Hepatitis B and C in the Spotlight

A public health response in the Americas

2016

Pan American Health Organization

World Health Organization
REGIONAL OFFICE FOR THE Americas

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Foreword

This past May 2016, the World Health Organization (WHO) Member States endorsed the first "Global Health Sector Strategy on Viral Hepatitis 2016-2021" at the 69th World Health Assembly. This strategy will contribute to the achievement of the Health Goals set out in the 2030 Agenda for Sustainable Development. Member States in the Americas have been working toward meeting the Strategy's ambitious goal of eliminating viral hepatitis as a public health threat by 2030. A major milestone was the September 2015 approval of the regional Plan of Action for the Prevention and Control of Viral Hepatitis, which serves as a guide for action and scaling up of a public health response to viral hepatitis, addressing crosscutting issues in a comprehensive manner.

The evidence indicates that viral hepatitis in our Region is a major cause of morbidity and mortality. While the burden of other communicable diseases has declined in the past decade, that related to viral hepatitis has increased. In this rapidly evolving and competitive health arena, we will need to be more strategic and exploit effective innovations in the area of viral hepatitis. With a focus on health system strengthening, taking advantage of the opportunities presented by the integration of services in primary health care and available maternal and child health care programs will be critical for a sustainable and efficient public health response to viral hepatitis. It is clear that the challenges for countries include increasing financial investment and addressing pricing issues related to viral hepatitis treatment. Through its Strategic Fund, the Pan American Health Organization (PAHO) is working with countries to facilitate access to medicines for the treatment of viral hepatitis as part of its role in ensuring that affordable, quality assured medicines are available in countries, in the required presentation and the quantities needed.

It is also clear that the collaboration of national governments with other sectors such as academia, private enterprise, and affected communities will need to be galvanized for successful progress towards elimination goals.

In the fast changing and exciting landscape of new evidence, norms, and actions occurring as we write, this report provides a regional baseline reference for the epidemic and the current response. PAHO, in its role of actively supporting countries in their public health response, will continue to monitor progress. This report constitutes the first in a series that will present lessons learned and highlight areas for special attention and joint action in our countries as we pave the way for ending the hepatitis B and C epidemics in our Region.

Carissa F. Etienne

Director, Pan American Health Organization

Acronyms

anti-HBc	total hepatitis B core antibody
anti-HCV	antibody to hepatitis C virus
CDA	Center for Disease Analysis
DAA	direct-acting antiviral
DTP	diphtheria-tetanus-pertussis
DU	drug users
EML	essential medicine list
HBsAg	hepatitis B surface antigen
HBIG	hepatitis B immunoglobulin
HBV	hepatitis B virus
HCC	hepatocellular carcinoma
HCV	hepatitis C virus
HDV	hepatitis D virus
Hib	*Haemophilus influenzae* type b
HIV	human immunodeficiency virus
IARC	International Agency for Research on Cancer
ICD-10	International Statistical Classification of Diseases and Related Health Problems 10th Revision
IHME	Institute for Health Metrics and Evaluation
LAC	Latin America and the Caribbean
MSM	men who have sex with men
NAT	nucleic acid testing
NIDU	noninjecting drug users
MTCT	mother-to-child transmission
PAHO	Pan American Health Organization
PWID	people who inject drugs
RF	PAHO Revolving Fund
SDG	Sustainable Development Goal
SINAN	Brazilian Ministry of Health's Information System for Notifiable Diseases
VH	viral hepatitis
WHA	World Health Assembly
WHO	World Health Organization

Executive Summary

This report provides an overview of the current hepatitis B virus (HBV) and hepatitis C virus (HCV) epidemics and current health sector response in the Americas. In a rapidly changing environment, it aims to provide a basic understanding of the main issues in the response to HBV and HCV in the Region, presenting an overview of the affected populations and burden of the HBV and HCV epidemics in the Americas, together with current policies and health sector practices.

This report is the first of its kind to monitor progress toward meeting the targets of the regional Plan of Action for the Prevention and Control of Viral Hepatitis and is intended to assist Member States in aligning their policies and priorities for an effective and comprehensive public health response.

A major shift has occurred in the global awareness of viral hepatitis epidemics. Previously considered silent epidemics, there is now a move towards global action towards elimination of viral hepatitis as a public health problem. In the Americas, the main burden of viral hepatitis is due to Hepatitis B and C. An estimated 2.8 million people (2.2-8.0 million)[1] live with chronic HBV in the Americas, 2.1 million of them in Latin America and the Caribbean. The general population prevalence in the Americas in 2016 is 0.28% (0.22-0.81%)[1], and in Latin America, 0.33% (0.26-0.95%)[1]. Region-wide implementation of universal HBV infant vaccination, with decades of high coverage levels in most countries, appears to have contributed to successful outcomes in terms of high levels of population protected from HBV infection, with a decline in HBsAg seroprevalence and HBV-related illness. On the other hand, chronic HCV epidemics are currently being noticed as comparable to other infections such as TB or HIV. An estimated 7.2 million (5.2-8.6 million)[1] people live with chronic hepatitis C infection in the Americas, for a prevalence of 0.73% (0.52-0.87%)[1]. In Latin America and the Caribbean, an estimated 4.1 million (2.8-4.6 million)[1] people live with hepatitis C.

In 2013, viral hepatitis was one of the major causes of death worldwide, and the number of deaths attributable to viral hepatitis had increased by 63% from 1990 to 2013. An estimated 125,700 deaths in the Americas in 2013 were due to HCV and HBV, 80% of them attributable to HCV, and 39% of the latter occurring in North America. While the number of deaths from other infectious disease is declining, the absolute number of deaths from viral hepatitis in the Americas in 2013 increased by 134% over 1990 and 8% over 2010.

National strategies or plans for the prevention, care, and control of viral hepatitis are in place in fewer than half of responding countries in the Americas (43%, 15/35). In 2015, eight countries in the Region reported having diagnosis, care and treatment guidelines aligned with the WHO guidelines for HCV: Anguilla, Argentina, Brazil, Canada, Chile, Cuba, El Salvador, and the United States (21 total reporting countries).

The Region has made great strides in vaccination efforts since HB vaccines were first introduced: (1) Every country and territory has included HB vaccine in

[1] The figures between parentheses represent the uncertainty intervals.

its immunization schedule for children. In 2015, 89% of children under 1 year of age received the third dose of hepatitis B vaccine in the Americas; (2) 36 out of 52 (69%) countries/territories have included an HB birth dose in their immunization policies, 22 of them as a universal vaccination policy (representing over 90% of the Americas' birth cohort); and 14 countries/territories administer a birth dose exclusively to infants born to HBsAg-positive mothers. Birth-dose vaccination coverage, in 17 reporting countries with a universal birth-dose vaccination policy, was 83% in 2015; (3) Catch-up vaccination of older individuals and vaccination of high-risk groups have been implemented in many countries, including Argentina, Brazil, Cuba, Peru, the United States, and Uruguay.

Quantitative HBV viral load testing (to differentiate active from inactive chronic infection, for decisions to treat chronic HBV, and to monitor the response to treatment) is available in 72% (13/18) reporting countries. Confirmation of HCV diagnosis through qualitative nucleic acid testing (NAT) for HCV-RNA is available in almost two-thirds of reporting countries (65%, 13/20), and genotyping of HCV, needed for determining appropriate treatment regimens, is available in 63% (12 out of 19 reporting countries). Treatment response monitoring through quantitative HCV viral load testing is available in 63% (12 out of 19 reporting countries).

In the Americas, the number of people with chronic HCV infection diagnosed and treated is extremely low. Around 25% of people with chronic HCV are estimated to be diagnosed (this figure drops to 14% for Latin America and the Caribbean), and an unknown number know their status and are effectively connected with care. In 2016, an estimated 301,000 people in the Americas were treated for chronic HCV infection; that is, 16% of the diagnosed population received treatment, (dropping to 5% in Latin America and the Caribbean). Fifteen countries performed approximately 18,100 liver transplants in 2014.

As part of the global momentum to eliminate VH, the SDGs and the Global Health Sector Strategy on Viral Hepatitis have set the pace toward global action. VH is increasingly being recognized as a major cause of suffering and burden of disease worldwide. The Region of the Americas has recognized that the time has come to put forward a more effective and comprehensive response to VH. WHO and PAHO have provided guidelines, strategies, and plans aimed at supporting national responses. The Region of the Americas is making gains, particularly from decades-long universal HBV vaccination and catch-up campaigns, but the time has come to accelerate access to care and treatment for people living with chronic viral hepatitis. Developing plans, aligning clinical guidelines with WHO recommendations, strengthening information systems and developing national baselines, identifying and prioritizing the needs of key vulnerable populations, and negotiating prices for essential treatments have all become urgent. PAHO will continue to provide technical cooperation, supporting countries in their response and the path toward elimination of hepatitis B and C in the Region.

1. Introduction and Objectives

Viral hepatitis is an international public health challenge that is gaining recognition as both a health and development priority. WHO resolution WHA 67.6, Sustainable Development Goal 3.3, and the new breakthroughs in hepatitis C treatment are landmarks and turning points in progress toward ending viral hepatitis epidemics.

