

MULTIPLE ASPECTS OF CHRONIC DISEASES IN THE AMERICAS

by

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Abstract

The purpose of the reported internship program was to gain insight into the realities of working in the field of Public Health at a large organization level. The focus of the program was to study multiple aspects of chronic diseases in populations, and strategies to reduce their burden. In the 21st century, non-communicable diseases shape epidemiological profiles of many countries in the Americas. Of particular concern is the increasing overlapping of communicable and non-communicable diseases. Diabetes and tuberculosis co-morbidity is a particular example of this new epidemiological pattern. The association between diabetes prevalence and the incidence of tuberculosis is reported here. I helped conduct an ecologic analysis for the 26 countries from the Americas. Diabetes was found to be associated with tuberculosis burden in the Americas, with 16.5% of all incident cases of tuberculosis attributed to diabetes. Collaborative initiatives between tuberculosis and diabetes control services are needed.

Essential components of the comprehensive management of chronic diseases at the population level are: 1) good quality health data and documentation of trends, 2) educational programs for patients to develop their self-monitoring abilities, 3) regular medical care and evaluation of associated risk factors and complications, 4) relevant research exploring new features, and 5) identification of the most cost-effective strategies and economically-realistic solutions. During my 2010 internship program at the Pan American Health Organization, I touched upon each of these components through: 1) preparing a summary of data for the last three years on chronic conditions in general, and diabetes in particular, in countries of the Americas to contribute to the next edition of Health in the Americas; 2) preparing the introduction for the second edition of Atlas of Diabetes Education in Latin America and the Caribbean; 3) providing input from a clinical perspective regarding information included in the Chronic Care Passport and its supplementary booklet for health care providers; 4) contributing to the grant writing for a proposal entitled Addressing the burdens of diabetes and tuberculosis in the Americas; and 5) preparing an inventory of studies on health economic evaluations that addressed chronic diseases in the Americas.

Table of Contents

List of Figures	v
List of Tables	vi
List of Abbreviations	vii
Acknowledgements.....	viii
CHAPTER 1 - Introduction	1
Purpose.....	1
Internship project structure	1
CHAPTER 2 - Pan American Health Organization.....	3
Mission and functions	3
Organizational structure.....	4
CHAPTER 3 - The impact of diabetes epidemic on the tuberculosis incidence in the Americas	
Region.....	7
Background.....	7
Diabetes burden	7
Tuberculosis burden.....	7
Dual burden of diabetes and tuberculosis	7
Methods	9
Data processing.....	9
Data analysis	10
Results.....	11
Incidence of tuberculosis	11
Prevalence of diabetes.....	13
Incidence of tuberculosis associated with diabetes.....	14
Conclusions.....	17
Practical implications.....	18
General recommendations	18
CHAPTER 4 - Additional activities with PAHO during my internship and general reflections .	19
Health in the Americas	19

Atlas of Diabetes Education in Latin America and the Caribbean	20
Chronic Care Passport	21
Grant proposal.....	22
Economic evaluation of chronic diseases in the Americas Region	22
General reflection	23
References.....	25

List of Figures

Figure 2.1 Organizational chart of the Pan American Sanitary Bureau	5
Figure 3.1 Estimated incidence rate of tuberculosis by country (number of cases per 100,000 population)	12
Figure 3.2 Sex distribution of cases of tuberculosis (number, %)	12
Figure 3.3 Estimated prevalence of diabetes by country (%)	13
Figure 3.4 Sex distribution of cases of diabetes (number, %)	14
Figure 3.5 Estimated population attributable fraction (PAF) by country (%)	15
Figure 3.6 Estimated incidence rate of tuberculosis attributed to diabetes by country (number of cases per 100,000 population).....	15
Figure 3.7 Estimated incidence rate of tuberculosis attributed to diabetes by sex (cases per 100,000 population)	16
Figure 3.8 Estimated incident cases of tuberculosis attributed to diabetes by age, in years, and sex (number of cases).....	16

List of Tables

Table 3.1 Sources of information used in calculations	9
Table 3.2 Estimated incident cases of tuberculosis attributed to diabetes by country (number of cases).....	17

List of Abbreviations

AD	Assistant Director
CARIDIAB	Caribbean Diabetes Project
CD	Communicable Disease
DM	Diabetes Mellitus
HSD	Health Surveillance and Disease Prevention
LAC	Latin America and the Caribbean
NC	Noncommunicable Disease
PAF	Population Attributable Fraction
PAHO	Pan American Health Organization
RR	Relative Risk
TB	Tuberculosis
UN	United Nations
WDF	World Diabetes Foundation
WHO	World Health Organization

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CHAPTER 1 - Introduction

Purpose

The purpose of this internship program was to gain insight into the realities of working in the field of Public Health at a large organization level. The program was aimed to provide understanding of roles and functions, as well as real activities, of the Pan American Health Organization (PAHO), and the impact and importance of this agency for the health of its member states.

Specific goals of the program included learning the methodology of conducting analyses at the population level, acquiring skills to identify and elaborate strategic initiatives that provide the greatest impact and sustainable results, and gaining experience with collaborative work in the healthcare field. The primary focus of the program was to study multiple aspects of chronic diseases in populations and strategies to reduce their burden, especially in countries with economic constraints.

Internship project structure

I conducted my internship project at the PAHO headquarters in Washington, D.C., for a period of 13 weeks in 2010. I was assigned to work with the Noncommunicable Disease (NC) Unit and was privileged to be supervised by Dr. Alberto Barceló, Regional Advisor at the NC Unit, who has extensive expertise in diabetes. As a PAHO intern, I was granted full access to the Organization's computer network (PAHO Intranet), to meetings and presentations with participation of experts in different areas of public health and healthcare authorities from the PAHO member states, and to working meetings within the NC Unit.

During the internship program, I conducted one core project and a series of additional activities. The core project was a cross-unit work with participation of NC and Communicable Disease (CD) Units aimed to evaluate the impact of diabetes mellitus (DM) prevalence on the incidence of tuberculosis (TB) in the Americas. I was the project leader and completed the work under the supervision of Dr. Alberto Barceló, Regional Advisor at the NC Unit, and Dr. Mirtha del Granado, Regional Advisor on TB. I presented project results at the general meeting of the NC Unit. A detailed description of the TB/DM project is given in Chapter 3 of this report.

On a daily basis, I was involved in the ongoing activities and projects within the NC Unit. They ranged from participating in meetings, collecting and reviewing information, conducting data analysis, revising and commenting on elaborated interventions, and presenting reports. In addition, I was able to take part in team activities organized for participants of the PAHO summer 2010 internship program. I had the opportunity to participate in a focus group and round table discussions with experts from PAHO; to visit international organizations, such as World Bank, International Monetary Fund, and Inter-American Development Bank; and to have productive informal discussions with other interns. Descriptions of relevant additional activities are given in Chapter 4 of this report.

