denominated "war on drugs", which started in the 1970s and were broadened in the following decades, also had a lot of influence upon the legislation, policies, and programs proposed by the Brazilian government. It is worth pointing out that, between 1964 and 1985, Brazil was under a military dictatorship marked by governmental actions that repressed individual and collective rights. Within this context, Law 6.368/1976 was approved, which talked *of the measures for prevention and repression of illegal traffic and the improper use of intoxicating substances or those that create physical or psychic dependence, and other provisions.* The principles that guide this law in its different articles are guided by the idea of repression, criminalization, and social exclusion, since the treatments it advocates are centered upon incarceration and isolation, as demonstrated by article 9 of the aforementioned law: *The health care networks of the States, Territories and Federal District will count on, whenever necessary and possible, suitable establishments for treating those dependent on the substances referred to by the present Law. §1 While the establishments referred to in this article are not created, the existing network will adapt units for this purpose* [6]. This law made possible the proliferation of so-called *therapeutic communities* in Brazil, which are private services managed by civil society entities, generally linked to religious institutions, that adopt hospitalization, social isolation, and abstinence as their main treatment strategies for drug users [5].

In 2002, a new law comes into effect, Law 10.409, but due to a number of unconstitutional aspects and technical deficiencies, it was vetoed in many aspects, with only its procedural part put into action. Thus, Law 6.368/1976 was still valid in regard to its penal aspects. In this manner, this law remained in place for over 30 years, or in other words, it guided both governmental and civil society actions and programs, as well as the development of a mentality about treatments and health issues relating to people who make use of drugs, until in August 2006 Law 11.343 was set in place, revoking both previous laws. This law introduced the novelty of non-incarceration sentencing in cases of drug possession for own use, and included the availability of health treatment for users.

Over the last 30 years, Brazil went through many transformations, especially in the field of health. Since the 1970s, different civil society groups, such as health care professionals, women's groups, academics, and social movements fighting for housing rights gathered under a banner of *sanitary reform* that fought for changes in how health care was organized in the country. This movement was responsible for elaborating and discussing proposals during the 8th National Health Conference in 1986, which established the principals and guidelines for health care that would be included in the 1988 Constitution, as well as the basis for the Brazilian Unified Health System (SUS).

Thus, during the country's re-democratization process, health care was acknowledged as a right of all citizens and a duty of the State, and SUS, created in 1990, has as its principles universal access, integrality, and equity, which means it is a system where processes of health and sickness are understood to be a result of social determinants of health such as poverty, housing, and others. Within SUS, everyone has access to public health services, and these services seek to guarantee that different people have their needs attended to [2, 7]. This has meant a profound reorganization of health services and the supply of health care in Brazil, reaching all levels of care, a diversity of professionals, and public and private institutions, and moving an immense productive chain within national development, while employing an economically active population in Brazil. With all this repercussion, it is not hard to interpret that the construction of this system is proving to be durable and extensive.

In the field of mental health, the anti-mental institution movement and the fight for a society without mental asylums that took place in the 1980s and 1990s were crucial for the reorganization of services and approval of Law 10.216 in 2001. This law established new parameters for mental health care, investing in structuring a public network of mental health care services, including the establishment of the Psychosocial Care Centers (Centros de Atenção Psicossocial—CAPS). Following on from the new law, the Ministry of Health created the National Policy for integral care for users of alcohol and other drugs [8]. This policy is clearly guided by the harm reduction model, and allows for the implementation of a specific care network for those who make use of alcohol and other drugs, named CAPS-AD [5]. These centers basically perform outpatient care and group activities, taking treatment possibilities beyond psychiatric care, since they include other health-care professionals and focus on social reinsertion. This policy breaks with exclusionist hospitalization strategies and highlights the importance of the following principle in public health: *The offer of care for people who present problems due to the use of alcohol and other drugs should be based on mechanisms for specialized psychosocial attention taking place outside hospitals, duly connected to the mental health care network and to the rest of the health network. These mechanisms must make deliberate and efficient use of the concepts of territory and network, as well as a broader logic of harm reduction, carrying out an active and systematic search for the needs to be attended to, in a manner that is integrated with the cultural environment and community within which they are inserted, and according to the principles of the Psychiatric Reform* [8].