In the Americas, in September 2015, the Member States of the Pan American Health Organization (PAHO) approved a new Plan of Action for the Prevention and Control of Viral Hepatitis 2016-2019, with the objective of focusing public health efforts on preventing and controlling hepatitis, with emphasis on hepatitis B and C. The regional plan is aligned with the WHO Global Health Sector Strategy on Viral Hepatitis, 2016-2021, approved by the 69th World Health Assembly in May 2016. This strategy presents the first set of global hepatitis targets, including a 30% reduction in new cases of hepatitis B and C by 2020 and a 10% reduction in mortality, with the ultimate goal of eliminating viral hepatitis, halting transmission, and ensuring access to safe and affordable care and treatment for people living with hepatitis.

Countries in the Region are rapidly organizing and scaling up their response to the HBV and HCV epidemics. Decades-long success in primary prevention through vaccination is yielding results, with a decreasing prevalence of chronic HBV [1]. With regard to treatment, several countries conducted negotiations in 2015 and 2016 and purchased the new direct-acting antivirals for hepatitis C treatment; they have recently developed treatment criteria and begun treatment of new patient cohorts.

In a rapidly changing environment with global momentum and action towards VH elimination, this report provides a baseline understanding of key issues in the public health response to HBV and HCV in the Region, providing an overview of affected populations and the burden of HBV and HCV epidemics in the Americas and of current policies and health sector practices. The goal is to support Member States for an organized and comprehensive public health response.

The report follows the elements outlined in the Plan of Action for the Prevention and Control of Viral Hepatitis 2016-2019, reviewing major gaps and identifying areas for improvement. The intended audience includes national policymakers, planners, and managers in ministries of health in the Americas, civil society advocates, and development partners and donors.

2. Methods

This report has two sections: the first provides an overview of the epidemiology of HBV and HCV in the Americas, and the second presents the national response to HBV and HCV. The information consists of a compilation of secondary data, obtained through country reports and/or literature reviews. Specific indicators and the respective sources for the epidemiology of HBV and HCV in the Americas are listed in ***Table 1***. Other supplementary sources can be found in the bibliography. Hereafter, both countries and territories are referred to generically as "countries."

Sources for HBV and HCV epidemics in the Americas

General information on the epidemiology of hepatitis B and C was obtained through the compilation of data from multiple sources, including estimates from modeling and published systematic reviews. (***Table 1***).

Table 1. Indicators with sources for HBV and HCV epidemics in the Americas

Indicator	Source
Chronic HBV infection in the general population	Estimates from the Center for Disease Analysis 2016; Schweitzer et al., "Estimations of worldwide prevalence of chronic hepatitis B virus infection: a systematic review of data published between 1965 and 2013" 2015
Chronic HCV infection in the general population	PAHO "Supply of blood for transfusion in Latin America and Caribbean Countries 2012 and 2013" 2015
Trends in HBV infection in the post-HBV immunization era	Estimates from the Center for Disease Analysis 2016, including estimates from the Polaris Observatory
HBV in indigenous populations in the Amazon Basin; chronic HBV and HCV among key populations; health care workers, unsafe injections, and viral hepatitis	PAHO literature review and published systematic reviews; coverage data for HBV immunization from PAHO country reports to PAHO Family, Gender and Life Course/ Comprehensive Family Immunization (FGL-IM)
HBV and HCV prevalence among blood donors	PAHO "Supply of blood for transfusion in Latin America and Caribbean countries" 2013 and 2015 editions
Cirrhosis and hepatocellular carcinoma	CDA Polaris Observatory; IHME Global Burden of Disease data; IARC GLOBOCAN 2012; PAHO Survey on Strategic Information on Viral Hepatitis 2015-16
Blood safety with a focus on HBV and HCV prevention	PAHO "Supply of blood for transfusion in Latin America and Caribbean countries" 2015, 2013, 2010, 2009 editions
Number of liver transplants	PAHO survey on strategic information on viral hepatitis B and C; Salvalaggio et al., "Liver Transplantation in Latin America: The State-of-the-Art and Future Trends," 2014

Sources for the response to viral hepatitis B and C

The data for the sections *Policies and Plans and Continuum of Care and Treatment for HBV and HCV* were obtained from the PAHO survey on strategic information on viral hepatitis B and C, reported by country focal points in the ministries of health. Twenty-four countries submitted data in 2015 and/or 2016. The countries that responded to the surveys in both 2015 and 2016 are Anguilla, Argentina, Chile, Colombia, El Salvador, Guatemala, and Peru; 14 countries submitted the survey only in 2015: Antigua and Barbuda, Barbados, Belize, Brazil, British Virgin Islands, Canada, Cuba, Haiti, Honduras, Mexico, Panama, Paraguay, St. Vincent and the Grenadines, and the United States; and 3 countries responded only in 2016: Cayman Islands, Costa Rica, and Jamaica. The policy data was completed using other sources, including information provided by ministries of health to WHO in an earlier survey conducted in 2009-2010 and published in 2013, namely the *WHO Global Policy Report on the Prevention and Control of Viral Hepatitis.* For six countries (Argentina, Brazil, Chile, Colombia, El Salvador, and Panama), information from country data mining exercises on viral hepatitis submitted to PAHO was also incorporated. The data for *Policies for the Prevention of Mother-to-Child Transmission of Hepatitis B and Hepatitis B Vaccination Coverage for Birth Dose and Third Dose Among Children Under 1 Year* Were supplemented with information from the PAHO Comprehensive Family Immunization Unit, Family, Gender and Life Course, including reports via the PAHO-WHO/UNICEF Joint Reporting Form (JFR), 2015. The data for *HBV and HCV Surveillance Systems and Cancer Registries* were compiled from the WHO *Global Policy Report 2013*, PAHO Cancer in the Americas, country profiles 2013 and WHO GLOBOCAN 2012. The 2016 prices for HBV vaccines were obtained from the PAHO Revolving Fund.

3. Epidemiological overview: Chronic HBV and HCV in the Americas

Infection with the hepatitis B or C virus is a major global public health problem, affecting millions of people worldwide and putting them at risk for the consequences of chronic infection such as cirrhosis and liver cancer.

Infection with either viral hepatitis B or C can present acutely or result in chronic infection. The majority of adults infected with HBV clear the infection, but children under 5 have a very high probability of developing chronic infection: approximately 90% of children under 1 year of age; 25% to 50% of children aged 1-5, and 6% to 10% of individuals over the age of 5 have a probability of developing chronic infection [2]. Approximately 55% to 85% of people infected with HCV develop chronic infection [3], which can go undiagnosed for many years, with symptoms appearing decades later secondary to substantial liver damage [2].

3.1 CHRONIC HBV INFECTION IN THE GENERAL POPULATION

In the Americas:

- **2.8 million people living with chronic HBV with 0.28% prevalence of HBsAg among general population.**
- **88,000 new cases of acute HBV and 10,000 new chronic infections in 2016.**
- **56% of new HBV infections are due to perinatal transmission and 44% to horizontal transmission in all ages.**

An estimated 2.8 million people [2.2-8.0 million] live with chronic HBV in the Americas, 2.1 million of them [1.7-6.0 million] in Latin America and the Caribbean. The general population prevalence in the Americas in 2016 is 0.28% [0.22-0.81%]. In Latin America, the prevalence is 0.33% [0.26-0.95%] [4] (Table 2).

An estimated 88,000 new cases of acute HBV have occurred in the Americas in 2016, 93% of them the result of horizontal transmission, the majority in adults, and 7% through perinatal transmission [4].

In 2016, there have been approximately 10,000 new chronic HBV infections, 56% due to perinatal transmission and 44% to horizontal transmission, 3% of them in children. Thus, chronic infections beginning in childhood account for 57% of all incident chronic infections [4].

The information above represents newer, revised estimates, compared with those previously published by Schweitzer et al. (both estimates are presented in ***Table 2***, along with a comparison lower-limit baseline such

Table 2. Estimated HBsAg seroprevalence in selected countries in the Americas in 1965-2013 and 2016, percentage of blood units reactive to HBsAg in 2013

	Schweitzer estimate, 1965-2013	CDA 2016 estimate	Blood units reactive to HBsAg, 2013
Country	**% HBsAg seroprevalence (95% CI)**	**% HBsAg seroprevalence (uncertainty interval)**	**% positive to HBsAg**
Argentina	0.77 (0.77-0.78)	0.3 (0.3-1.0)	0.17
Barbados	1.40 (0.67-2.91)	N/A	0.27[b]
Belize	4.71 (3.90-5.67)	1.2 (1.0-1.5)	0.23
Bolivia (Plurinational State of)	0.44 (0.20-0.98)	N/A	0.28
Brazil	0.65 (0.65-0.66)	0.3 (0.3–0.8)	0.16
Canada	0.76 (0.74-0.79)	0.4 (0.4-0.5)	N/A
Chile	0.68 (0.34-1.35)	0.1 (0.1-0.3)	0.01
Colombia	2.29 (1.86-2.82)	0.3 (0.2-0.5)	0.16
Costa Rica	0.62 (0.46-0.83)	0.2 (0.2-0.6)	0.13
Cuba	1.30 (0.62-2.70)	0.6 (0.5-0.8)	0.51
Dominican Republic	4.09 (2.65-6.25)	1.7 (1.4-2.2)	1.03
Ecuador	2.00 (1.08-3.68)	N/A	0.49
El Salvador	N/A	1.0 (0.7-1.3)	0.12
Guatemala	0.22 (0.15-0.32)	0.5 (0.5-1.8)	0.46
Haiti	13.55 (9.00-19.89)[a]	N/A	3.52
Jamaica	3.76 (2.65-5.29)	3.0 (3.0-4.0)	0.6
Mexico	0.20 (0.19-0.21)	0.1 (0.1-0.37)	0.18
Nicaragua	0.55 (0.28-1.10)	0.9 (0.9-1.2)	0.21
Panama	1.68 (1.39-2.02)	N/A	0.22
Peru	2.10 (1.90-2.32)	0.3 (0.3-0.5)	0.38
Suriname	3.91 (2.97-5.14)	N/A	0.05
USA	0.27 (0.24-0.30)	0.3 (0.2-0.4)	N/A
Venezuela (Bolivarian Republic of)	0.48 (0.44-0.52)	0.9 (0.9-1.2)	0.43
Regional average	**0.81 (0.81-0.81)**	**0.28 (0.22–0.81)**	**0.18**

[a] Prevalence for Haiti is based on 2 studies with sample sizes of 116 and 39. These studies were published in 1989 and 1992, respectively. The most recent study is based on a sample of pregnant women with human immunodeficiency virus type 1 and human T lymphotropic virus type I infections. Alternative studies among pregnant women showed 5.0% prevalence in 2006 (Andernach et al., 2009) and 4.7% in in 2003-2004 (GHESKIO and CDC, 2004).