CHAPTER 2 - Pan American Health Organization

The Pan American Health Organization is an international public health agency committed to improving health and living standards of the countries of the Americas. It serves as the specialized organization for health of the Inter-American System. It simultaneously serves as the Regional Office for the Americas of the World Health Organization (WHO) and it is a part of the United Nations (UN) system.¹ PAHO is the oldest international public health agency in the world. It was originally established in 1902 as the International Sanitary Bureau by a resolution of the Second International Conference of American States. In 1949, the organization became also the Regional Office of the WHO for the Americas. The name of the organization was changed to PAHO in 1958.

According to the PAHO constitution, membership is open to all states in the Region of the Americas.¹ The Region of the Americas includes all countries of the Western Hemisphere, including North America, the Caribbean, Central America, and South America. The Organization has 35 member States and Territories; Puerto Rico is an Associate Member. The PAHO headquarters is based in Washington, D.C. The organization has 28 country offices and 10 regional and subregional centers that are under the technical and administrative responsibility of PAHO.

Mission and functions

The essential mission of PAHO is to lead strategic collaborative efforts among member states and other partners to promote equity in health, to combat disease, and to improve the quality of, and lengthen, the lives of the peoples of the Americas.¹

The PAHO core functions are:

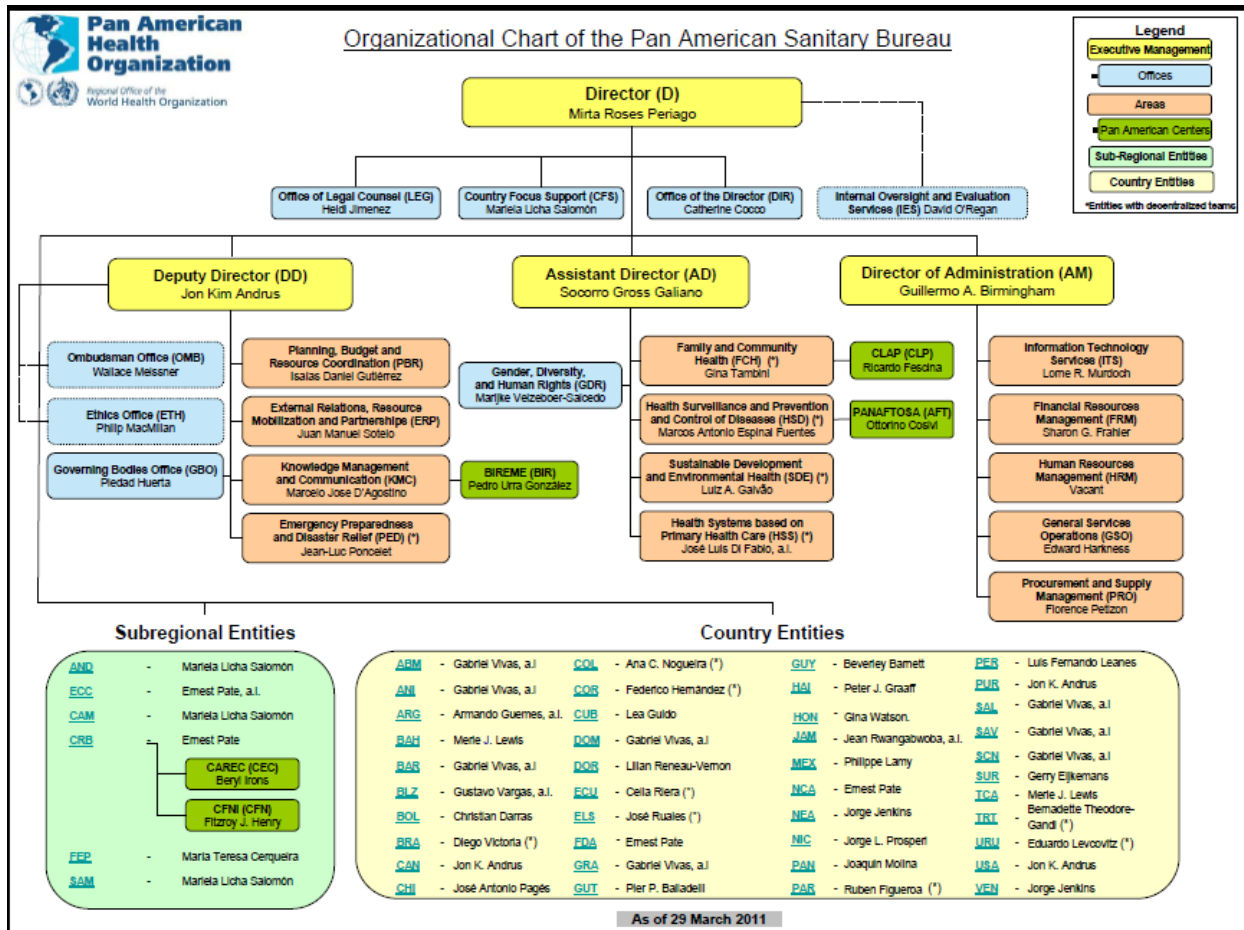
- *Technical cooperation* – PAHO recruits highly proficient and experienced technical staff. Experts and consultants from different areas operate at the headquarters, as well as in the country offices and scientific centers across the Region. They provide professional guidance and high-quality technical assistance in key areas of health, healthcare, and programming at the different levels (local, national, and regional).

- *Dissemination of information* – PAHO has served as a valuable repository of information on health, which is disseminated through validated and relevant publications, since its inception. PAHO continuously develops new strategic forms for the dissemination of the information and uses them as a tool to meet the Organization's goals.
- *Advocacy* – PAHO identifies national and regional health priorities based on needs assessments, and defines strategies to positively impact the priority issues. The Organization is involved in the development of national health programs and services in the countries across the Region. This has a direct influence on the allocation of financial and non-financial resources for health development.
- *Mobilization of health resources* – PAHO plays an active role in increasing available resources and enabling effective resource mobilization. It assists member countries in strengthening their capacity and initiates partnerships with other organizations that share the same goals.

Organizational structure

The Pan American Sanitary Bureau represents the executive body of PAHO. Its organizational structure includes five Administrative Areas and eight Technical Areas, which operate under three Executive Managements. Each Area carries under its umbrella several Units and Regional Centers (Figure 2.1).

Figure 2.1 Organizational chart of the Pan American Sanitary Bureau



Source: www.paho.org

I performed my internship program at PAHO within the Executive Management of Assistant Director (AD), Technical Area of Health Surveillance and Disease Prevention and Control (AD/HSD), Noncommunicable Disease Unit (AD/HSD/NC).

The AD/HSD has a primary mission to develop, promote, and implement technical-cooperation activities for the prevention, control, and elimination of communicable and non-communicable diseases and zoonoses. The AD/HSD strives to fulfill its mission through a wide range of activities, such as promoting technically feasible and economically realistic programs for prevention, control, elimination, or eradication of communicable diseases, noncommunicable diseases, zoonoses, and foot-and-mouth disease; developing sustainable capacity of PAHO member states to effectively address public health problems; providing technical cooperation in collecting reliable data; and developing sound policies. Four Technical Units carry out their

activities under the umbrella of AD/HSD: Communicable Disease (AD/HSD/CD), Health Analysis and Statistics (AD/HSD/HA), Noncommunicable Disease (AD/HSD/NC), and Veterinary Public Health (AD/HSD/VP).