But, as in Brazil, the matter of use of alcohol and other drugs has always been on the agenda for health-care and public safety organizations, in 2005 the National Office for Policies About Drugs (Secretaria Nacional de Políticas Sobre Drogas—SENAD), connected to the Ministry of Justice, established the National Drug Policy (Política Nacional sobre Drogas—PND), which—despite including the strategy of harm reduction—brings back the possibility of hospitalization as treatment, whether in therapeutic communities or psychiatric hospitals: *Promote and guarantee the coordination and integration, in a national network, of interventions for treatment, recovery, harm reduction, and social and occupational reinsertion (primary care centers, outpatient centers, CAPS, CAPS-AD, therapeutic communities, groups for self-help and mutual aid, general and psychiatric hospitals, day hospitals, emergency services, fire department, specialized clinics, support and community centers, and assisted living) within the Brazilian Unified Health System and the Unified System of Social Care, for the user and their family, by means of decentralized distribution and the monitoring of technical and financial resources* [9].

The Ministry of Health was responsible for the introduction of a public health policy and a code of ethics for care when dealing with drug users. As a guardian of sanitary reform, the Ministry implemented the first support programs in mental health for users who had difficulty with social insertion; program benefits included payment of one minimum wage, and support for families and users in order to help them return home. As from 2010, with the elaboration and implementation of the project *Crack Plan, it's possible to win* (*Plano Crack, é possível vencer)*, the funding for hospitalization has grown in all Brazilian capitals. The triad of prevention, care, and authority, despite the proposal of integration, emphasized funding for a return to psychiatric hospitalization and security measures. Coming from a different perspective, the Oswaldo Cruz Foundation (FIOCRUZ) created in 2014 a program for alcohol, crack, and other drugs, taking actions beyond crack, which had been chosen by the federal government as the banner of the fight, though not without criticism from sectors already working with integral care for users. This institution, besides working on training network professionals, carried out a large survey project in Brazil, the *National Survey on Use of Crack—Pesquisa Nacional sobre o Uso do Crack* [10] which brought a new dimension to crack addiction, indicating less use than had been propagated in the media and presenting a user profile according to aspects such as gender, age, education level, occupation, and patterns of usage.

Implementing the principles and administrative directives that guide SUS, in other words, decentralization, regionalization, hierarchy, and community participation, is a complex task, due to multiple factors such as the country's territorial extension, regional differences, and political, social, and economic issues

Decentralization of actions in health is one of the administrative directives that, in the day-to-day application of measures, seeks to involve all three levels of government: federal, state, and municipal. According to [11]: *The Federal Constitution of 1988 made it so that Brazil became a peculiar case of a Federation with three entities considered primary parties within the pact: Union, states and municipalities—only Belgium and India give local power a similar status. Indeed, one could observe a greater political, administrative, and financial autonomy of municipalities in regard to the previous period, followed by a decentralization of resources and attributions.*

Thus, responsibility fell to the federal government to formulate and follow up on the execution of national health policies, while the states were responsible for more complex services, besides the management, formulation, and coordination of some policies, and the municipalities took responsibility for executing actions and offering direct services. In this manner, the three public spheres participate in the national policy and its execution with distinct responsibilities, either set out by the legal system or pressured into it by the law.

As from 2006, the construction of the new policy within the national plan brought, on one hand, directives that indicated a need for a new posture in regard to user care; on the other hand, setting the programs in place highlighted that there were still indicatives and financing issues that allowed for a questioning of actions and the resurgence of religious and philanthropic institutions that turned to user care, choosing to trust in confinement and isolation, with little social insertion, and that competed for public resources.

