

ORIGINAL ARTICLE

From Past to Present: 100 Years of Public Health Practice in Trinidad

Abstract

The aim of this study is to map the chronological achievements of public health over the past 100 years in a small island state and to outline emerging themes.

A retrospective analysis of data was conducted from the published population and vital statistics reports of the Central Statistical Office for the period of 1953-2006, as well as all available published reports of the Ministry of Health. Data were also collected from the published reports of the Registrar General for the period of 1944-52.

The study demonstrated the sequence in which diseases of public health importance were eliminated; these included hookworm, smallpox, malaria, cholera, typhoid, yellow fever and the vaccine preventable diseases such as measles, mumps, rubella, poliomyelitis, diphtheria, tetanus and pertussis. In addition, for the first time the mumps epidemic of 2000-2003 was identified.

While much has been achieved over the past 100 years particularly with regard to infectious diseases, many challenges stand ahead. Hence, a highly trained and skilled PH workforce is required to confront a changing healthcare landscape, epidemics, rising expectations from clients, as well as to tackle key determinants of health.

Key words: Public Health practice, Public Health achievements, Old Public Health, New Public Health, evolution of Public Health

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Introduction

Trinidad and Tobago (TTO) has witnessed a long system of local government (LG) dating as far back as the Royal Cabildo established in 1768 by Spanish colonist. In 1797, TTO was ceded to the British, and LG continued in the municipalities of Port of Spain, San Fernando and Arima (Figure 1); however, the Port-of-Spain City Corporation was proclaimed the municipal authority of the city of Port-of-Spain by the Governor on June 25, by way of Ordinance 24 of 1914 and was established by the Legislative Council on June 26. Hence, in June of 2014, the Port of Spain Municipal Cooperation celebrated 100 years as an institution. Part of its remit is to maintain the Public Health (PH) of the Capital City as well as setting trends and exerting an influence on other parts of the country. Its core activities are enshrined in the Public Health Ordinance Chapter 12 No. 4 of 1952, which still remains as the only law applicable to Public Health practice (PHP). Thus, PHP in Trinidad has a long history, its organization is old and fragile, and like all other sciences must evolve with time as articulated by Rosen (1910-1977) in 1958; those changes in public health can be seen to mirror changes in the modern state¹.

1- Rosen, 1958.

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Figure 1. Map of Trinidad and Tobago showing proximity to Venezuela

The concept of a ‘new PH’ as distinct from the ‘old PH’ lies in its departure from the biomedical model of disease to the adoption of a social model of health which advocates a

multi-causal approach through the interaction of biophysical, social or psychosocial factors and the promotion of healthy lifestyles linked to behaviour and individual responsibility supported by government action². From the past 100 years onwards, PHP in TTO has been devoted to old PHP i.e. sanitary reform and 'healthy conditions', thus the landscape of public health over the past 100 years can be characterized through these themes.

Historically, the environment was considered to be causative of ill health and disease. The supposition is, miasma could be seen or smelt, and disease produced by miasma was transported through breathing contaminated air or absorbed through skin³. The environment was also seen significant in humoral theories, where body was thought to need a healthy balance of four humours: blood, phlegm, yellow bile and black bile with four elements: earth, air, fire and water and four qualities: hot, cold, wet and dry⁴. Being cold or wet was often seen as the cause of colds or fevers; still-present perspectives in popular make discourse today.

The widely accepted "Germ theory", advocating microorganisms as the cause of all communicable diseases, was advanced in the mid-19th century with the classic description of the transmission of measles by Peter Panum (1820-1885) in Faroe Islands in 1846⁵. The scientific advances brought about as a result of germ theory were enormous and over time, took into account biological, as well as sociodemographic and environmental issues. Louis Pasteur (1822-1895) developed the scientific and public health applications of this theory in his discovery in which germs caused spoilage of wine, and that prevention of such spoilage could be achieved by a heating process, now known as pasteurization⁶.

The bacteriologic revolution led by Louis Pasteur, Ferdinand Cohn (1828-1898) and Robert Koch (1843-1910) established the scientific basis for the germ theory and laid the groundwork for the development of the immunological basis for vaccines. Application of new scientific evidence generated in the late 19th century through Robert Koch's discovery of microorganisms such as *Mycobacterium tuberculosis* and *Vibrio cholerae* as the cause of communicable diseases placed the germ theory at the center of scientific advances in infection control⁷.