The AD/HSD/NC was established in 1995 in recognition of the changes in the epidemiological profile of the countries in the Americas and the predominance of noncommunicable diseases among causes of morbidity and mortality. The AD/HSD/NC focuses its activities on strengthening technical capacity of the countries in the Americas to develop policies and strategies for controlling chronic diseases; integrating chronic disease prevention and control strategies within primary and secondary health care; and supporting the development of surveillance systems for chronic diseases and their risk factors. The Unit carries special emphasis on cardiovascular diseases, cervical cancer, and DM, which account largely for the burden of chronic conditions in the Region.

CHAPTER 3 - The impact of diabetes epidemic on the tuberculosis incidence in the Americas Region

Background

Diabetes burden

Diabetes is one of the most rapidly escalating and spreading epidemics globally. In the Americas Region, DM affects about 55 million people, with a projected increase to 83 million by 2030.² Considered once a “disease of affluence”, DM presently is invading the developing world, accompanying social and economical advancement. Seven out of 10 countries with the highest number of people with DM represent low- and middle-income countries.³ Effective control of DM among populations requires healthcare systems to have in place programs for monitoring and evaluation of chronic diseases. These programs are resource-consuming.

Tuberculosis burden

Tuberculosis continues to be an important cause of morbidity and mortality globally. Despite the widespread availability of effective treatment for many years, TB is the second leading cause of death from an infectious disease.⁴ In the Americas Region, approximately 280,000 people develop active TB every year.⁴ Most TB cases and deaths occur in low- and middle-income countries. Global TB control is included in the U.N. Millennium Development Goals with the specified target “to have halted and begun to reverse incidence” by 2015.⁵

Dual burden of diabetes and tuberculosis

The co-occurrence of DM and TB at the population level represents a relatively new epidemiological pattern. This phenomenon becomes increasingly characteristic for many regions in the world. The TB and DM syndemic, as defined by Singer and Clair, made its appearance once epidemiological transition reached less developed countries.⁶ The classical theory of epidemiological transition, conceptualized by A. Omran, presumes shifting in the population disease status from the stage of acute communicable diseases to one of chronic non-communicable conditions.⁷ According to this model, socio-economic development and

transitioning lifestyles bring about an increase in chronic degenerative diseases paralleled with a decline in infection rates. However, with the present pace of globalization and socio-economic improvement, the classical model does not correspond to new epidemiological patterns, such as the overlap of communicable and non-communicable epidemics.⁸

A specific case for this scenario is the concurrent TB and DM disease state observed both at the individual and population level. An explosive increase in DM prevalence is occurring in low- and middle-income countries with rapidly emerging economies; as many as 80% of all patients with DM live in developing regions.⁹ At the same time, many of these countries also have a disproportionate number of TB cases. Despite all control efforts undertaken globally, the decline in TB incidence rate is very slow, less than 1% annually.⁴ This results in the confluence of TB and DM epidemics and an increasing occurrence of TB and DM in the same populations with significant negative implications for both diseases.^{10,11,12}

The importance of this DM and TB overlay comes from the fact that these two conditions are not independently associated. The interaction between DM and TB generates a synergistic negative effect. Several physiological mechanisms are implicated to support the link between TB and DM, such as: 1) chronic inflammatory effect triggered and sustained by TB infection that is a predisposing factor for DM;¹³ 2) common underlying predisposing conditions, such as vitamin D metabolism disorders;¹⁴ 3) longer period of TB infectivity in the presence of DM;^{15,16} and 4) disturbance in glucose control in the presence of TB infection.¹⁷ However, the increased risk of developing active TB that is associated with having DM is the major factor that defines and influences the TB/DM relationship.

Chronic hyperglycemia, characteristic for DM, alters immune response and enhances susceptibility to infections.^{18,19} Experimental studies reported impaired initiation of adaptive immunity and delayed innate immune response to *Mycobacterium tuberculosis* in the presence of DM.²⁰ Defects in protective immunity associated with DM provide a plausible explanation for the existence of TB/DM co-occurrence at the individual level.

Consistent scientific evidence support that DM is a major risk factor for development of TB.²¹⁻²⁵ A recent meta-analysis of 13 observational studies reported that people with DM present a 3.11 times higher risk of developing active TB compared to people without DM.²⁶ Given this, the escalating DM epidemic may account for an important number of TB cases and imposes a significant threat to TB control.^{27, 28}

Within a cross-unit project with the participation of PAHO NC and CD Units, we aimed to estimate the association between DM prevalence and the incidence of TB in countries across the Americas. Geographical selection was based on the regional focus of PAHO. The specific objectives of the analysis reported here were: 1) to assess the proportion of incident cases of TB attributed to DM in the Americas Region, and 2) to assess the number of cases of TB that could be prevented with the elimination of DM in the Americas Region.

Methods

We conducted an ecologic analysis of the DM/TB co-morbidity in the countries across the Americas using data on DM prevalence, TB incidence, population structure, and relative risk (RR) of incident TB associated with DM. We extracted the data from the sources summarized in Table 3.1.

Table 3.1 Sources of information used in calculations

Data	Source
Population 25-79 years	U.N. Population Estimates, 2009 ²⁹
Incidence of TB cases (all forms)	World Health Organization, 2009 ³⁰
Prevalence of DM	Diabetes Atlas, 2009 ²
RR of TB/DM	Kim et al., 1995 ²¹

We restricted our estimations to the adult population 25 to 79 years of age, since data on DM prevalence and RR of TB associated with DM were available for this age range only. We conducted a country-by-country analysis for different subgroups divided by gender and age categories, because both DM prevalence and TB incidence are unequally distributed across genders and age groups. We summarized our estimations to present general data.

Data processing

Input data for the prevalence of DM and incidence of TB did not match in regard to the age interval. To be able to generate age- and sex-specific estimations, we applied prevalence of

DM to single-year age populations and then regrouped data in similar age categories for both conditions.

We aimed to quantify the impact of DM on the incidence of all forms of TB. However, age- and sex-specific statistics were available for smear-positive cases of TB only. We applied the assumption that smear-positive incident cases of TB and incident cases of all forms of TB have similar age distributions and made the following calculations. First, we computed the ratio between age specific and total number of smear-positive incident cases of TB. We then multiplied the resulting ratio for each age group by the total number of incident cases of all forms of TB and obtained this index divided by age categories.

Data analysis

We did all calculations country by country in each age- and sex-specific subgroup. The results were also summarized by total population for each country and by total identified populations for all included countries. We evaluated the burden of TB by calculating the incidence rate of all forms of TB (reported in number of cases per 100,000), and the burden of DM by calculating the prevalence of DM (reported in %).

We estimated the impact of DM on the incidence of TB in terms of Population Attributable Fraction (PAF), incidence rate of all forms of TB attributed to DM, and number of incident cases of all forms of TB attributed to DM. For our study, we defined PAF as the proportional reduction in the incidence rate of TB that would theoretically be achieved by eliminating DM in the population. We did the PAF calculations using following formula, as described by Levin:³¹

$$PAF = P_{DM} (RR - 1) / 1 + P_{DM} (RR - 1)$$

Where, PAF is the population attributable fraction

P_{DM} is the prevalence of DM

RR is the relative risk for TB associated with DM.