The new policy presented prevention, care, and authority as lines of action, taking into consideration an approach centered upon construction of the person as a subject of rights, upon humanization, and upon the establishment of links within the service network, the family, and the community. The introduction of public programs and statutes for professional training took place all over Brazil, with regional reference centers implemented in the states supported by the vast network of public federal universities that worked with professional training for intersectoral services. The reach of this policy was initially extensive. The mental health care network was widened by psychosocial care centers, therapeutic residential units, street clinics, and specialized reference centers, strengthening deinstitutionalization as a movement for the creation of new mechanisms and therapeutic spaces.

However, the service network could not cope with user monitoring and care. There were also a growing number of religious therapeutic communities that still had no direct support from the public powers. This phenomenon was strengthened by a rise in parliamentary representatives linked to religious institutions. This context provoked a change in how drug policies were carried out. The Ministry of Health had established guidelines from a human rights perspective, adopting criteria and regulations for the implementation of health care services that respected access and integrality in their actions. The Ministry of Justice took on drug policies in 2011 by means of the National Office for Policies About Drugs (Secretaria Nacional de Políticas sobre Drogas—SENAD). The guidelines continued, but a growth was observed in programs that came under the responsibility of religious institutions. In 2015, with presidential changes due to impeachment, new managers took over the ministries of Health and Justice, promoting the implementation of a new policy that focused on treatment of chemical dependency, compulsory hospitalization, and religious therapeutic communities.

On an international level, a debate was gaining ground, especially after the creation of the *Global Commission on Drug Policy* in 2011, made up of former Heads of State and specialists, and which contested the war on drugs as an efficient combat policy, indicating by means of studies and statements a different path to tackle the drug problem. In the Commission's first report, with the title *War on Drugs*, released in June 2011, the organization proposed 11 recommendations to substitute the criminalization and punishment of drug users for an offer of health services, support, and treatment of users, besides highlighting the need to advance in regulating psychoactive substances. Commissions linked to the UN, such as the *Expert Committee in Drug Dependence* and the *International Narcotics Control Board*, were still focusing on the classification of narcotics as forbidden and ignoring research and the cumulative knowledge of the World Health Organization (WHO).

3. Tensions between health-care models within the same territory: the Cracolândia case

The arrival of crack in the urban landscape of São Paulo[2] dates back to the 1990s, and the establishment of public sales and usage zones gradually turned the so-called cracklands into symbols of immorality, abandonment, and demonization; this legitimized, as from 2010, the compulsory rounding up of the street population, making social and urban exclusion invisible and becoming a historical process connected to the aggravation of the social inequality that resulted from urban expulsion and economic and social segregation.

In the 1960s, before the central region of São Paulo became infamous for the commerce and use of drugs and crack, prostitution was the main target for police actions in the area. Initially protected by territorial confinement, the neighborhood engaged in an ever-changing game between the tolerated, the permitted, and the repressed [11]. As from the 1950s, however, with the city's growth and urban development, the grouping of licit and illicit activities surrounding this practice would migrate to other nearby territories [12], and this area would become a constant target for police and urban interventions aimed at "re-qualifying" the region, besides

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[2] For this contextualization about territory and the "Operação Sufoco" we based ourselves on the text [34].

the "mega operations" that often occurred, gathering different public departments to combat irregularities and illegalities in the neighborhood.

Following this track, the 2000s brought the Nova Luz project, predicting a radical transformation of the neighborhood, declaring the region as a public-use area[3] and attracting investments, by means of fiscal incentives. By proposing the demolition of existing buildings for the reconstruction of the neighborhood [13], the "New Luz" went from social blight to highly valued real estate. Based on the idea of "urban rebirth", this legitimized the expulsion of certain social groups from decadent regions of the city, especially the poor and homeless population, often by violent and repressive means[4]—a process that took place in a number of metropolises and is known as *gentrification* [14]—and with the State and businesses as the main agents, in public-private partnerships. However, this process incurs disputes [15], offering resistance to the logic of urban segregation, whether this takes the shape of social movements and neighborhood associations[5], or whether simply due to the determination of those who frequent the region to remain, despite repressive measures.