[b] Latest year available is 2010.

N/A= Not available.

Source: Schweitzer et al. [5]; CDA [6]; PAHO [7], [8].

as blood bank HBsAg seroprevalence). As to country-level prevalence, most of the Western Hemisphere is classified as low endemicity, with the exception of intermediate endemicity in the Caribbean and high endemicity in subnational areas of the Amazon Basin.[1]

Worldwide efforts are focused on developing reliable up-to-date estimates for chronic HBV and HCV. Part of this effort is reflected in the newly established WHO reference modeling group for viral hepatitis, which will review methods and advise on the validity of these new models. PAHO will report and publish new estimates as they become available and is working with countries to support the development of country-validated estimates.

TRENDS IN HBV INFECTION IN THE POST-HBV IMMUNIZATION ERA

- Several studies in the Region have shown decreases in HBsAg levels in children and young people in recent decades.
- Effective HBV vaccination strategies in children appear to have contributed to this reduction.

Implementation of hepatitis B vaccination programs in highly endemic areas worldwide has contributed to the decrease in HBsAg prevalence and incidence of liver cancer [9, 10]. Several studies in our Region have shown decreases in HBsAg prevalence among young populations in recent decades. For example, seroprevalence studies in Bolivia[2] [11], Brazil [9, 12], Colombia [13], Peru [14], and the United States [15, 16, 17] have shown a decrease in HBsAg prevalence in children correlated with an increase in HBV immunization (***Table 3***). The Canadian Notifiable Disease Surveillance System reported a 90% decrease in the rate of acute and indeterminate HBV infection cases in children aged 10-19 during the period 1990-2008, attributing it to routine vaccination [18]. The U.S. Centers for Disease Control and Prevention (CDC) also reported a decrease in acute hepatitis B between 1990 and 2012, attributing the decline to effective vaccination strategies [19].

[1] The seroprevalence of HBsAg in the general population in a defined area determines the HBV endemicity classification. Highly endemic areas have an HBsAg prevalence of >8%; intermediate endemicity is described as prevalence of 2–7%; and low endemicity is HBsAg-positivity in <2% of the population [1].

[2] This serological study identified a persistently low prevalence of HBV infection after a decade of universal vaccination.

Table 3. Studies showing a decrease in HBsAg prevalence in pre- and post-HBV immunization periods in selected countries in the Americas

Country	Study population of pre-immunization group	Study population of post-immunization group[a]	Year vaccination began in area	Pre-Immunization study period	Pre-Immunization age (years)	Pre-immunization HBsAg pos/total	Pre-immunization HBsAg prev (%), CI	Post-immunization study period	Post-Immunization age (years)	Post HBsAg pos/total	Post HBsAg prev (%), CI	Author, year of publication
Bolivia (Plurinational State of)	Randomized selection of regional schools and schoolchildren in Cochabamba, eastern Bolivian province		2000	2010	10 to 16	0/329	0%	2010	5 to >10	0/95	0%	Masuet-Aumatell et al., 2013
Brazil	Randomized selection of households in the villages along the Purus River in Labrea municipality		1989	2005-2006	>20	61/603	10.1% (9.34-10.9)[b]	2005-2006	0 to 2	3/136	2.2% (0.54-3.86)[b]	Braga et al., 2011
Brazil	Participants in the Brazilian National Hepatitis A, B, and C Survey conducted in the North, South and Southeast regions		1989-1993	2007-2008	20 to 29	1,395,061 /15,799,014	8.83% (7.58-10.07)[c]	2007-2008	10 to 19	38,835 /4,742,302	0.82% (0.45-1.20)[c]	Ximenes et al., 2015
Colombia	Children living in Araracuara and Puerto Santander villages near the Amazon river	Children living in Araracuara, and Puerto Santander villages near the Amazon river	1992	1992	5 to 9	N/A	9%	1999	5 to 9	N/A	2%	de la Hoz et al., 2008
Peru	Randomized selection of indigenous groups in the Peruvian Amazon Basin	Systematic randomized sample of children < 5 years in indigenous groups in the Peruvian Amazon Basin	1996	1996	0 to 5	N/A	9.4%	2009	0 to 5	0/739	0%	Cabezas-Sanchez et al., 2006, 2014
USA	Alaska natives residing in Bristol Bay region		1983	1993	11 to 15	9/118	7.6%	1993	0 to 10	0/271	0%	Harpaz et al., 2000

Country	Study population of pre-immunization group	Study population of post-immunization group[a]	Year vaccination began in area	Pre-Immunization study period	Pre-Immunization age (years)	Pre-immunization HBsAg pos/total	Pre-immunization HBsAg prev (%), CI	Post-immunization study period	Post-Immunization age (years)	Post HBsAg pos/total	Post HBsAg prev (%), CI	Author, year of publication
USA	School-children attending public schools in Oahu, Hawaii in grades 1-3	School-children attending public schools in Oahu, Hawaii in grades 2-3	1992	1988-1989	N/A	43/2701	1.6%[d]	2001-2002	6 to 9	1/2469	0.04[d] (0.00-0.23)%	Perz et al., 2006
USA	Participants in the National Health and Nutrition Examination Surveys (NHANES) in the USA		1991	1988-1994	6 to 19	N/A	0.24 (0.07-0.56)[d]	1999-2006	6 to 19	N/A	0.05 (0.02-0.11)[d]	Wasley et al., 2010

N/A=Not available; CI confidence interval 95%

[a] Available HBV vaccine coverages (three doses) in the post-immunization groups are as follows: Brazil (Ximenes et al. 2015) - the average vaccination rate for the pre-immunization group was approximately 32%; for post-immunization, it was approximately 71%; Colombia 91%; Peru 58.5%; United States (Harpaz et al. 2000) 93% ; United States (Perz et al. 2006) 99%. There was no reported vaccine coverage for the study in Brazil (Braga et al.), Bolivia, and the United States (Wasley et al.).

[b] Adjusting for age, gender, and vaccination for HBV: the odds ratio for the nonvaccinated was 1.61 (95% CI 1.15-2.22). No cohort effect was analyzed.

[c] Prevalence estimates using antibodies against hepatitis B core antigen.

[d] Prevalence estimates of chronic HBV infection defined as the presence of anti-HBc and HBsAg.

Source: Masuet-Aumatell et al. [11]; Braga et al. [20]; de la Hoz et al. [21]; Cabezas-Sanchez et al. [14, 22]; Harpaz et al. [15]; Perz et al. [16]; Wasley et al. [23];Ximenes et al. [12].

HBV IN INDIGENOUS POPULATIONS IN THE AMAZON BASIN

- Specific ethnic and indigenous groups show a high HBV burden in the Americas, notably in the Amazon Basin.
- Prevalence of chronic HBV carriers in the Amazon Basin is intermediate to high. Values range from 1% to over 14% among different indigenous populations and age groups, for years 2005 to 2015.

The Amazon Basin is home to some 385 indigenous groups, totaling approximately 33 million people in Bolivia, Brazil, Colombia, Ecuador, Guyana, French Guiana, Peru, Suriname, and Venezuela [24]. These groups are some of the most marginalized populations and live under very difficult social and economic conditions. Mortality rates and morbidity indicators in these groups are generally higher [25], particularly in the case of HBV infection and HDV super- or coinfection. It should be noted that while the Amazon Basin is recognized as an area of high HBV endemicity, studies show a high HBV burden in many other ethnic and

indigenous groups outside of that region [26, 27]. The main routes of transmission are vertical, person-to-person in early childhood, and sexual [28].

Prevalence of chronic HBV carriers in the Amazon Basin is intermediate to high. Values range from 1% to over 14% among different indigenous populations and age groups, according to information from 5 countries in the Amazon Basin (***Table 4***). Nevertheless, the wide-scale implementation of universal infant HBV vaccination appears to have helped lower the prevalence of HBV in several of these countries in the region [1, 29] Additionally, a small number of studies have described reductions in prevalence in indigenous populations over the past decade (***Table 3***). Timely vaccination coverage among indigenous populations varies within countries and communities (***Figure 1***), and prevalence levels in these indigenous groups remain unacceptably high.