We applied the resulting PAF to the incidence rate of TB and number of incident cases of TB and obtained the incidence of TB related to DM, expressed as incidence rate per 100,000 population and number of cases.

All calculations were conducted in Microsoft Excel 2007.

Results

Overall, we included in the analysis the 26 countries from the Americas Region for which all data were available, accounting for more than 520 million people ages 25-79 years.

Incidence of tuberculosis

The overall incidence of TB in the identified population was estimated at 40.5 per 100,000 population, accounting for 210,496 cases. The incidence of TB varied largely across the countries (Figure 3.1). The highest rate was estimated for Haiti, followed by Bolivia and Guyana (368.9, 195.6, and 179.6 per 100,000, respectively). The lowest TB incidence rate was found in Puerto Rico, followed by Canada and the United States (4.3, 6.4, and 6.7 per 100,000, respectively). The estimated number of cases of TB was significantly higher among males compared to females (Figure 3.2). The highest male to female (M:F) ratio was found in Cuba (3.6:1) and the lowest in Haiti (1.1:1).

Figure 3.1 Estimated incidence rate of tuberculosis by country (number of cases per 100,000 population)

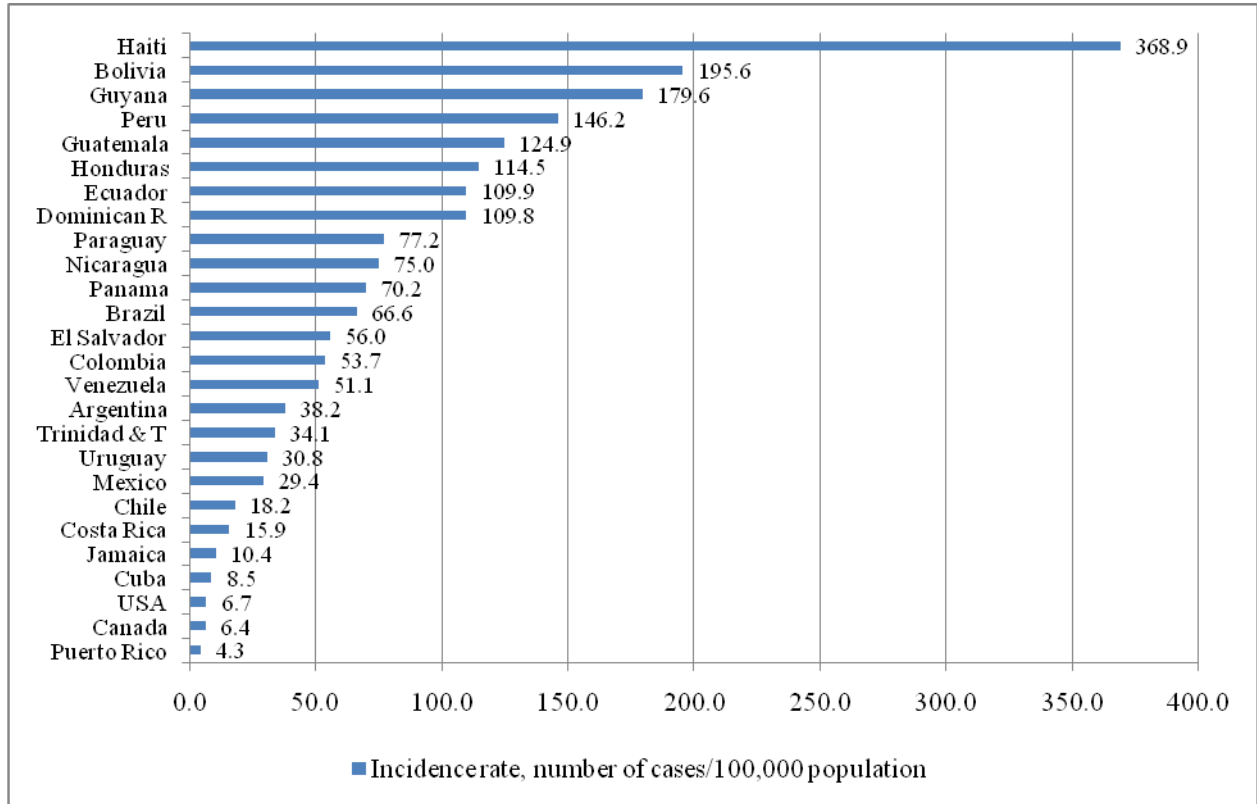
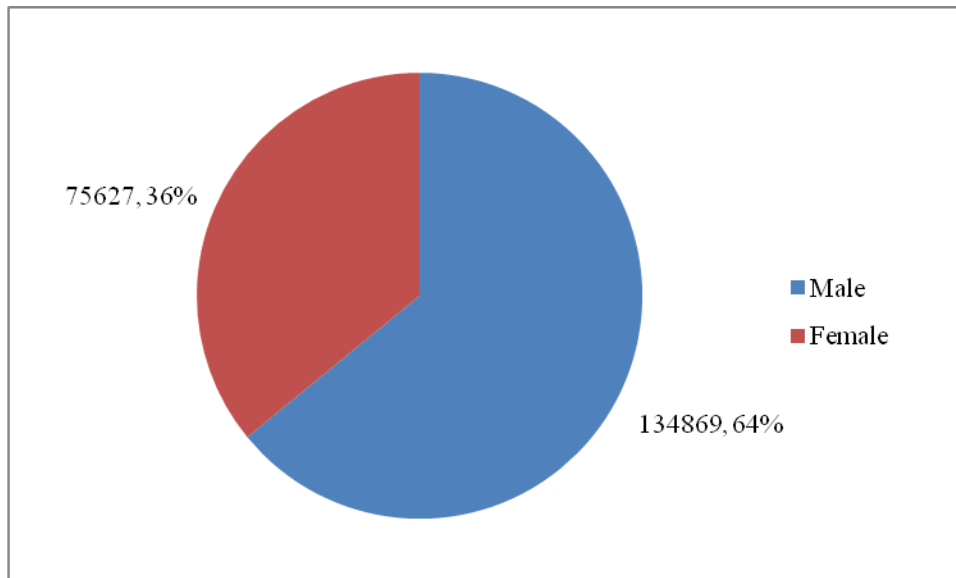


Figure 3.2 Sex distribution of cases of tuberculosis (number, %)



Prevalence of diabetes

The overall prevalence of DM in the identified population was estimated at 9.7%, accounting for more than 50 million cases. The highest DM prevalence was found in the United States (12.8%), followed by Trinidad and Tobago, and Puerto Rico (12.5%) (Figure 3.3). The lowest rate was estimated in Paraguay, Colombia, and Bolivia (4.6%, 5.5%, and 6.0%, respectively). The prevalence of DM was comparable among men and women. (Figure 3.4).