Thus, as signaled by different scholars [16, 17], it is a case of considering the so-called crackland less as a specific geographic location within the city and more as an "itinerant territoriality": a dynamic constantly instituted within the relationships established with the city by those who are marginalized and living with illegality, determined by the force applied by repressive mechanisms of the public powers and the resistance strategies of the users.

The year of 2012 began with "Operation Suffocation" ("Operação Sufoco"), "an integrated action involving State and Municipality to rescue people in vulnerable conditions, fight drug traffic and create a suitable environment for social areas", with three phases: "consolidation of the area", predicting actions by the Military Police of the State of São Paulo and the Metropolitan Civil Police to control and occupy the area, promoting arrests of drug dealers, users, and fugitives from the law; "social action", that, at a second moment, would initiate welfare and health care; and "area maintenance"[6].

The state coordinator of Drug Policies from the State Department of Justice and Defense of Citizenship (Secretaria de Estado da Justiça e Defesa da Cidadania) justified these actions:

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[3] The conflicts surrounding Nova Luz and the resistance organized around the actions were vividly reported in the documentary *Luz*, part of the project Museo de Los Desplazados, of the artistic collective LeftHandRotation. Available at: <http://vimeo.com/32848727>. Accessed on: 19/January/2014.

[4] The dossier published by the Centro Vivo Forum (2007) denounces a number of rights violations that indicate social hygiene as the predominant policy of government actions, especially under mayors José Serra and Gilberto Kassab (2005–2012). This points to a lack of housing policies in the center of the city and, consequently, the relocation of the poor population to the outskirts, including at times forced removal with collusion of the government and supported by police violence. Regarding the street population, the dossier mentions anti-homeless ramps; the closure of shelters in the center and their relocation to the outskirts; coercive measures with children; recurring expulsion actions with regards to street dwellers and "urban cleansing", the famous "*rapa*" [35, 36].

[5] One result of the resistance that emerged was suspension of the Nova Luz project, by court order, in January 2012, and re-elaboration of the project by mayor Fernando Haddad (PT), in 2013. ("Haddad shelves Kassab's plan for Luz". *Folha de São Paulo*, 24/January/2013).

[6] Military Police of the State of São Paulo. *Operação Integrada Centro Legal*. Available at: <http://www.policiamilitar. sp.gov. br/hotsites/centrolegal/index.html>. Accessed on: 15/December/2012.

> The lack of drugs and the difficulty caused by attachment to them will make people seek treatment. How can you lead users to treatment? Not by reason, but by suffering. Those seeking help are those who cannot stand that situation any longer. Pain and suffering make people reach out for help [18].

As soon as the operation began, accusations of police abuse, aggression, and violation of rights began to multiply. In addition, the practice of involuntary or legally mandated hospitalization of users intensified. The right to life started being used as a justification for the suppression of the capacity of users to determine their own lives. Such is the interpretation published by the Brazilian Psychiatry Association (Associação Brasileira de Psiquiatria), defending the need for hospitalization without patient consent:

> Freedom has limits. What has no limits and is unquestionable is the right to life. Even if, to fully exercise this right, the citizen must relinquish freedom for a period of time.[7]

Within medical knowledge, there is evidence of different prescriptions and ethical positions on the issue:

> There is no scientific support signaling that dependency treatment should be preferably carried out by means of hospitalization. Paradoxically, hospitalization that has been badly conducted or erroneously recommended tends to generate negative consequences. In the case of compulsory hospitalization, relapse rates reach 95%! In general, the best results are those obtained by means of outpatient treatment [19].
>
> You have to care for those people who are always on the streets (due to abusive use of crack). This [involuntary/compulsory hospitalization] is an act of solidarity and not private imprisonment [20].
>
> It is important to underline that what was being debated was not the possibility of involuntary and compulsory hospitalization, since these approaches are listed in the Psychiatric Reform law [21] as therapeutic tools to be recommended as exceptions, being popular practices in mental health. The controversy was focused on mass involuntary hospitalization as a form of treatment. Thus, Operação Sufoco was already marked by heterogeneous discourses and practices set in motion by governmental actions, with homeless chemical dependents described either as undesirable segments or the subjects of rights [17]. In addition, if these hospitalizations were proving a failure in terms of connection to hospitalization services, the offer of street side care—by both social welfare and health care teams—was also impaired by the operation. The professionals working in the region reported that, with the migration, they lost contact with many users and that these became more reactive and resistant to their efforts, identifying them with the repression carried out by the government.

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[7] "Internação compulsória e direito à vida". *Correio Braziliense*, 06/March/2012. Available at: <www.correiobraziliense.com.br>. Accessed on: 12/December/2014.

At the end of 2012, when Operação Sufoco was completing a year and showing signs of failure, since it was clear that Cracolândia had survived and the use and sale of drugs in the Luz neighborhood persisted, a new intervention was created, focusing on making more beds available for treatment of this population. The year of 2013 began with a cooperation agreement signed by the State Government, in partnership with the Ministry of Public Prosecution and the Brazilian Bar Association (as well as the Public Defender's Office, which joined the effort despite not being mentioned in the agreement), looking at setting up a legal office at the Reference Center for Tobacco, Alcohol and Other Drugs (Centro de Referência Tabaco, Álcool e Outras Drogas—CRATOD), a health care unit in the Luz region, bringing together doctors, judges, and lawyers in order to "accelerate procedures for the process of compulsory hospitalization (predicted by law), in order to protect the lives of those who need it most"[8].

Reigniting conflicting interfaces with mental health, the Judiciary, by inaugurating a sort of "special court", added tension to the divergences on the compulsory nature of these hospitalizations occurring with the justice system itself, bolstered by an alignment of the networks regarding the cases. By operating as an administrator for hospital beds, this sets up hospitalization as a primary response that is often fundamentally repressive-punitive in character. In this manner, the scene is set for complex relationships between distinct ethical-political concepts relating to the street population, where hospitalization is lauded as the answer to social misery and to the threat posed by certain segments, contrasting with the viewpoint that defends life and rights. The acts of social expulsion and taking people off the streets are backed by the use of logics by health care services that back repression and incarceration, such as penal-sanitary logics [22], even if these are in constant tension with practices that seek to establish care within the territory and in networks of protection.

Two cases in Brazil's largest city highlight these tensions in care models. The years of 2013 and 2014 would bring new modulations. The Fresh Start Program (Programa Recomeço)[9], launched by the São Paulo state government in 2013, leant on the integrated work of the Judiciary and Executive powers in order to facilitate medical treatment and hospitalization. Operating with the legal office created at the CRATOD, the program aimed at paying R$ 1350 per user hospitalized at associated entities, most of which were therapeutic communities, with a total monthly investment of R$ 4 million in what became known as the "bolsa-crack" (crack stipend)[10]. The program adopted the punitive perspective of a "world free from drugs" and a metaphysical-religious view of its subjects, as can be seen in a fragment of the "message" from the communications office of the State Department of Justice and Defense of Citizenship of São Paulo to its beneficiaries, available on the Programa Recomeço site: "May God preserve you in his image and likeness.

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[8] "Entenda o que é internação compulsória de dependentes químicos". *Portal do Governo do Estado de São Paulo* [online]. 29/January/2013. Available at: <http://www.saopaulo.sp.gov.br/spnoticias/lenoticia.php?id=225,660>. Accessed on: 29/April/2013.