Super- or coinfection of HDV with HBV infection leads to an increased risk of fulminant hepatitis or progression to severe chronic liver disease. In the western Brazilian Amazon region, family outbreaks of fulminant hepatitis, commonly known as Lábrea black fever, has frequently been reported in small rural villages [20]; this has also been reported in other areas in Brazil and other countries in the Amazon region such as Ecuador [30]. HDV prevalence among HBsAg carriers has been reported at 42% in some indigenous populations, with overall anti-HDV prevalence of 13.5% in rural populations of Lábrea, Brazil [20]. Among the Amerindians of Acre, Brazil, 7.1% anti-HDV prevalence has been reported [31]. In Brazil, 3,494 cases of hepatitis D were notified via the SINAN between 1999 and 2015, 25% of them in the state of Acre and 41% in the state of Amazonas.

Table 4. Studies documenting HBsAg prevalence in indigenous populations along the Amazon Basin, 2005-2015

Country	Description/location of population	Age range (years)	HBsAg positive/ Total	HBsAg (%)	Reference
Bolivia (Plurinational State of)	Amerindian Bolivians in eastern Bolivia	8 to 67	12/200	0.1 (0-0.5)	Khan et al., 2008
Brazil	Representative sample of general population in Lábrea, Western Amazon region	0 to >50	20/605	3.3 (1.9-4.7)	Braga et al., 2005
Brazil	12 municipalities in the state of Acre in the Western Amazon region	0 to 92	89/2,656	3.3 (2.6-4.0)	Viana et al., 2005
Brazil	Children in Western Amazon	0 to >16	7/163	4.3 (1.2-7.4)	Lobato et al., 2006
Brazil	People living with HIV/AIDS in Amazon Basin	0 to >50	45/704	6.4 (4.5-8.2)	Braga et al., 2006
Brazil	Amerindian populations from four ethnic groups: Mawayana, WaiWai, Katwena, and Xerew; 1,270 adults and children living in the Mapuera village in Pará State	0 to >40	23/339	6.8 (HBc Ag) (4.1-9.5)	De Souza et al., 2007
Brazil	Retrospective study of samples submitted to the Central Public Health Laboratory of Pará from January 2002 to December 2005	0 to >50	410/11,282	3.6 (3.3- 3.9)	Aquino et al., 2008
Brazil	13 rural and urban locations in Buriticupu municipality in Eastern Amazon region	1 to 87	7/243	2.9 (0.8-5.0)	El Khouri et al., 2010

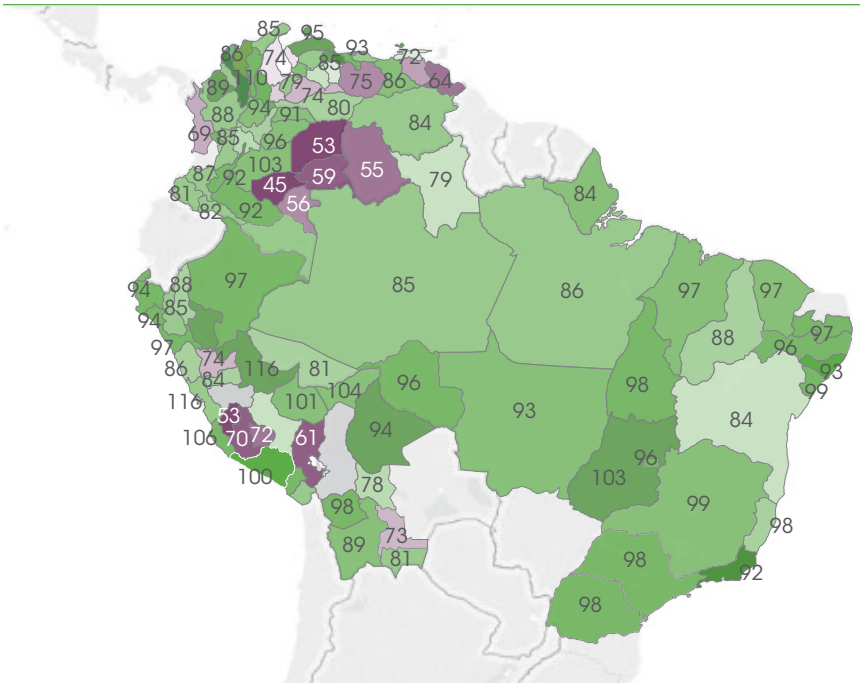
Country	Description/location of population	Age range (years)	HBsAg positive/ Total	HBsAg (%)	Reference
Brazil	Random selection of households in villages along the Purus River in Lábrea municipality	0 to >20	94/1510	6.2 (5.0-7.4)	Braga et al., 2012
Brazil	Rural communities on the Purus River basin in Lábrea, Western Amazon region	1 to 78	23/225	10.2 (3.0-9.4)	da Costa Castilho et al., 2012
Colombia	Rural and urban areas of Amazonas state	12 to 72	14/176	8.0 (4.0-12.0)	Alvarado-Mora et al., 2011
Colombia	Amerindian communities in Amazonas state	0 to 18	23/861	2.7 (1.6-3.8)	di Fillipo Villa et al., 2015
Peru	Indigenous communities in Peruvian Amazon	0 to 94	82/870	9.4 (7.5-11.3)	Cabezas-Sanchez et al., 2006
Peru	Pregnant women in 6 indigenous communities (Ashaninka, Kandozi, Matsigenka, Shapra, Shiwilo and Shipibo Konibo)	N/A Mean 25 +7.2	11/1241	2.8 (1.4-5.0)	Ministerio de Salud, Peru, 2009
Peru	Male sexual partners of pregnant women in 6 indigenous communities (Ashaninka, Kandozi, Matsigenka, Shapra, Shiwilo and Shipibo Konibo)	N/A Mean 30 +8.8	15/697	4.8 (2.7-7.8)	Ministerio de Salud, Peru, 2009
Peru	Pregnant women and their male partners from 6 indigenous Amazon populations[a]	N/A	26/899	2.9 (1.8-4.0)	Ormaeche et al., 2012
Peru	Children <5 in indigenous groups in the Peruvian Amazon Basin	0 to 5	0/739	0%	Cabezas-Sanchez et al., 2014
Venezuela (Bolivarian Republic of)	Japreira indigenous community in Venezuela	>5 to >65	44/149	29.5 (22.2-36.8)	Monsalve Castillo et al., 2008
Venezuela (Bolivarian Republic of)	Piaro and Yanomami Amerindians of Amazonas State	0 to >70	54/645	8.4 (6.3-10.5)	Duarte et al., 2010

N/A=Not available.

[a] Mean age of pregnant women in study was 25.1 and of male partners, 29.8.

Source: Khan et al. [32]; Braga et al. [33]; de Souza et al., [34]; Aquino et al. [35]; da Costa Castilho et al. [36]; Braga et al. [37]; Viana et al. [31]; El Khouri et al. [38]; Lobato et al. [39]; Braga et al. [9]; Alvarado-Mora et al. [40]; di Fillipo Villa et al. [41]; Ministerio de Salud, Peru, 2009 [42] ; Ormaeche et al. [43]; Cabezas-Sanchez et al. [22, 14]; Monsalve Castillo et al. [44]; Duarte et al. [45].

Figure 1. HepB3 coverage in states or departments along the Amazon Basin in Brazil, Colombia, Peru, Bolivia, and Venezuela, 2013 (%)



Source: PAHO [46].

3.2 CHRONIC HBV INFECTION AMONG KEY POPULATIONS

- Key populations such as female sex workers, men who have sex with men, prison inmates and drug users present higher HBV infection vis a vis the general population (pooled HBsAg prevalence of 1.5% (CI 95% 1-2%) among sex workers; 2.9% (2.1-3.7%) for MSM; 8.6% (1.8-15.3%) for prison inmates; 3.3% (2.2-4.5%) for people who inject drugs; and 1.5% (1.2-1.8%) for noninjecting drug users.
- Identifying populations at higher risk for viral hepatitis is essential for appropriate public health interventions.

Key populations are defined as those at higher epidemiological risk of acquiring and transmitting viral hepatitis [47]. Identifying populations at higher risk for VH is essential for appropriate public health interventions.

A systematic PAHO review of published and unpublished literature between 2000 and 2013 examining HBsAg prevalence among key populations in studies conducted between 1993 and 2011 in 9 Latin American and Caribbean countries revealed HBsAg prevalence ranging from 0% to 30.6%. The pooled prevalence for female sex workers was 1.5% (CI 95% 1-2%), for MSM 2.9% (2.1-3.7%), for prison inmates 8.6% (1.8-15.3%), for PWID 3.3% (2.2-4.5%), and for NIDU 1.5% (1.2-1.8%) ***(Figures 2 & 3)***.