Figure 3.3 Estimated prevalence of diabetes by country (%)

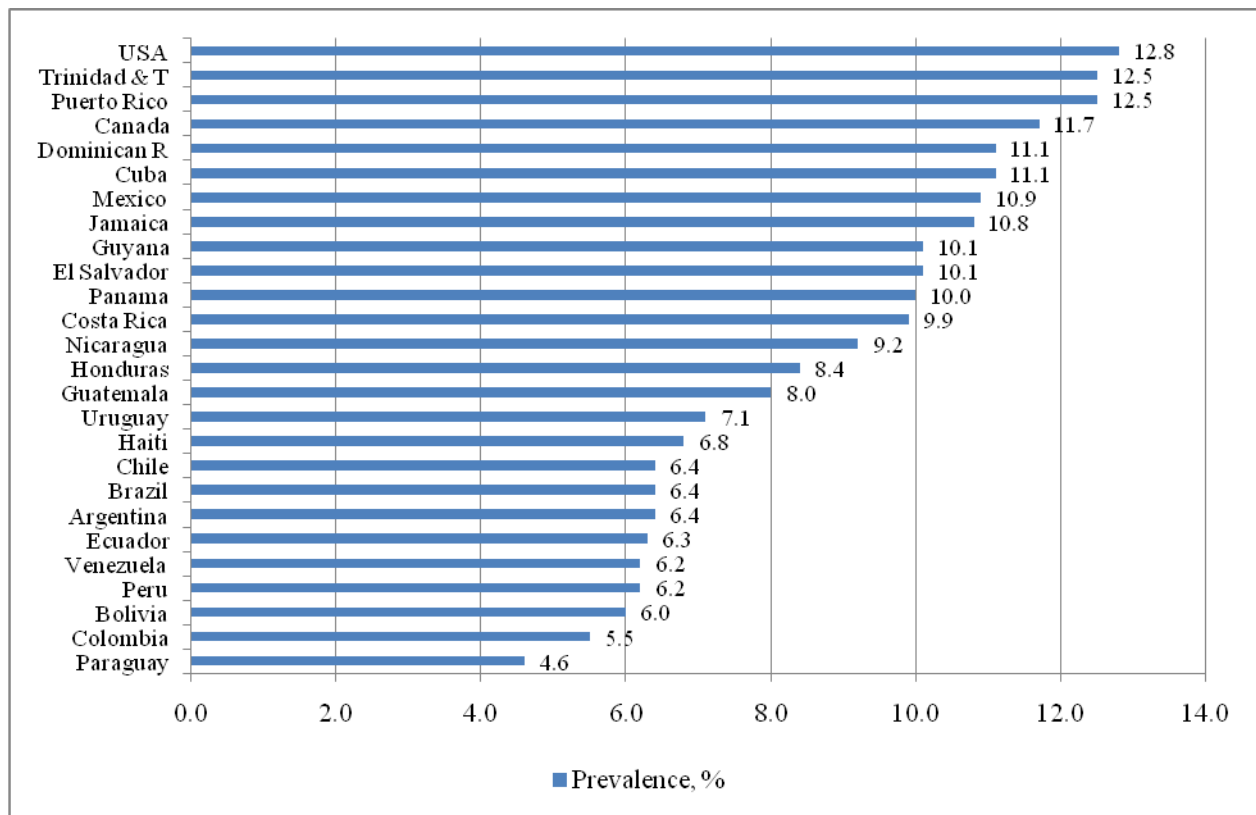
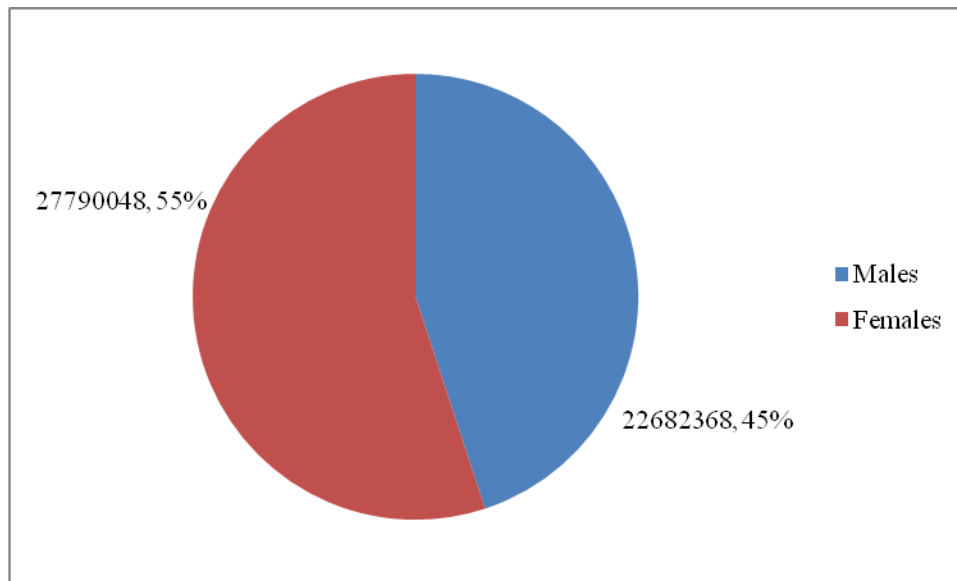


Figure 3.4 Sex distribution of cases of diabetes (number, %)



Incidence of tuberculosis associated with diabetes

Overall, DM accounted for 16.5% of incident TB cases in the general population 25-79 years of age in the Region of the Americas, based on the PAF. The highest contribution of DM on TB incidence was estimated in Trinidad and Tobago, where 22.1% of all TB cases were related to DM (Figure 3.5). Paraguay, with a PAF of 10.6%, showed the lowest proportion of TB cases due to DM. The overall incidence of TB related to DM in the identified population was estimated at 6.7 per 100,000 population, with the highest rate in Haiti (54.1 per 100,000) and the lowest in Puerto Rico (0.9 per 100,000) (Figure 3.6). The TB/DM incidence rate was significantly higher among males compared to females (Figures 3.7 and 3.8). The incidence of TB attributed to DM peaked in the group ages 35-44 years for both men and women (Figure 3.8). The total number of TB cases that theoretically could be prevented with the elimination of DM was estimated at 31,909 (Table 3.2). Almost one-third of all cases of TB attributed to DM were found in Brazil.