[9] Joint action by the Department of Health, Department of Social Development, and Department of Justice and Defense of Citizenship.

[10] "Cartão para tratamento de usuário de crack custará R$ 4 milhões mensais". Tatiana Santiago. *Portal G1*, 09/May/2013. Available at: <http://g1.globo.com/sao-paulo/noticia/2013/05/cartao-para-tratamento-de-usuario-de-crack-custara-r-4-milhoes-mensais.html>. Accessed on: 12/December/2014.

This is our expectation for all who are working with us and for many others who depart this difficult path".[11]

In 2014, the new municipal government (Mayor Fernando Haddad, Partido dos Trabalhadores 2013–2016) "exchanges Sufoco for Open Arms"[12]. The Open Arms Program (*De Braços Abertos* —DBA)[13] introduced a "rights package" (housing, food, employment, and health), in the words of the national coordinator of mental health at the time, Roberto Tykanori Kinoshita. This placed focus not upon the drugs, but upon the subjectivities, the new groupalities, and the broadening of contractualities[14] of users [23], bringing tension to the actions already implemented and that were based on police and legal "compulsion".

The DBA, a name chosen by users and workers in assembly, was based on low-threshold treatment services[15] and inspired by successful international experiences in treating those in high vulnerability situations who make use of alcohol and other drugs, such as Housing First, in New York and Vancouver[16]. The program aims for the social rehabilitation of beneficiaries by means of job offers—sweeping, gardening, building maintenance, cosmetics and beauty, painting and sculpture, furniture restoration—with an income of R$ 15 for 4 hours per day of labor, paid weekly, as well as housing in hotels in the area and meal tickets for the Restaurante Popular program. Health treatment is encouraged, although not a condition for inclusion in the program, but on average 60% seek some form of health treatment. Over 450 people signed up and received benefits.

In fact, the complexity of care would be confirmed later by research carried out by the Oswaldo Cruz Foundation [6]: "The profile of crack users at scenes of usage is composed by 80% men, in the group of 20–30 years of age; 8 in 10 are black; 8 in 10 did not reach high school; 40% live on the streets; 49% came from the prison system."

As pointed out by [23], "the money received weekly for labor creates a new duration, forcing a distinct temporality from the immediacy of crack", and is used for personal hygiene products and

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[11] Link: http://programarecomeco.sp.gov.br/noticias/selo-recomeco-vai-recolocar-dependentes-quimicos-no-mercado-de-trabalho/

[12] "'Cracolândia' troca Sufoco por Braços Abertos", Carta Capital, 16/January/2015.http://www.cartacapital.com.br/sociedade/cracolandia-troca-sufoco-por-bracos-abertos-mas-ha-duvidas-sobre-novo-programa-6234.html. Accessed on 21/August/2015.

[13] The De Braços Abertos program began in January 2014, with actions coordinated by the municipal departments of Health (SMS), Social Assistance and Development (SMADS), Development, Labor and Entrepreneurship (SDTE), Urban Safety (SMSU) And Human Rights and Citizenship (SMDHC). ("Programa 'De Braços Abertos' completa um ano com diminuição do fluxo de usuários e da criminalidade na região", site of the Prefeitura de São Paulo, 16/January/2015).

[14] "Contractuality—The Contract with the Operation Work Program (Programa Operação Trabalho—POT) contributes to a rupture with the logic that is characteristic of drug use and addiction, lengthening the time between one moment of usage and the next. Work creates a new temporality in the life of program beneficiaries, who start to have new sources of satisfaction in their daily lives, besides perspectives for the future." [38].

[15] "Low-Threshold: the principle of not imposing abstinence as a condition for remaining in care, or for accessing the offered benefits." The expression literally means a low bar in terms of entry and triggers [27].