Figure 2. Studies in Latin America and the Caribbean documenting HBV prevalence (HBsAg) among injecting and non-injecting drug users, 1994-2011

	Author	Region	Marker	Field Work
DU	Cocozella 2203	Argentina (unknow)	f (2/97)	≤ 2003
DU	Sheehan 2012	Argentina (Buenos Aires)	f (4/203)	2005-2006
DU	Bastos 2000	Brazil (Rio de Janeiro)	f (1/225)	≤ 2000
DU	Novais 2009	Brazil (Cuiabà)	f (6/314)	2006-2007
DU	Alvarado-Esquivel 2008	Mexico (Durango)	f (1/180)	2006-2007
PWID	Weissenbacher 2003	Argentina (Buenos Aires)	f (15/174)	2000-2001
PWID	Oliveira 2005	Brazil (Rio de Janeiro)	f (21/609)	1999-2001
PWID	Caiaffa 2006	Brazil (6 cities)	f (20/857)	2000-2001
PWID	de Matos 2013	Brazil (Goiânia, Campo Grande, Cuiabà)	f (1/150)	2005-2006
PWID	Frost 2006	Mexico (Tijuana, Ciudad Juárez)	f (1/202)	2005
PWID	Osimani 2005	Uruguay (Montevideo)	f (9/200)	2003
NIDU	Rossi 2008	Argentina (Buenos Aires)	f (3/502)	2002-2003
NIDU	Nunes 2007	Brazil (Salvador)	f (1/125)	2001-2002
NIDU	Ferreira 2009	Brazil (Goiânia, Campo Grande, Cuiabà)	f (9/852)	2005-2006
NIDU	Santos Cruz 2013	Brazil (Rio de Janeiro) Brazil (Salvador)	f (5/81) f (0/79)	2010-2011 2010-2011
NIDU	Dowe 2001	Jamaica (Kingston)	f (2/301)	1994-1999
NIDU	Osimani 2003	Uruguay (Montevideo)	f (5/367)	2002-2003

Note: DU: drug users; PWID: people who inject drugs; NIDU: non-injecting drug users.
Source: Gutzmann A, Alonso M, Mazin R, Pinzon C, Reveiz L. Systematic review of HBsAg prevalence among key populations in Latin America and the Caribbean. Unpublished, 2014

Figure 3. Studies in Latin America and the Caribbean documenting HBV prevalence (HBsAg) among female and transgender sex workers, and men who have sex with men, 1994-2011

	Author	Region	Marker	Field Work
Female Sex Workers	Passos 2007	Brazil (Ribeirao Preto)	f (3/499)	199-2000
	Uribe- Salas 2003	Mexico (Soconusco)	f (6/461)	1998
	Alvarado-Esquivel 2008	Mexico (Durango)	f (0/141)	2006-2007
	Hakre 2013	Panama (Bocas del Toro)	f (0/95)	2009-2011
		Panama (Chiriqui)	f (3/155)	2009-2011
		Panama (Ciudad de Panama)	f (1/455)	2009-2011
		Panama (Colon)	f (2/150)	2009-2011
T. SW	Camejo 2003	Venezuela (Los Teques)	f (8/212)	1999
	Russi 2003	Uruguay (Montevideo)	f (6/200)	1999
	Segura 2010	Argentina (Buenos Aires)	f (12/877)	2003
	Sutmoeller 2002	Brazil (Rio de Janeiro)	f (47/1165)	1994-1998
	Johnston 2013	Dominican Rep. (Barahona)	f (2/281)	2008
		Dominican Rep. (La Altagracia)	f (9/270)	2008
		Dominican Rep. (Santiago)	f (9/327)	2008
		Dominican Rep. (Santo Domingo)	f (11/150)	2008
MSM	Guanira 2008	Peru (Lima)	f (25/497)	2000-2003
	Lama 2010	Peru (Arequipa)	f (10/436)	2002-2003
		Peru (Iquitos)	f (15/307)	2002-2003
		Peru (Lima)	f (38/933)	2002-2003
		Peru (Piura)	f (6/273)	2002-2003
		Peru (Pucalipa)	f (10/286)	2002-2003
		Peru (Suliana)	f (8/468)	2002-2003

Note: T.SW: female trans sex workers. Source: Source: Gutzmann A, Alonso M, Mazin R, Pinzon C, Reveiz L. Systematic review of HBsAg prevalence among key populations in Latin America and the Caribbean. Unpublished, 2014

According to estimates from a systematic review by Nelson et al., approximately 316,000 PWID are HBsAg-positive in the Americas (*Table 5*).

Table 5. Estimated number people who inject drugs, and injecting drug users who are HBsAg-positive in the Americas

Region	Estimated number of injecting drug users, 2007	Estimated number of injecting drug users that are HBsAg- positive, 2010
Caribbean	186,000 (137,500-241,500)	N/A
Latin America	2,018,000 (1,508,000-2,597,500)	43,500 (12,500-90,500)
Canada and USA	2,270,500 (1,604,500-3,140,000)	272,500 (57,500-642,000)
Total	4,474,500 (3,250,000-5,979,000)	316,000 (70,000-90,500)

PN/A; Not available; the authors' reported data was insufficient to produce a region-specific estimate for populations of injecting drug users in the Caribbean.

Source: Mathers et al. [48]; Nelson et al. [49].

3.3 CHRONIC HCV INFECTION IN THE GENERAL POPULATION

- 7.2 million people living with chronic hepatitis C in the Americas, of them, 4.1 million are from Latin America and the Caribbean.
- The prevalence of chronic HCV is 0.73% among general population in the America Region, and 0.65% in Latin America and the Caribbean.
- There were 65,000 new HCV infections in 2016 in the Americas.
- Genotype 1 responsible for 70% of HCV infections.

An estimated 7.2 million (5.2-8.6 million) people live with chronic hepatitis C infection in the Americas, with a viremia prevalence of 0.73% (0.52-0.87%). In Latin America and the Caribbean, an estimated 4.1 million people (2.8-4.6 million) live with hepatitis C [50] (***Table 6***).

In 2016, the estimated HCV viremia prevalence is under 1% in all countries. The United States and Puerto Rico have the highest rates of HCV viremia, at 0.90% (0.68%-1.17%) and 0.97% (0.63%-1.64%), respectively. Out of the 13 other countries with data, Brazil and Colombia have viremia prevalence rates of 0.80%-0.90%, and the rates for the rest of the countries are below 0.80%. It is estimated that in 2016 there have been 65,000 new HCV infections, over 50% of them in Latin America and the Caribbean [50].

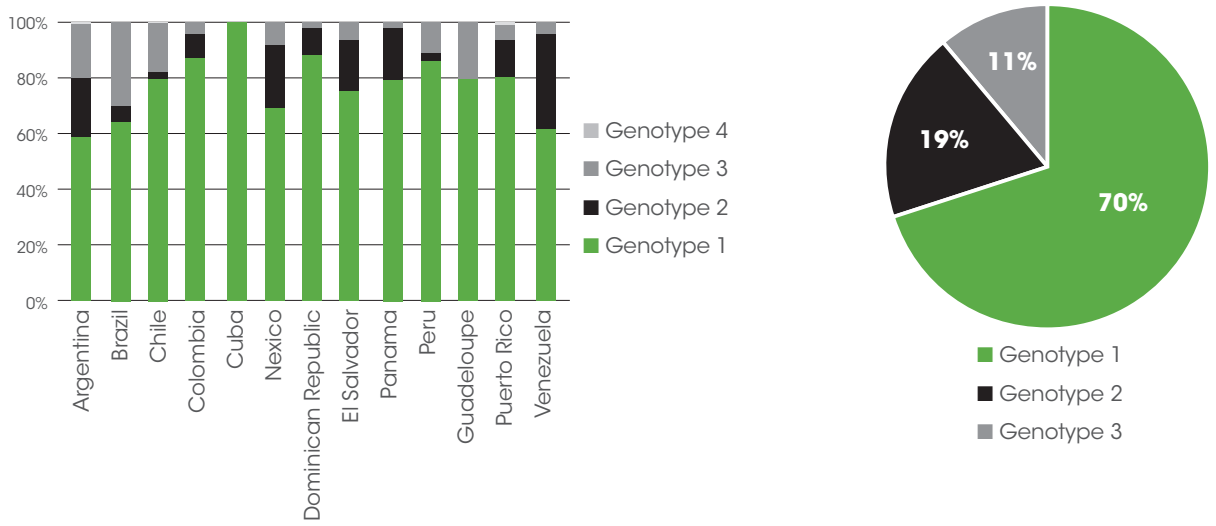
Based on the data from the Polaris Observatory, genotype 1 is predominant in Latin America and the Caribbean [51] (***Figure 4***). Within the genotype 1 subtypes, genotype 1a is predominant in Canada, the Dominican Republic, Peru, and the United States, and genotype 1b is predominant in Argentina, Brazil, Chile, Colombia, Cuba, Mexico, and Venezuela. HCV genotype sequencing can assist in understanding the timing and expansion of HCV in specific countries and/or regions. For example, a study by Joy et al. evaluating HCV

Table 6. Estimated HCV viremia prevalence and number of viremic people by region in the Americas, 2016

Region	Estimated viremia (HCV-RNA) prevalence	Estimated number of viremic (HCV-RNA) people
Latin America	0.66% (0.45-0.72%)	3.8 million (2.6-4.2 million)
Caribbean	0.53% (0.40-0.78%)	240,000 (180,000-350,000)
Latin America and the Caribbean	0.65% (0.45-0.73%)	4.1 million (2.8-4.6 million)
North America (Canada, USA)	0.87% (0.65-1.12%)	3.1 million (2.4-4.1 million)
Total Americas	0.73% (0.52-0.87%)	7.2 million (5.2 -8.6 million)

Note: The estimated anti-HCV seroprevalence for the Americas is 0.97%
Source: CDA [50].