Figure 3.5 Estimated population attributable fraction (PAF) by country (%)

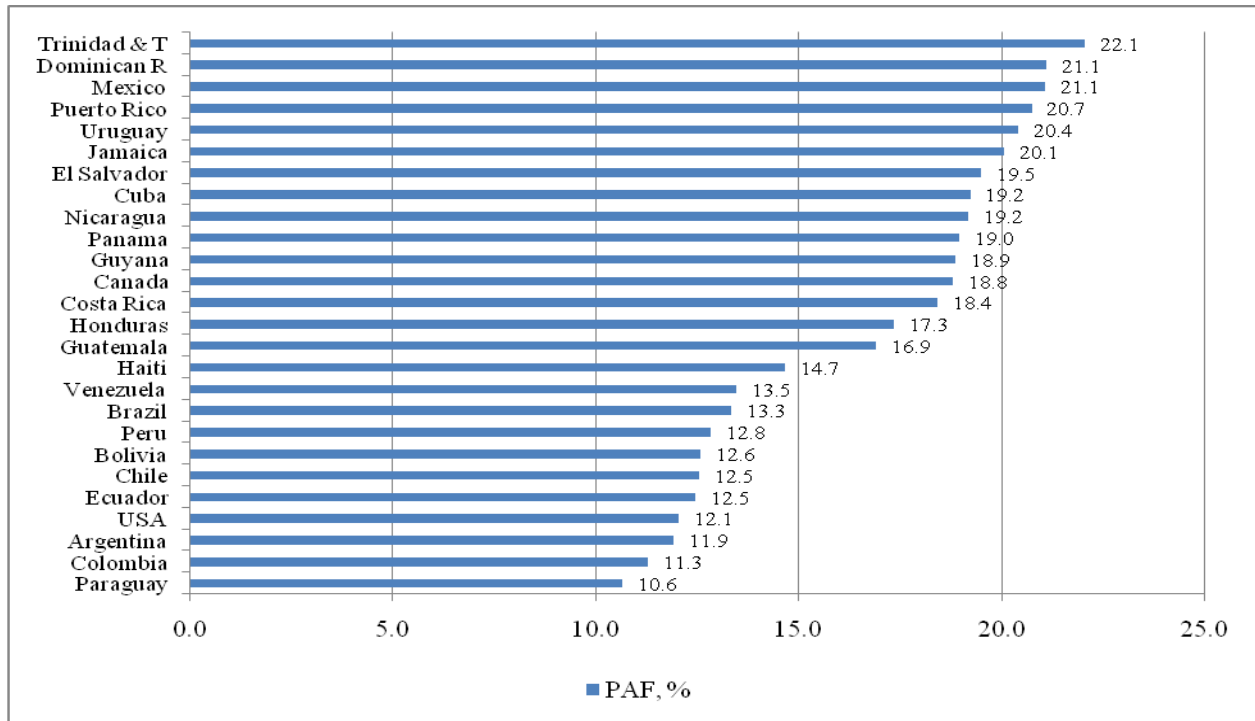


Figure 3.6 Estimated incidence rate of tuberculosis attributed to diabetes by country (number of cases per 100,000 population)

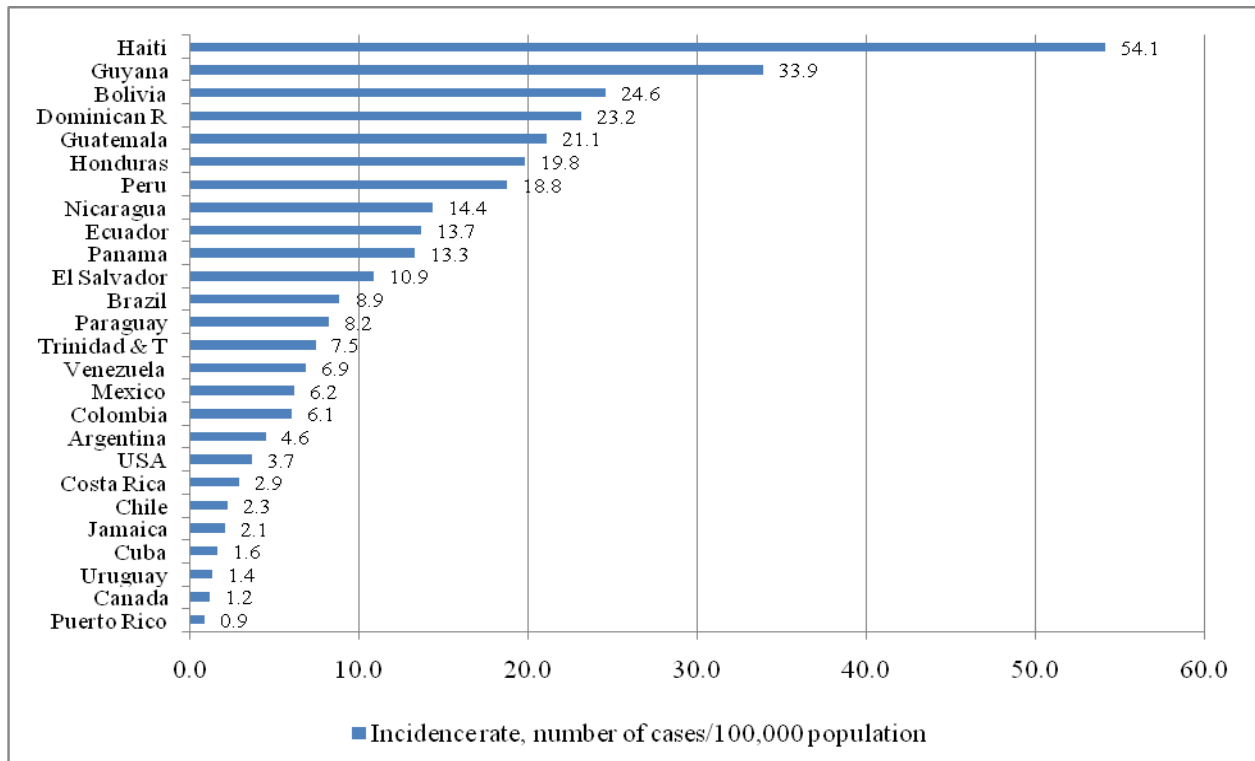


Figure 3.7 Estimated incidence rate of tuberculosis attributed to diabetes by sex (cases per 100,000 population)

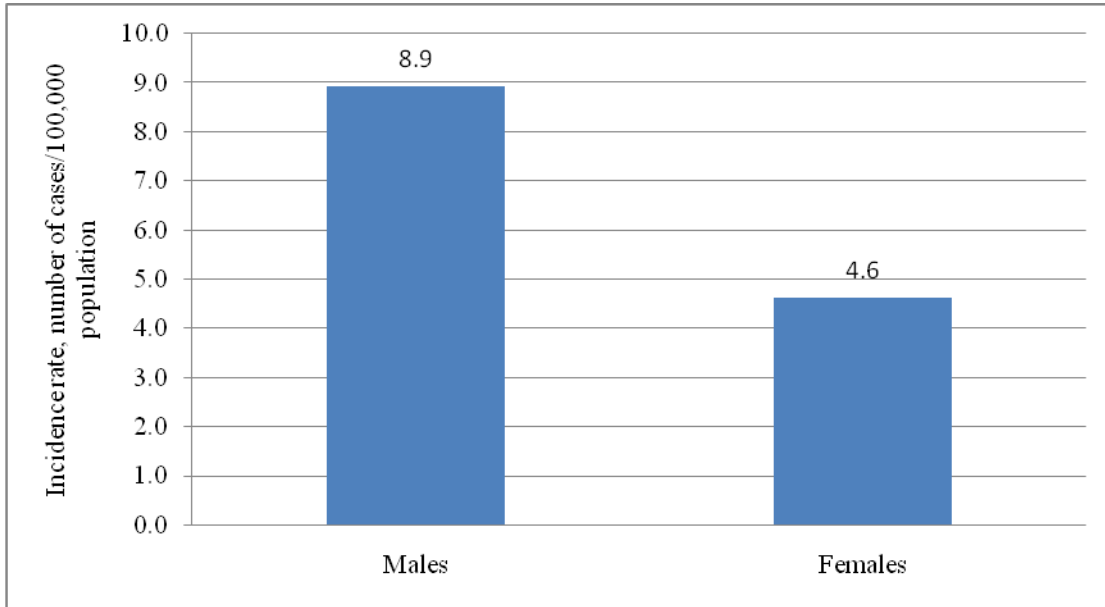


Figure 3.8 Estimated incident cases of tuberculosis attributed to diabetes by age, in years, and sex (number of cases)