[16] "Housing First: intervention method already tested and evaluated in several countries of the world; proposes the offer of housing for people living on the streets and users who make intense use of alcohol and other drugs. Some international evaluations point to a reduction in consumption of alcohol and other drugs, of violence and, above all, of the supposed perception of urban disorder due to an excess of conflict on the streets [27].

clothing, injecting local businesses with over R$ 30 mil each week. From the perspective of harm reduction, the DBA encourages self-care and the guarantee of rights, within a mindset that is not only individual but also collective, and taking into account the singularity of choices and possibilities.

Recomeço and *De Braços Abertos* have opposing perspectives regarding models of health and assistance, the concept of subject, and the concepts of rights and public space. The two programs are rivals in competing for the "users" of the Luz region, not only in an ideological sense but also in terms of the physical space where their hospitality "tents" are set up, one facing the other, close to the region's flow of drug use and traffic[17].

As pointed out by [24], based on ethnographic studies from the Cracolândia region, a close look at these disputes in terms of treatment and intervention models (involving both the internal quarrels of the public and private entities that offer care for drug users, and the external forces that question the efficiency of their actions) allows us to perceive the complexity of this region, and signalizes that "the State, seen from its tip, or from its margins, is something much more complicated".

Indeed, if this antagonism aligns radically different destinies and lifestyles, especially for users, it must also be viewed in terms of urban space management. After all, even when recognizing the use of drugs as socially determined and integral to the concept of harm reduction, the national drug policy already demonstrated among its political and legal landmarks the "contradictory and veiled coexistence between two antagonistic perspectives" [24].

As put by [25]: "In each of these programs (and in the region of Cracolândia), there is a matter of the coordination of power mechanisms, guided by distinct logics, but which compose themselves and condition to a large degree the manners of circulation of these populations. These programs fix individuals and social groups to their places of implementation—the programs presume a territoriality, a fixing in place, of the populations classified as their target-audience and, at the same time, end up acting as gravitational poles for others arriving from other places. From one moment to another, they might find themselves obliged to set themselves in motion once again, in search of other hospitality points, due to the effects of repressive actions that operate from a logic of dispersion (liberation, "cleansing" of these spaces), often in the aftermath of the dismantling or deactivation of these programs by the acting governors".

These logics of *dispersion* and *concentration*[18] operate in a concerted manner, allowing comprehension of these places within a government rationality of urban populations and spaces, by

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[17] Name given by users to define the area of use in the Luz region.

[18] There was a moment of inflection in the forms of state management of the Cracolândia space after Operation Sufoco: from a dispersion rationality, that aimed to prevent gatherings of crack users by means of force (mainly by policing and the resulting "crack processions"), to a government logic based on territorial establishment, on concentrated space, and the multiplication of programs and services offering social assistance, health, and care. In this manner, a field of gravitation around Cracolândia is formed; especially in regard to the extremely poor population with precarious access to housing and employment, and that these subjects that install themselves in the area are made to move on as soon as the local establishments close, going to new locations where they find a possibility of settling [16, 27, 37, 38].

means of traffic management. The State defines and limits where people can or cannot remain according to situational scenarios and interests. These are triage points, from which, according to certain criteria, it is decided who enters and leaves: who may remain, who must be sent on, and to where, following a logic for distribution of people within urban space [16, 26, 27].

The logics of the programs, however, "are far from agreeing on fixed identities that capture individuals. In the liminarity between care and control, paths of escape emerge upon which the subjects glide (…)" [28]. Evaluative research on the DBA, qualitative-quantitative in nature, and conducted throughout the first semester of 2015, from the perspective of its beneficiaries, brings forth evidence that the program is "for the most part well evaluated by its participants and that, in fact, the public effort in offering employment, food, and housing has resulted in an improvement of objective and subjective conditions in these people's lives and in the general diminishing of the problematic consumption of crack" [29] although "the truculence of the actions coordinated by the Municipal Department of Urban Safety, which is an integral part of the DBA, is a permanent threat to the beneficiaries and to the public visibility of the program".