Figure 4. Estimated distribution of HCV genotypes (%) in selected countries in Latin America and the Caribbean



Source: CDA, [50]

genotype 1a sequences in Canada and the United States found that the spread of genotype 1a occurred before 1965, suggesting possible nosocomial or iatrogenic factors, rather than past sporadic behavioral risks, as key contributors to the HCV epidemic [52].

3.4 CHRONIC HCV INFECTION AMONG KEY POPULATIONS

- Highest prevalence among PWID with a pooled regional anti-HCV prevalence of 49%.
- Prison inmates, noninjecting drug users, men who have sex with men, sex workers and HIV positive individuals are other groups with elevated burden of HCV.

A 2015 systematic review examining HCV prevalence among key populations in Latin America, based on studies published between 2000 and 2013, found the highest prevalence of HCV infection (positivity to anti-HCV antibody) in PWID, ranging from 1.7% in Colombia to over 95% in two cities in Mexico, and a pooled regional anti-HCV prevalence of 49% (CI 95% 22.6-76.3%). Anti-HCV prevalence shows high burden of HCV in NIDU, MSM, and sex workers, with a pooled regional prevalence of 4% (CI 95% 2.6-4.5%), 3% (CI 95% 1.7-4.5%), and 2% (CI 95% 1.0-3.4%), respectively. Among prison inmates, prevalence decreased over the 15-year time span studied ($p<0.001$), with current HCV infection (based on HCV-RNA positivity) in Brazil, Mexico, and Venezuela showing a prevalence of under 10% in prison inmates [53].

Worldwide, HCV prevalence in PWID is over 50% in the majority of countries

[54]. The United States has one of the largest PWID populations, with HCV prevalence estimated at 72% of PWID [49]. HBV is also highly prevalent among PWID in the Region (***Table 7***).

A 2016 review by Platt et al. studying HCV/HIV coinfection estimated the total number of HIV/HCV-infected individuals at 319,000 (202,400–396,700) in North America and 176,600 (61,500–334,500) in South and Central America and the Caribbean. HCV prevalence was consistently higher in HIV-positive individuals than in HIV-negative individuals in all risk groups and regions [55].

Table 7. Estimated number people who inject drugs, and those who are anti-HCV positive in the Americas, 2007 and 2010

Region	People who inject drugs, 2007	Anti-HCV-positive injecting drug users, 2010
Caribbean	186,000 (137,500-241,500)	N/A
Latin America	2,018,000 (1,508,000-2,597,500)	1,022,000 (675,500-1,441,000)
Canada and USA	2,270,500 (1,604,500-3,140,000)	1,673,500 (1,099,000-2,471,500)
Total	4,474,500 (3,250,000-5,979,000)	2,695,500 (1,774,500-2,471,500)

N/A=Not available; the authors' reported data was insufficient to produce a region-specific estimate for injecting drug user populations in the Caribbean.

Source: Mathers et al. [48]; Nelson et al. [49].

3.5 HBV AND HCV PREVALENCE AMONG BLOOD DONORS

- The HBsAg prevalence among blood donors in Latin America and the Caribbean in 2013 ranged from 0.0 to 3.63%, with 6 countries with prevalence higher than 0.6% (Dominican Republic, Anguilla, Britsh Virgin Islands, Guyana, Haiti, San Kitts and Nevis and Saint Lucia).
- The anti-HCV prevalence among blood donors in Latin America and the Caribbean in 2013, ranged from 0.0 to 1.24%, with 6 countries with prevalence higher than 0.6% (Cuba, Guatemala, Mexico, Anguilla, Haiti, Jamaica).

In 2013, most of the 38 reporting countries reported less than 1% of blood units reactive to HBsAg, with the exception of the Dominican Republic (1.03%), Haiti (3.52%), and St. Kitts and Nevis (3.63%). Similarly, among 37 countries in the Region reporting screening for anti-HCV, the percentage of reactive blood units was also <1%, with the exception of Haiti (1.03%) and Cuba (1.24%) (***Figures 5 & 6***).

Figure 5. Percentage of HBV-reactive units in screened blood, 2013

Source: PAHO [46].

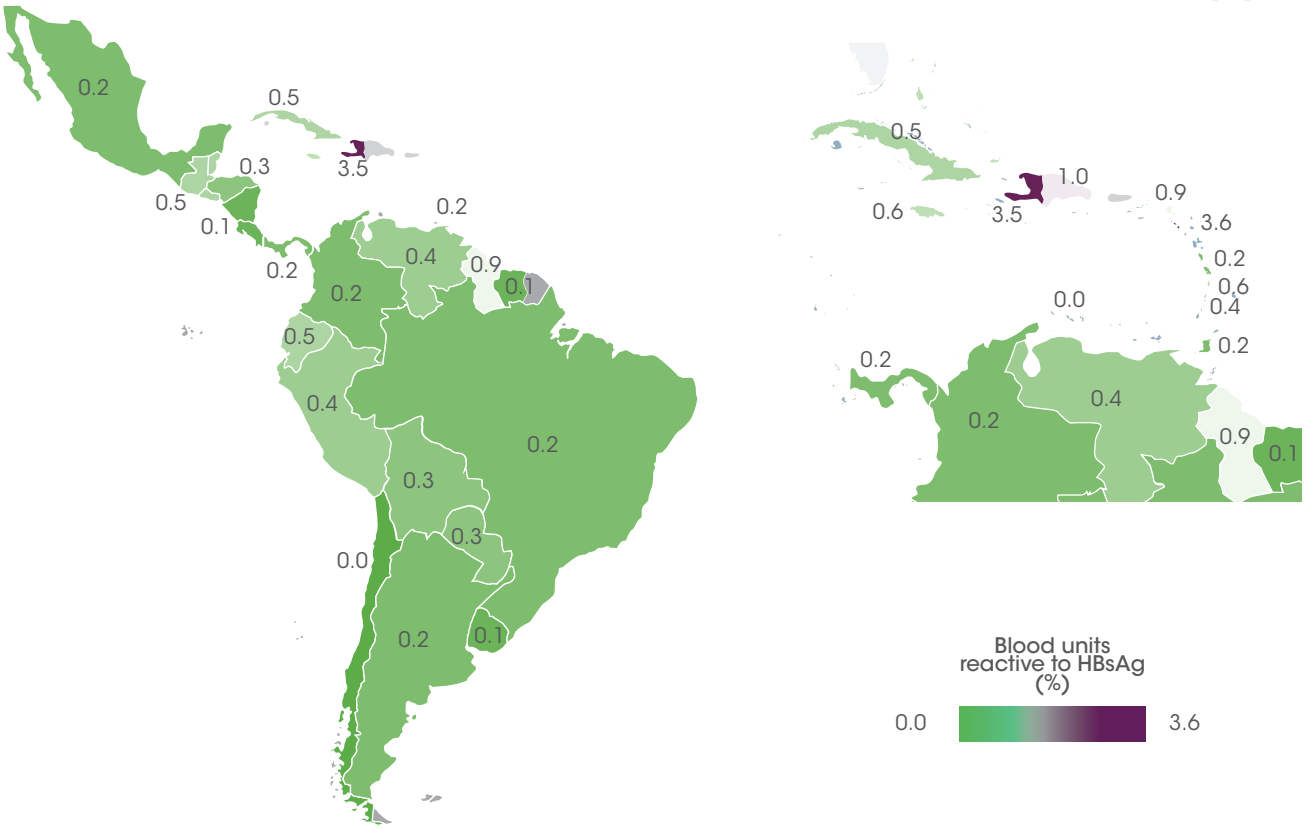
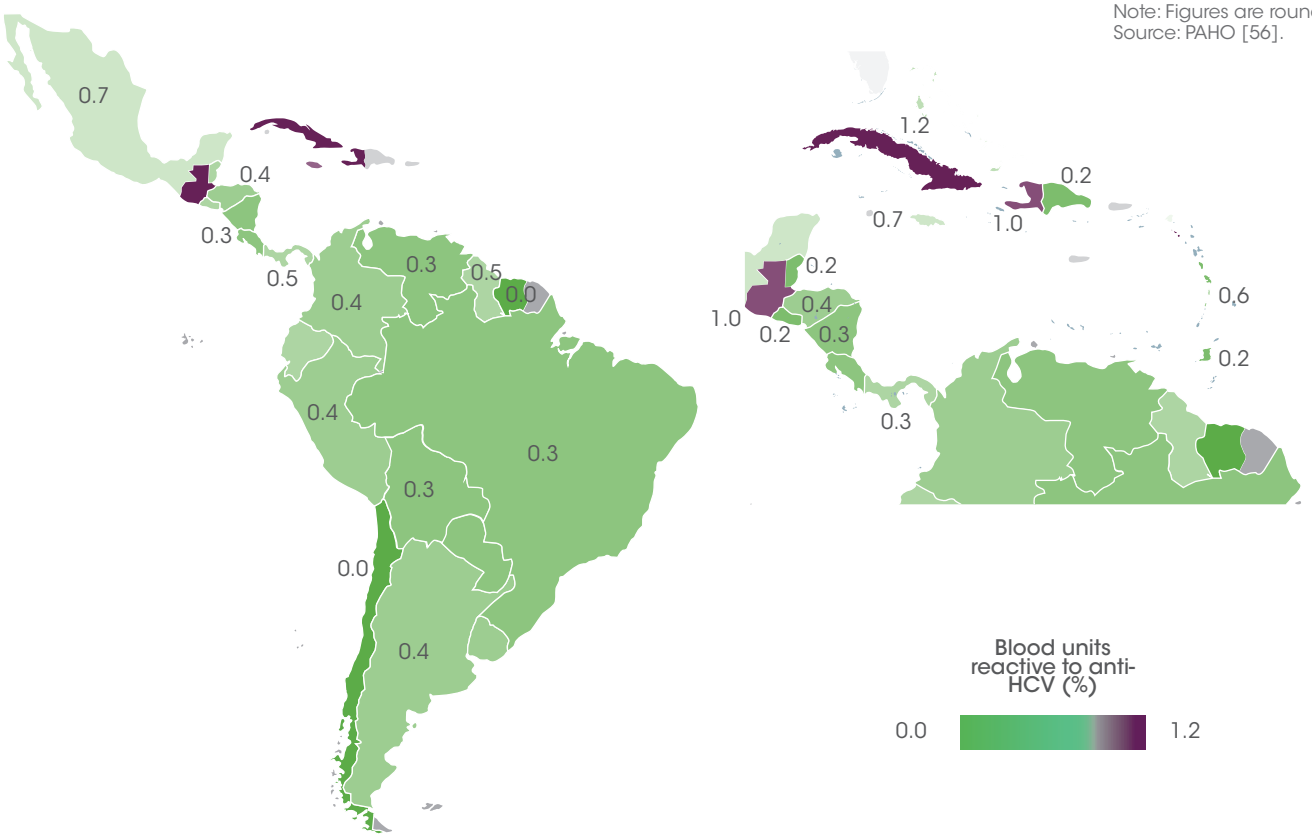