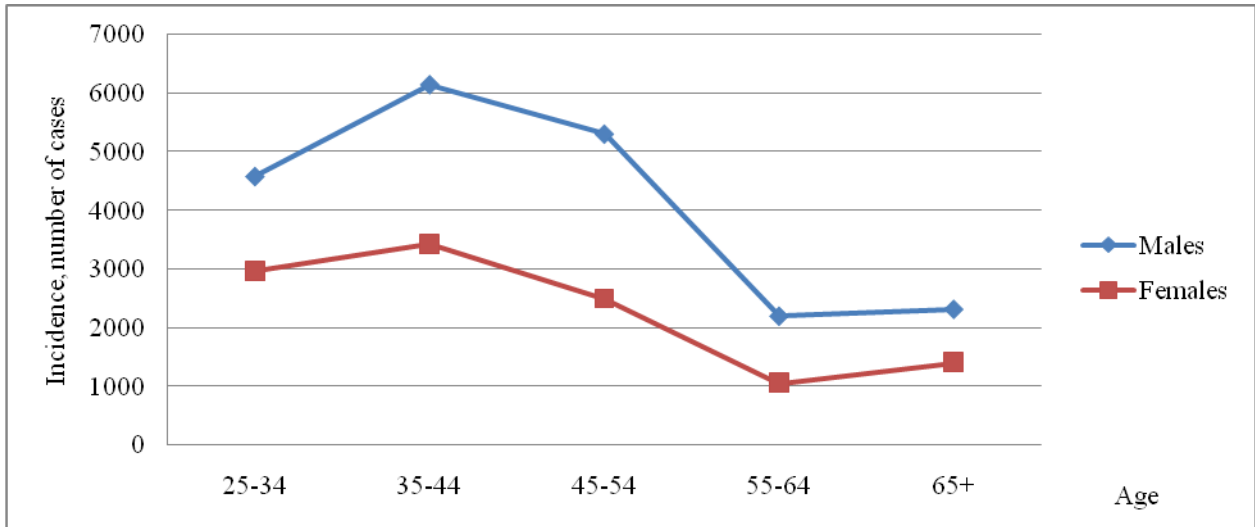


Table 3.2 Estimated incident cases of tuberculosis attributed to diabetes by country (number of cases)

Country	TB/DM cases
Argentina	1,011
Bolivia	1,042
Brazil	9,696
Canada	273
Chile	235
Colombia	1,426
Costa Rica	78
Cuba	126
Dominican Republic	1,229
Ecuador	887
El Salvador	322
Guatemala	1,177
Guyana	151
Haiti	2,495
Honduras	635
Jamaica	29
Mexico	3,586
Nicaragua	369
Panama	259
Paraguay	242
Peru	2,777
Puerto Rico	22
Trinidad and Tobago	64
United States of America	2,693
Uruguay	74
Venezuela (Bolivarian Republic of)	1,010
Total	31,909

Conclusions

The invasion of chronic diseases in settings that are still endemic for infections has resulted in new epidemiological patterns. Within these changes, the co-morbidity of TB and DM has been configured into a global health priority. Estimates from the analysis reported here support that DM is associated with the burden of TB in the Americas Region, 16.5% of all incident cases of TB being attributed to DM, which corresponds to 31,909 cases of TB that could be prevented annually with the elimination of DM. Given the significant number of incident TB/DM cases, DM may negatively impact TB control and may contribute to the resurgence of

this infection. In response, strategies for DM control and prevention should be considered for inclusion in TB programs.

Practical implications

Results of this analysis justify a need for conducting research and scientific projects that address TB/DM co-morbidity in the Americas to evaluate its characteristic features in this region in general, as well as in those countries with the highest joint burden of TB and DM in particular. Collaborative initiatives between TB and DM control services are needed. Evidence-based TB/DM joint approaches for diagnosis, prevention, and care should be identified and implemented.

General recommendations

The increasing confluence of TB and DM epidemics has important public health implications and imposes new challenges for health care systems.^{27, 32} Common practices apply individual infectious and non-communicable disease approaches to address TB and DM, respectively. However, the TB/DM convergence that has reached epidemiological importance requires intersecting strategies for TB and DM control. Cross-referral of TB and DM is a rational approach in this context.^{33, 34} Proactive screening for DM in patients with TB, and vice versa, seems to beneficially affect control of both diseases. Screening for DM among TB patients is recommended, especially in countries with high prevalence of DM.³⁵ Screening for active TB among people with DM should be conducted, especially in patients with uncontrolled DM and in countries highly-endemic for TB.³⁵

The greatest challenge occurs because most countries with the highest dual burden of TB and DM do not have robust healthcare systems and experience a lack of healthcare resources. Health systems in many low- and middle-income countries do not have potent structures for the management of non-communicable diseases. Economically- and logistically-realistic approaches should be identified for these settings.

CHAPTER 4 - Additional activities with PAHO during my internship and general reflections

Essential components of the comprehensive management of chronic diseases at the population level are: 1) good quality health data and documentation of trends, 2) educational programs for patients to develop their self-monitoring abilities, 3) regular medical care and evaluation of associated risk factors and complications, 4) relevant research exploring new features, and 5) identification of the most cost-effective strategies and economically-realistic solutions. During my 2010 internship program at the Pan American Health Organization, I touched upon each of these components through: 1) preparing a summary of data for the last three years on chronic conditions in general, and diabetes in particular, in countries of the Americas to contribute to the next edition of Health in the Americas; 2) preparing the introduction for the second edition of Atlas of Diabetes Education in Latin America and the Caribbean; 3) providing input from a clinical perspective regarding information included in the Chronic Care Passport and its supplementary booklet for health care providers; 4) contributing to the grant writing for a proposal entitled Addressing the burdens of diabetes and tuberculosis in the Americas; and 5) preparing an inventory of studies on health economic evaluations that addressed chronic diseases in the Americas.

Health in the Americas

Health in the Americas is the main PAHO publication that reports on health conditions and trends in the PAHO member states and territories. The publication was launched in 1954 and is published every 5 years. Health in the Americas 2007 is the last edition of this quinquennial. This comprehensive presentation of the health situation in the 46 countries and territories of the Americas analyzes health problems and conditions, as well as the response of the health sector to those problems. Besides general issues on health and human development, and the evolution of health systems and services, the content of this publication includes descriptions and analyses of specific conditions and risk factors.