Growing understanding of the biological processes, enhanced by modern epidemiological principles and practice, has led to the emergence of a third tier in the evolution of public health conceptualized as clinical in its approach. It re-

- 2- Brown, 2002:361-369.
- 3- Cipolla, 1992.
- 4- Nutton, 1992: 15-58.
- 5- Panum, 1940:1245-6.
- 6- Rosen, 1993.
- 7- Crookshank, 1888:312-313.



flects a scientific or evidence-based approach to the understanding of the causes of many leading non-communicable diseases such as cardiovascular disease, diabetes and cancer. Many well conducted eminent studies have identified smoking, obesity, high blood pressure and elevated cholesterol as critical risk factors for cardiovascular disease, diabetes and cancer⁸⁻¹². The identification of such risk factors inspired preventive efforts to modify lifestyles both at individual as well as the public levels to reduce the incidence of disease. This approach, which Rose described as a high-risk approach to prevention because it targets individuals at high risk, has tended to dominate preventive efforts in developed countries over the past decades^{13, 14}. The implications of personalized medicine are already being explored for public health interventions such as the potential for risk stratification and screening¹⁵.

The aim of this study is to map the chronological achievements of public health over the past hundred years, in a small island state and to outline emerging themes.

Methods

This research is based on materials from several archives of disease occurrence in Trinidad. The data for this study were derived from the published population and vital statistics reports of the Central Statistical Office for the period 1953-2006, as well as all available published reports of the Ministry of Health. Currently, there are no published reports for the period 2007-14. Data were also collected from the published reports of the Registrar General for the period 1944-52. Codes for all reported diseases are those listed in the International Classification of Diseases (ICD) revisions 6-10. All crude death rates were standardized using the World Health Organization's standard population for age adjustment for international comparisons, and the method suggested by Armitage and Berry¹⁶⁻¹⁸.

Results

In 1914, Trinidad and Tobago was a colony in the British Empire, and therefore under colonial rule. Between 1914-1950, there was much turmoil, the world had experienced two world wars, and a global economic depression, which negatively impacted social conditions and the delivery of health care. The labour riots of 1937 and the appointment of the West Indian Royal Commission in 1938 (commonly known as the Moyne Commission, all impacted health care

- 8- Wolf et al, 1988: 1025-1029.
- 9- Stokes et al, 1989:113-8.
- 10- Wilson et al, 1980:649-54.
- 11- Doll et al, 1954: 1451-1455.
- 12- Doll et al, 2004: 1519.
- 13- Schwartz et al, 2001:435-439.
- 14- White et al, 2001:1494-5.
- 15- Burton et al, 2013:349-351.
- 16- WHO, 2001.
- 17- Rothmn, 1986:41-50.
- 18- Armitage et al, 1987:399-405.



in Trinidad. One of the earliest challenges was the elimination of hookworm infestation; through a system of chemotherapy, sanitation, the construction of pit latrines and health education between 1914-1925 resulting in the successful elimination of hookworm as a public problem¹⁹. The next successful challenge was the eradication of smallpox. TTO joined the smallpox eradication effort led by the World Health Organization in 1958, and with increasing momentum, this goal was achieved in 1980. On 8 May 1980, during the eighth plenary meeting of the Thirty-third World Health Assembly, the president of the assembly, Al-Awadi, signed resolution WHA 33.3, which declared: "Having considered the development and results of the global program on smallpox eradication initiated by WHO in 1958 and intensified since 1967 ... declares solemnly that the world and its peoples have won freedom from smallpox"^{20,21}. Three important factors contributed to this success; 1) the vaccine used was a heat-stable, freeze-dried vaccine allowing long-term storage without refrigeration, 2) humans are the only known reservoir for the virus, and 3) the cost of eradication, and the high level of social and political commitment supporting the initiative; thus emphasizing the supporting role of PH among the several disciplines such as the biomedical sciences, economics, political persuasion and other technical factors in achieving goals.