Figure 6. Percentage of HCV-reactive units in screened blood, 2013

Note: Figures are rounded.
Source: PAHO [56].



3.6 HEALTH CARE WORKERS, UNSAFE INJECTIONS, AND VIRAL HEPATITIS

- Healthcare workers are particularly vulnerable to viral hepatitis due to their risk of exposure to infectious biological material.
- Estimates indicate a decrease in HBV and HCV infections through unsafe injections in the Latin America and the Caribbean between 2000 and 2010.

Health care workers (HCW) are particularly vulnerable to blood-borne transmissible infections due to their risk of exposure to infectious biological material, and HBV and HCV are among the most frequently transmitted infections [57]. Risk factors for HBV infection in HCW include high HBV viral load in source patients and unvaccinated HCWs. [57]. In a 2016 systematic review of HBV and HCV infection in HCWs, studies found a 0.7% prevalence of anti-HCV positivity in HCW in the United States and low rates of HBsAg positivity in the United States (0.1%) and Brazil (0.8%) [57].

In a 2014 review by Pepin et al. [58], the number of HBV and HCV infections transmitted through unsafe injections[3] was estimated in two groups of countries in the Americas (***Table 8***). There was a decrease in HBV infections transmitted through unsafe injections in 2000 to 2010. On the other hand, there was an increase in HCV infections in the majority of countries (mainly in the group comprised by the following countries: Antigua and Barbuda, Argentina, The Bahamas, Barbados, Belize, Brazil, Chile, Colombia, Costa Rica, Dominica, the Dominican Republic, El Salvador, Grenada, Guyana, Honduras, Jamaica, Mexico, Panama, Paraguay, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, and Venezuela [58]) (***Table 8***).

3 Healthcare-associated transmission of bloodborne pathogens can be prevented through the development of a strategy to reduce injection overuse and achieve best safety practices for intradermal, subcutaneous and intramuscular injections in healthcare settings. A safe injection does not harm the recipient, does not expose the provider to any avoidable risks and does not result in any waste that is dangerous for other people. [149]

Table 8. Revised estimates of HBV and HCV infections transmitted through unsafe injections in 2000 and 2010 by subregion, as defined in Global Burden of Disease 2000 study

	HBV		HCV	
Countries[a]	2000	2010	2000	2010
Antigua and Barbuda, Argentina, The Bahamas, Barbados, Belize, Brazil, Chile, Colombia, Costa Rica, Dominica, the Dominican Republic, El Salvador, Grenada, Guyana, Honduras, Jamaica, Mexico, Panama, Paraguay, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela	33,743	28,969	604-1,208[b]	2,098-4,195[b]
Bolivia, Ecuador, Guatemala, Haiti, Nicaragua, Peru	89,003	16,111	1,374-2,748[b]	472-944[b]

[a] The Global Burden of Disease 2000 study grouped countries in the Americas by child and adult mortality stratum, based on UN Population Division estimates and WHO mortality rates from 1999.

[b] Lower estimate used a 0.5% probability of transmission and higher estimate used a 1.0% probability of transmission.

Note: North America and Cuba were excluded from the analysis due to assumed low incidence of unsafe injections.

Source: Pépin et al. [58].

3.7 CIRRHOSIS AND HEPATOCELLULAR CARCINOMA

- In the Americas
  - In 2015, approximately 1 million people (in 14 countries) were estimated to have HCV-related cirrhosis, a 32% increase over 2010.
  - An estimated 88,100 deaths in the Americas were due to cirrhosis secondary to HBV and HCV infection, 85% of them attributable solely to HCV.
- Worldwide, an estimated 60% of Hepatocarcinoma cases were attributed to HBV or HCV infection.
- Over 63,000 new cases of liver cancer were estimated in 33 countries in the Americas in 2012.

The two main complications of chronic HBV or HCV infection are cirrhosis and hepatocellular carcinoma (HCC), which constitute the greatest burden of disease associated with HBV and HCV infection. In 2015, approximately 1 million people in 14 reporting countries were estimated to have HCV-related cirrhosis, a 32% increase over 2010 [51] (*Table 9*).

Table 9. Estimated number of people living with HCV-related liver cirrhosis in selected countries in the Americas, 2010-2015

Country	2010	2011	2012	2013	2014	2015
Argentina	36,800	39,100	41,300	43,500	45,900	48,200
Brazil	204,000	218,000	230,000	242,000	254,000	267,000
Canada	24,000	25,200	26,200	27,400	28,500	29,700
Chile	5,600	5,900	6,100	6,300	6,600	6,800
Colombia	51,900	53,100	54,200	55,300	56,400	57,400
Cuba	4,100	4,200	4,200	4,200	4,300	4,300
Dominican Republic	4,800	5,200	5,600	6,000	6,500	6,800
Guadeloupe	90	100	110	120	130	130
Mexico	53,300	55,300	57,100	59,000	60,900	62,700
Panama	1,200	1,300	1,300	1,400	1,500	1,500
Peru	14,900	15,500	15,900	16,200	16,600	16,900
Puerto Rico	3,300	3,500	3,700	3,900	4,000	4,200
United States	408,000	438,000	468,000	501,000	535,000	568,000
Venezuela (Bolivarian Republic of)	16,900	17,800	18,600	19,400	20,100	20,700
Total	828,890	882,200	932,310	985,720	1,040,430	1,094,330

Source: CDA [51]. Accessed 7 July 2016, downloaded from the Polaris Observatory, under the "Data" tab and the option of "Base" as the strategy.

Table 10. Number of deaths and mortality rate (per 100,000 population) due to cirrhosis secondary to HBV and HCV in 1990 and 2013 in 34 countries in the Americas

	1990		2013	
	Number of deaths	Rate / 100,000	Number of deaths	Rate / 100,000
HBV	7,663	1.05	13,154	1.35
HCV	36,581	5.06	74,964	7.73

Source: IHME. Global Burden of Disease 2013 [59].

According to estimates from the Global Burden of Disease 2013 study, approximately 88,100 deaths in the Americas were due to cirrhosis secondary to HBV and HCV infection, 85% of them attributable solely to HCV (*Table 10, Annex Table 1*). Over the past two decades, the number of deaths has doubled and the rate has increased by 48%, mainly due to HCV (2013 estimates compared to 1990).

Chronic HBV or HCV infection is the most common risk factor for hepatocellular carcinoma [60]. HCC accounts for an estimated 80% of all primary liver cancers worldwide [60]. In a 2015 systematic review evaluating the contribution of HBV and HCV to HCC worldwide, an estimated 60% of HCC cases were attributed to HBV or HCV infection [61]. Unpublished data will update this estimation to an even higher attributable fraction of HCC due to HBV or HCV infection of 72%. Major risk factors associated with HCC include alcoholic liver disease, coinfection with human immunodeficiency virus (HIV), and both HBV and HCV infection [62]. Other risk factors include diabetes and obesity and overweight, inclusively increasing the risk for HCC two-fold [63, 64].

In 2012, over 63,000 new cases of liver cancer were estimated by the IARC GLOBOCAN in 33 countries in the Americas, almost half of them in the United States and a quarter in Brazil and Mexico; the average estimated crude liver cancer rate (per 100,000 population) that year was 6.6%, with the highest figures for Guatemala and the United States (*Table 11*). The number of new hepatocellular carcinoma cases in 2014 reported to PAHO by 12 countries[4] was approximately 37,300, with 70% of cases in the United States and approximately 22% in Brazil [65]. The estimated number of deaths due to HCC in 2013 was 34,236 [59]. For more information on deaths, see section 3.8

In a 2015 review examining worldwide trends in primary liver cancer incidence from 1973 to 2007, the authors found that incidence rates of primary liver cancer had increased in the majority of European, American, and Oceanian populations studied [66]. In another review using data from volumes V-IX of the IARC's electronic database on Cancer Incidence in Five Continents,

4 Reporting countries: Anguilla, Antigua and Barbuda, Brazil, British Virgin Islands, Canada, Cuba, El Salvador, Guatemala, Mexico, Panama, Peru, and the United States.

liver cancer rates have been on the rise in the Americas [67]. In 2016, the United States reported an increase in both incidence and death rates from liver cancer, in contrast to downward trends for all other types of cancer [68].