As part of my internship program, I prepared a summary of data for the last three years on chronic conditions in general, and DM in particular, in countries across the Americas. This

work aimed to contribute to the next edition of Health in the Americas that is to be published in 2012. I conducted a literature review on epidemiological patterns of DM in the Americas using both published and unpublished data (provided to PAHO by the countries' health regulatory bodies). One of the challenging features of this project was to make a synthesis of data that varied largely in terms of their scientific validity and the methodological approaches that were used to generate the data. I would remark here that many countries from the Americas Region do not have surveillance and monitoring systems to document the frequency and distribution of chronic conditions. The lack of epidemiological assessment data brings additional difficulties when it comes to framing prevention and control strategies for chronic diseases in those countries.

A general observation note that comes from my review is that DM in the Americas determines to a considerable degree the global pattern of this condition. According to the latest estimates, three of the top 10 countries with the largest population of people affected by DM (United States, Brazil, and Mexico) are located on the American continent. At the same time, North America is the world region with the highest comparative prevalence of DM, and reaches 10.2% among the adult population there.

The last edition of Health in the Americas 2007 can be accessed at:
<http://www.paho.org/hia/index.html>

Atlas of Diabetes Education in Latin America and the Caribbean

Atlas of Diabetes Education in Latin America and the Caribbean is an inventory of educational programs for people with DM that are available in the Region. This document was prepared by the Program of Non-Communicable Diseases of the Division of Disease Prevention and Control of the PAHO. The Atlas gives a description of methodology, objectives, materials, and evaluation (if it was conducted) of DM educational programs. This publication is addressed to professionals in the field with a primary goal of creating an environment for sharing knowledge and experience across the countries and to contribute to the development of DM education programs.

The first edition of the Atlas of Diabetes Education in Latin America and the Caribbean was published in 2002 and included profiles of 21 educational programs for people with type 2 DM from 19 countries. The second edition of this document was extended to also include

programs for people with type 1 DM and new programs for people with type 2 DM that were available in the Latin America and the Caribbean (LAC) Region at the time. With all additions, it contains information on 46 programs in a total of 23 countries. The second edition of the Atlas is in press now.

As part of my internship with PAHO, I contributed to the second edition of the Atlas of Diabetes Education in Latin America and the Caribbean. Specifically, I prepared the introduction section for this document. It includes updates of new scientific evidences about DM as a major public health problem in the LAC Region, the importance of self-management in DM control, biomedical and psychological benefits of educational interventions in people with DM, and related economic aspects.

The first edition of the Atlas of Diabetes Education in Latin America and the Caribbean can be accessed at: <http://www.paho.org/english/ad/dpc/nc/dia-atlas.htm>

Chronic Care Passport

The NC at PAHO is committed to improving the quality of care of people with chronic conditions in the Americas. As part of this mission, NC undertakes numerous projects aimed to support national healthcare initiatives in PAHO member states and territories. CARIDIAB: Caribbean Diabetes Project is an ongoing project in 10 Caribbean countries supported by the World Diabetes Foundation (WDF). It has a general goal of providing guidance and support to Ministries of Health and health care providers in participating countries in the design, implementation, and evaluation of quality improvement initiatives for DM care.

Within the CARIDIAB project, PAHO has developed and designed, with contributions from participating countries, a Chronic Care Passport. This is a patient-held card containing standards of care for chronic conditions and records of individual risk factors, results of laboratory tests, and medical examinations. It also includes prescriptions for meal plans and medication(s). Chronic Care Passport aims to provide a way for systematic monitoring and evaluation of patients with chronic conditions that is of primary importance in achieving sustained improvements in chronic disease care.

The Chronic Care Passport was supplemented with a booklet for health care providers with instructions for its completion. As part of my internship with PAHO, I was involved in

reviewing these materials and provided my input from a clinical perspective regarding included information.

Grant proposal

PAHO has identified TB associated with DM as one of the health sector priorities in the Americas Region. In this context, PAHO developed the project entitled Addressing the burdens of diabetes and tuberculosis in the Americas. Two countries were selected as sites for the project: Brazil and Mexico. These countries have the highest estimated number of TB cases related to DM. Conducting the project in these regions will have the greatest impact. The project is to run over a two-year period.

The overall goal of the project is to improve the timely identification of DM and TB in people of the Americas. The specific objectives of the proposed project are:

- 1) To develop an instrument to facilitate screening for DM among people with TB, and screening for TB among people with DM.
- 2) To include TB risk assessments in the standard of care for people with DM, especially at diagnosis, and to include DM screening in the package of care for people with TB.
- 3) To increase awareness among health professionals of the double burden of TB and DM.
- 4) To improve monitoring of cases screened, diagnosed, and treated via the development of a form and database to facilitate data collection and analysis.

The proposal for this project was prepared for submission to the WDF, which supports the prevention and treatment of DM in developing countries. As part of my internship with PAHO, I was involved with reviewing this grant proposal. The WDF highly appreciated this project and provided the requested funding. The project was launched in April 2011.

Economic evaluation of chronic diseases in the Americas Region

Economic evaluation was relatively recently incorporated into the comprehensive approach of health issues. It aims to assess financial implications of health conditions and diseases. Economic evaluation includes both cost analysis, providing a tool for assessing economic outcomes linked with a disease, and cost-effectiveness analysis, providing a tool for selecting the most cost-effective solutions.

The great majority of economic evaluation studies are conducted for developed countries, because health economic evaluations are based on the extensive epidemiological data that are not available in many developing settings. At the same time, countries with economical constraints would benefit the most from using cost-effectiveness analysis in the decision-making process. Health economic research in developing countries would increase efficiency in the use of their scarce financial resources. Because of significant differences in the social and economic frameworks between developed and developing countries, results of economic evaluation studies cannot be extrapolated from one setting to another.

As part of my internship with PAHO, I prepared an inventory of economic evaluation studies on chronic diseases in the LAC Region. Publications in peer-reviewed literature from 2000 to 2010 identified in PubMed and LILACS databases were considered for inclusion. Chronic diseases – particularly cardiovascular disease, DM, cancer, and chronic respiratory diseases – were selected because of their global invasion and the burden they pose on health care systems. The continuous increase in the prevalence of chronic conditions is very demanding of health care resources, including financial allocations.

Overall, 27 studies were included in the inventory, with 20 of them conducted in seven individual countries and seven studies reporting regional analyses. Variability in methodological approaches across the studies was large. Only a few studies reported validated models used for the data analysis. Most studies evaluated direct/indirect costs associated with certain chronic conditions and fewer analyses were conducted to assess the cost-effectiveness of a diagnostic, treatment, or preventive procedure/program.

The inventory of collected information will be used at PAHO to conduct a systematic analysis and identify challenges and opportunities for using health economic evaluation research in decision-making processes within the healthcare in the LAC Region. It is intended to elaborate guidelines and standard procedures for conducting and reporting economic evaluation studies in the health sector. It would increase both the credibility and comparability of scientific data and facilitate their practical use.

General reflection

My internship program with PAHO was an invaluable and rewarding experience. It offered me a variety of training and professional development opportunities. Through my

observational and participatory activities, I gained an understanding of how daily work at PAHO contributes to the Organization's mission. I also realized that achievements at the regional and international level require continuous dedicated and committed efforts. In this setting, with so many players involved, it takes time to see progress. My experience with PAHO has consolidated my professional goals in the field of Public Health and oriented me towards a career with an international agency.

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