In this period, rabies, malaria and tuberculosis also had to be confronted as well as maintaining the control of cholera. Although the last case of cholera occurred in the mid 1880's, continued vigilance was imperative. This surfaced in 1992 when cholera was reported in Venezuela, on 31 January 1992²². Venezuela is only seven miles west of Trinidad (Figure 1) facilitating frequent travel and trade between the countries, which created a real threat. A strategy of 1) intensifying the surveillance of diarrhoeal diseases, 2) strengthening the inspection of food offered for sale and (3) providing public education and heightening public awareness all basic PH strategies proved successful²³. Cholera did not occur in Trinidad and has not occurred in the past 100 years, which can be attributed to successful PH efforts. The first and the only epidemic of rabies occurred between 1923 and 1937, which resulted in 86 deaths²⁴. In this epidemic, Pawan in a seminal paper established through several experiments the transmission by bats²⁵. Although malaria was successfully eradicated from Trinidad in 1964, several imported and autochthonous cases have been reported emphasizing the importance of malaria control^{26, 27}. Yellow fever (YF) has also

- 19- Tikasingh et al, 2011:24-30.
- 20- WHO, 1980:145--52.
- 21- Fenner et al, 1988.
- 22- Pan American Health Organization, 1991:43.
- 23- Hospedallas et al, 1993: 331-336.
- 24- Chadee et al, 1992:583-90.
- 25- Chadee et al, 1999:467-75.
- 26- Mungrue, 2010.
- 27- Pawan, 1936:101-129.



significantly impacted PH practice in Trinidad. Monath reported 15 cases in 1954²⁸. Although the last reported case was in 1979 primarily due to effective immunization strategies, Trinidad continues to experience repeated epizootics of yellow fever virus (YFV). It is clear that YFV in Trinidad is maintained for relatively long periods; Auguste and colleagues have hypothesized that epizootics emerge from viruses maintained in enzootic cycles. This is contrary to the observations of less synchronous epizootics in the Americas and raises the issue of what mechanisms could account for this phenomenon. There is currently no definitive answer, but the mechanisms are likely to involve complex interactions among multiple factors²⁹.

Tuberculosis (TB) has had a long and continuing PH impact in Trinidad. The first and the only West Indian Inter-Colonial Tuberculosis Conference took place in 1913, "The Tuberculosis Control Act (Ch 28:51)" was passed in 1961, the discontinuation of BCG vaccine, the closure of the Cura sanatorium and the arrival of HIV are only a few highlights of its impact. Consequently, it is beyond the scope of this study to address all such issues. Nevertheless, after making huge efforts to control TB, in 2010 WHO reported that Trinidad and Tobago had the highest prevalence of HIV associated TB cases i.e. 25 per 100 000 individuals in the Americas³⁰.

While measles created an important challenge to PH in the 1980's, there were significant epidemics of rubella too. One such epidemic in 1983 reported 1159 cases and 20 neonates delivered at the Mt Hope Women's Hospital between November 1982 and July 1993 were diagnosed with congenital rubella syndrome (CRS)^{31, 32}. The public health burden of rubella is related to the risk of infection in pregnant women. In 1991, Lewis and Potter reported that 46.4% of a sample of 1838 pregnant women were negative for rubella antibody; a surrogate indicator of the potential risk for CRS in a population³³. Thus in 1988, the ministers of health of the Caribbean Community (CARICOM), a grouping of 13 independent states and 6 United Kingdom Caribbean overseas territories and Suriname, resolved to eradicate indigenous cases of measles from their countries, by means of mass vaccination targeting children 9-14 years. This resolution was implemented in May 1991. The Measles, Mumps, Rubella (MMR) vaccine (Schwarz strain of measles, Wistar RA-27/3M strain of rubella, Urabe strain of mumps) was used as it not only targeted measles but also rubella and mumps. The occurrences of measles, mumps and rubella in subsequent years

28- Monath, 1989; 139-231.

29- Auguste et al, 2010:9967-77.

30- Tuberculosis in the Region of the Americas, 2011:10-12.

31- Ali et al, 1986: 79-82.

32- Orenstein, 1985: 522-8.

33- Lewis et al, n. d.

(1994-2004) are shown in Table 1. There were a few sporadic cases of mumps between 1994 and 1999. Suddenly in 2000, there were 650 cases, which occurred predominantly among the age group 25-44 and among males than females (Table 2). This pattern continued in 2001, 2002 and 2003. There were no reported cases in 2004 (Figure 2), (small number of cases between 1-5 not captured in the figure). Other vaccine-preventable diseases i.e. neonatal tetanus, tetanus, pertussis and diphtheria, did not occur in Trinidad in the past 25 years. Polio is now eradicated from Trinidad as we partner with the rest of the world in efforts to achieve global eradication.