Despite the beneficiaries' desire for continuity of the program, and although research indicated important effects from the program, the waves of resentment, destruction, and production of despair that swept the country after the presidential impeachment in 2016 also brought a promise from the new mayor, João Dória[19], of ending the DBA and adopting in the municipality a program aligned with the already-existing Recomeço, named Redemption (Redenção).

By the end of the first year of the new administration, the manager of the Redenção program stated that they were not about to deny the advances and good ideas brought by the DBA, but let it slip, as pointed out by [25], that different mechanisms of power combine to create "governable spaces"—which also means spaces that are protected against the "undesirable behaviors" associated to these ineffable figures of all who are seen as risk carriers and threats to a certain regime of order and safety: in different manners according to circumstances, between use of coercion (and violence) and the policing of conducts, between punishment and "protection", between incarceration and "care".

4. Conclusions

This brief incursion into urban policies adopted under the urgency of "crack combat" indicates that policies aimed at the street population that were ushered in after 2010 exacerbated existing tensions between care and protection in policies for health care, welfare, and public safety. If,

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[19] João Dória, affiliated to the PSDB, was elected with 3,085,187 votes, corresponding to 53.29% of valid votes. Doria is the first mayor of São Paulo elected in the first round of voting since 1992, when elections began to have two rounds. He had as his main campaign marketing strategy his self-attribution as an administrator and not a politician.

on one hand, they strengthen care practices relating to the use of alcohol and other drugs, consolidating the "chemical dependent" in public policies and the allocation of specific funding, on the other hand, they do not always allow visibility of the complexity that gives rise to these processes, resulting from the combination of a diversity of demands and needs, and belonging to several spheres of interpretation and intervention for which there is no single or definite institutional solution.

Even though sanitation and roundup operations are not new within urban policies, the drug issue is placed in the field of health as central to management of the street population, re-establishing the duty of medical policing. Painted as a continuum of the "politics of pain and suffering", psychiatric hospitalizations as a primary response reinstall the mandates of protection of the social order and neutralization of the threat attributed to certain individuals. The idea of drug-related danger and the lack of capacity of users to overcome this become a motto to be disseminated in society. The epidemic was in the numbers presented and the discourse that supported them. Within this policy, medicalization as a strategy and process gains force among several social segments [30].

Heterogeneous, the health field tended toward, on one hand, the creation and investment in hospital beds for confinement, and on the other hand, itinerant care mechanisms (such as Community Health Agents, Harm Reducers, and Street Clinics), which widened the focus to include care strategies based on harm reduction and defending life [31]. Thus, the "itinerant" professionals reaffirmed the idea of health as a defense of dignity and social rights, counter to the assimilation of social control roles, such as "medical police" [23]. This tension still marks the policies created in Brazil in the last decades. If the homogeneity of the first decades of policies centered on abstinence and repression was a characteristic of the time, the novelty of the new policy brought a diversification of treatment models and mechanisms. These models persisted not as a planned offer based on the demands raised with users, but based on disputes such as market competition for sellable goods, professional employability, and the interests of the pharmaceutical industry.

Indeed, abandonment and vulnerability become dangerous when complexity stops being taken into account, working instead with single or fragmented institutional responses [32]. By pathologizing complex social demands, and defining them as risky, untreatable, and unrecoverable, we see a heightening of expulsion processes in the social field [33].

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The main aim of modern public health is to improve the quality of life and promote health for all. Public health deals with a wide range of individuals and collaborates with various organizations, departments, and agencies to improve health, forestall disease and promote well-being. The field of public health is constantly evolving in response to the needs of communities and populations that are facing demographic, epidemiological and technological challenges. To overcome these challenges, health professionals need to conduct research to generate evidence-based policies to improve the health of the community. Throughout the course of this book, a number of emerging and re-emerging public health issues from different countries are discussed and attempts are made to illustrate a balanced and evidence-based approach towards tackling major public health problems.

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