Table 1: Reported cases of measles, mumps and rubella 1996-2004

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Measles	1	26		1	-	-	30	19	16	15	-
Mumps	1	-		3	4	1	650	603	515	464	-
Rubella	-	-		2	4	2	-	1	-	-	-

Table 2: Reported cases of mumps for the period 2000-2003 by gender and age group 25-44 years

	Males n(%)	Female n(%)	Age (25-45) yrs. n(%)	Total
2000	(64) 413	(36) 237	(62) 404	650
2001	(63) 378	(37) 225	(62) 374	603
2002	(60) 310	(40) 205	(61) 314	515
2003	(60) 278	(40) 186	(60) 274	464

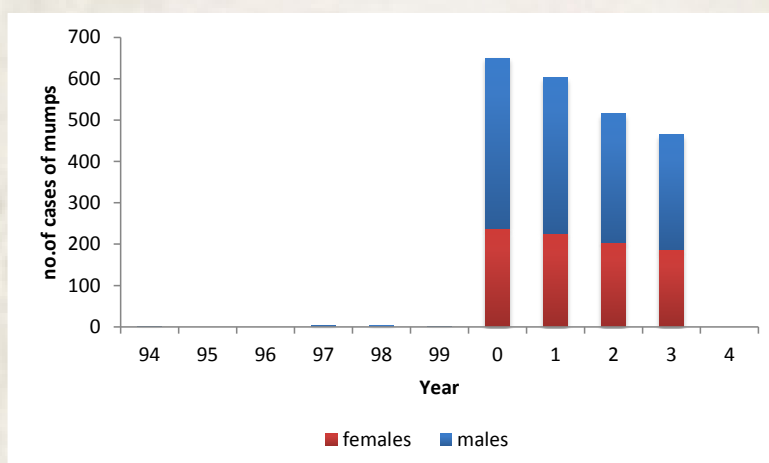


Figure 2. Number of cases of mumps reported by year since the start of the mass vaccination strategy

Port Health, a neglected area of PH is of strategic importance as the major seaport is located in the City of Port of Spain. Public Health Offices conduct environmental, human and animal health surveillance to fulfill the requirements of the revised 2005 International Health Regulations (IHR). The sale of food is controlled under the sale of food byelaws requiring inspection of premises for hygienic preparation and storage of both cooked and uncooked food items and the issuance of food badges. In addition, the sale of alcoholic beverages requires similar inspection prior to obtaining a liquor license. School Health is another important function of PH particularly at the time of entry to ensure immunization status and to screen developmental and missed congenital defects. Water quality and inspection of water courses and open spaces are additional functions of PH.

During 50 years between 1950 and 2000, IMR reduced by 80%, falling from 69.9 to 13.1 per 1000 live births. Over the same period, standardized mortality ratio also declined from 16.4 to 3.8 per 1000 population. Life expectancy increased from 56.3 to 68.2 for men, and 58.5 to 73.6 for women. This is against a background in which GDP per capita rose from 407.8 (USD) to 19 800 (USD).

Discussion

Public health over the past 100 years has witnessed enormous triumphs in the field of infectious disease control, as illustrated by the elimination of hookworm, smallpox, malaria, cholera, typhoid, yellow fever and the vaccine-preventable diseases such as measles, mumps, rubella, poliomyelitis, diphtheria, tetanus and pertussis. The reduced burden of these infectious diseases, which were rampant during 1930-50, can be attributed mainly to socioeconomic and PH interventions such as sanitation, water and food safety and improved nutrition and living standards; all of which are standard public health practices.

Globally, life expectancy doubled during the 20th century³⁴, largely as a result of reduction in child mortality attributable to expanded immunization coverage, clean water, sanitation and other child-survival programs³⁵. During the period 1960-2014, life expectancy in Trinidad increased among women from 64.3 to 74 years, and 61 to 65 years in men; this gain can in part be attributed to public health interventions.

An important finding of the study not previously reported was a large unexpected outbreak of mumps between 2000-2003 (Figure 2). Similar outbreaks have occurred in Canada,

34- Riley, 2005:537-43.

35- Riley, 2001.

the USA and the UK³⁶⁻⁴¹. This finding adds to the volume of literature on the occurrence of mumps in vaccinated populations and the effectiveness of the mumps vaccine. There are several different mumps vaccine strains available, such as Jeryl Lynn vaccine strain, Rubini (the only vaccine not recommended by WHO) and Urabe. Urabe vaccine strain used in this campaign has an effectiveness of 54%–87% but is prone to cause aseptic meningitis^{42, 43}. The Urabe strain is derived from a patient’s saliva isolate. Although the vaccine was developed in Japan, large quantities have been produced in Europe. Two likely explanations may account for this epidemic. A vaccinee may remain unprotected if the primary response is insufficient (primary vaccine failure) or if immunity wanes (secondary vaccine failure). The prevailing view^{44, 45} is that most mumps vaccine failures are attributed to primary vaccine failure. This view however is challenged, and with good reasoning⁴⁶⁻⁵⁰, the data provided in this study are more supportive of the latter view.

The epidemiologic transition from infectious diseases to chronic non-communicable diseases (CND) in Trinidad and Tobago occurred as early as 1947⁵¹. The rising burden of CND particularly diabetes, hypertension, obesity, cancer and injuries poses a challenge for all public health systems and requires innovative approaches to effectively improve population health. Tobacco use alone kills more than 5.4 million people per year, more deaths than HIV, tuberculosis and malaria combined, and nearly 80% of these deaths occur in low- and middle-income countries⁵². If left unchecked, it is estimated to rise to 8 million per year by 2030. Hypertension is the only condition killing more people globally than tobacco use, more than 9 million per year⁵³. CNDs pose a particular challenge to public health systems because of their multifactorial nature and the strong links with lifestyle-related factors such as smoking, diet, alcohol use and physical inactivity, some of which arise from global environment. In the words of Richard Coker, “globalisation, inequality, migration, ecological shifts, these are the challenges facing public health today”⁵⁴. No isolated institution can confront these massive societal forces; it will require a global response. Hence the current core operations of traditional public health functions have become too narrow for this challenge. Public health must now engage in the broader spectrum of social, political and economic foundations which determine population health.

- 36- Watson et al, 2006: 483-8.
- 37- Centers for Disease Control and Prevention, 2006; 55(13): 366-8.
- 38- Centers for Disease Control and Prevention, 2006; 55(42): 1152-3.
- 39- Brunell, 2006: 24-6.
- 40- Riley, 2006: 48.
- 41- Rubin et al, 2006: 2662-8.
- 42- Henry et al, 2006: 175-7.
- 43- Centers for Disease Control and Prevention, 2006:173-5.
- 44- Vesikari et al, 1983: 41-6.
- 45- Edees et al, 1991: 91-7.
- 46- Briss et al, 1994: 77-82.
- 47- Cheek et al, 1995: 774-8.
- 48- Vandermeulen et al, 2004: 2713-6.
- 49- Sanz-Moreno et al, 2005: 4921-5.
- 50- Who Report on the Global Tobacco Epidemic, 2015.
- 51- Mungrue, 2012: 452-9.
- 52- Who Report on the Global Tobacco Epidemic, 2008.
- 53- Horton, 2016: 10053.
- 54- Angell et al, 2015: 825-7.



Conclusion

Significant achievements have been made over the past 100 years. A better understanding of diseases, scientific discoveries such as vaccines, penicillin and streptomycin led to dramatic decline in both the morbidity and mortality of many diseases in Trinidad. Notwithstanding, there is an ambitious goal to end the epidemic of HIV/AIDS by 2030 through the 90-90-90 strategy i.e., 90% of HIV infected individuals diagnosed, 90% diagnosed being treated and 90% treated achieving viral suppression set by UNAIDS⁵⁵, the resurgence of TB and drug-resistant tuberculosis (DRTP), the persistence of dengue fever and new challenges chikungunya, Ebola and Zika, severe acute respiratory syndrome (SARS) and Methicillin-resistant *Staphylococcus Aureus* (MRSA)⁵⁶⁻⁶¹ underscore the need for every country to have core public health functionality to identify a threat when it emerges, to stop it promptly, and to prevent it wherever possible. This requires highly trained and skilled public health professionals in epidemiology, laboratory sciences, logistics, disease-surveillance systems and rapid response teams with an enabling technological environment. In addition, the strengthening of the global response capacity, establishing the best practices and supporting research and development will also be needed. PH, the new ideology may be taken to mean the promotion of healthy lifestyles linked to behaviour and individual responsibility supported by government action to meet the challenge of globalization, inequality, migration and ecological shifts.

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- 57- UNAIDS, 2014.
- 58- The Global Fund to Fight Aids, 2010.
- 59- The National Advisory Committee on SARS and Public Health, 2010.
- 60- National Institute of Neurological Disorders and Stroke, 2010.
- 61- Public Health Agency of Canada, 2010.



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