Using data from 9 countries in Latin America, Fassio et al. concluded that that hepatitis C is the most frequent etiology of HCC in Latin America (31%, and up to 38% if combined with other factors), followed by alcoholic cirrhosis (20%); HBV alone or in combination with other factors was responsible for 14% of HCC [69]. In Argentina, chronic HCV infection was responsible for 41% of HCC cases, alcohol for 42%, and chronic HBV infection for 13% [70].

A compilation of 6 studies in Brazil showed that, on average, 49% of HCC cases were due to HCV and 21% to HBV [61], and a 2005 study in Mexico revealed a 61% and 9% prevalence of HCV and HBV, respectively, in 71 HCC cases [71]. For Canada, the same review reported 13% and 6% HCV and HBV prevalence, respectively, among 80 HCC cases [61].

The 2015 country reports to PAHO from Cuba and Peru indicate that 10% of HCC cases are attributable to HBV; the percentage attributable to HCV is 64% for Cuba. Between 1991 and 2007, 22% and 7% of persons with HCC in the United States were positive for HCV and HBV, respectively [72].

Table 11. Estimated incidence, crude and age-standardized rates of liver cancer in 2012, number of newly diagnosed HCC cases in 2014

Country	Estimated incidence liver cancer cases, 2012	Estimated crude liver cancer rate (per 100,000), 2012	Estimated age-standardized liver cancer rate (per 100,000), 2012	Reported newly diagnosed HCC in 2014 (or latest available)
Anguilla	N/A	N/A	N/A	2
Antigua and Barbuda	N/A	N/A	N/A	1
Argentina	1,880	4.6	3.3	N/A
Aruba	N/A	N/A	N/A	N/A
Bahamas (The)	8	2.3	1.9	N/A
Barbados	11	4	2.1	N/A
Belize	14	4.3	6.3	N/A
Bermuda	N/A	N/A	N/A	N/A
Bolivia (Plurinational State of)[a]	276	2.7	3.7	N/A
Brazil	9,678	4.9	4.6	8,040
British Virgin Islands	N/A	N/A	N/A	9
Canada	2,261	6.5	3.6	1,630
Chile	1,090	6.3	4.7	N/A

Colombia	1,294	2.7	2.9	N/A
Costa Rica	206	4.3	4.1	N/A
Cuba	725	6.4	3.8	47
Dominica	N/A	N/A	N/A	N/A
Dominican Republic	851	8.4	8.9	N/A
Ecuador	705	4.7	5	N/A
El Salvador	447	7.1	7.7	35
French Guiana	10	4.1	4.9	N/A
Guadeloupe	28	6	3.5	N/A
Guatemala	1,542	10.2	16	14
Guyana	34	4.5	5.5	N/A
Haiti	460	4.5	6.4	N/A
Honduras[a]	598	7.6	11.2	N/A
Jamaica	131	4.7	4.6	N/A
Martinique	20	4.9	2.5	N/A
Mexico	6,387	5.5	5.7	935
Nicaragua	433	7.3	10.3	N/A
Panama	175	4.8	4.9	14
Paraguay	159	2.4	3	N/A
Peru	1,767	5.9	6.4	489
Puerto Rico	277	7.4	4.5	N/A
St. Lucia	N/A	N/A	N/A	N/A
Suriname	35	6.6	6.8	N/A
Trinidad and Tobago	37	2.7	2.4	N/A
Uruguay	103	3	1.7	N/A
USA	30,449	9.6	6.1	26,097
Venezuela (Bolivarian Republic of)	988	3.3	3.6	N/A
Total/Average	63,079	6.6	5.4	37,313

N/A=Not available
[a] Estimated incidence of liver cancer cases, crude rates and age-adjusted rates were estimated from national mortality using modeled survival.

Source: IARC [73]; PAHO [65].

3.8 MORTALITY FROM HBV AND HCV

- Estimates indicate that HBV and HCV accounted for 96% of viral hepatitis-related mortality in 2013.
- 125,700 deaths from HCV and HBV were estimated for 2013 in the Americas.
- Deaths associated with HBV and HCV in vital records systems are likely to be underestimated. Efforts need to focus on improving recording and coding of cause of deaths associated with HBV and HCV.

According to the IHME Global Burden of Disease study, in 2013, viral hepatitis was one of the major causes of death worldwide and the number of deaths attributable to viral hepatitis had increased by 63% from 1990 to 2013. HBV and HCV accounted for 96% of viral hepatitis-related mortality in 2013 [74]. Accordingly, approximately 125,700 deaths from HCV and HBV were estimated for 2013 in the Americas, 80% of which were attributable to HCV (100,200 deaths), 39% of them occurring in North America [59]. The number of deaths has increased by 134% since 1990 and 8% since 2010. Despite the tremendous increase in the number of deaths, the underlying age-specific rates declined between 1990 and 2013.

In 2013, the estimated average rate (per 100,000) for cirrhosis due to HBV and HCV in the Region is 1.35 and 7.73, respectively; for cirrhosis due to alcohol use, 7.40 and 0.96, respectively [59]; and for liver cancer due to HBV

Table 12. Number of deaths from viral hepatitis by subregion, 2013

	Argentina, Chile, Uruguay	Bolivia, Ecuador Peru	Brazil and Paraguay	Caribbean	Colombia, Mexico, Venezuela, and Central America	High-income North America	Total
Cirrhosis due to hepatitis B, hepatitis B, liver cancer due to hepatitis B	1,884	3,256	4,987	1,311	5,411	7,660	24,508
Cirrhosis due to hepatitis C, hepatitis C, liver cancer due to hepatitis C	6,807	4,720	17,240	3,580	27,298	40,598	100,243
Hepatitis A	73	46	196	55	188	357	916
Total	8,765	8,022	22,423	4,946	32,897	48,614	125,667

N/A=Not available.
Source: IHME [59].

Table 13. Mortality rates from acute and chronic HBV and HCV, cirrhosis, and HCC in selected countries in the Americas, 2013

	Hepatitis B	Hepatitis C	Cirrhosis due to hepatitis B	Cirrhosis due to hepatitis C	Liver cancer due to hepatitis B	Liver cancer due to hepatitis C
Antigua and Barbuda	0.09	0.01	0.95	3.84	0.86	1.61
Argentina	0.19	0.02	1.93	6.62	0.56	2.84
Bahamas (The)	0.15	0.02	1.24	5.20	1.15	1.98
Barbados	0.13	0.02	1.20	4.98	1.11	2.23
Belize	0.10	0.01	1.21	3.64	0.81	1.39
Bolivia (Plurinational State of)	0.23	0.03	4.80	10.03	1.64	0.63
Brazil	0.37	0.04	1.29	5.93	0.79	2.46
Canada	0.19	0.01	0.98	5.77	0.56	2.66
Chile	0.04	0.00	3.32	11.38	0.62	3.22
Colombia	0.09	0.03	0.29	3.78	1.72	1.86
Costa Rica	0.21	0.05	0.54	6.51	1.42	2.66
Cuba	0.04	0.00	1.21	4.19	1.28	2.96
Dominica	0.08	0.01	0.91	4.42	0.96	1.90
Dominican Republic	0.71	0.08	1.47	6.60	1.48	3.27
Ecuador	0.15	0.02	3.14	6.96	2.38	1.07
El Salvador	0.05	0.01	0.75	8.56	1.08	2.26
Grenada	0.09	0.01	1.17	4.53	1.03	2.12
Guatemala	0.09	0.02	0.89	8.37	1.15	2.35
Guyana	0.15	0.02	1.63	5.55	1.04	1.65
Haiti	0.58	0.08	1.09	4.61	1.12	2.22
Honduras	0.01	0.00	0.50	5.42	0.57	0.84
Jamaica	0.11	0.01	0.63	2.65	0.78	1.66
Mexico	0.22	0.05	1.15	12.55	1.22	2.68
Nicaragua	0.08	0.01	0.57	6.55	1.23	2.45
Panama	0.07	0.04	0.35	4.30	0.72	2.03
Paraguay	0.09	0.01	0.78	3.53	0.42	1.35
Peru	0.18	0.02	2.82	6.68	2.44	0.90
St. Lucia	0.13	0.02	1.14	4.23	0.93	1.91
St. Vincent and the Grenadines	0.08	0.01	1.04	4.29	0.99	1.85
Suriname	0.12	0.01	1.24	4.68	1.14	2.02
Trinidad and Tobago	0.17	0.02	1.09	5.05	0.95	1.86
United States	0.14	0.04	1.37	8.73	0.71	3.05
Uruguay	0.11	0.01	1.54	6.64	0.45	2.29
Venezuela (Bolivarian Republic of)	0.27	0.05	0.33	3.94	0.85	1.80

N/A=Not available.
Source: IHME [59].

and HCV, respectively, 2.56 [59].

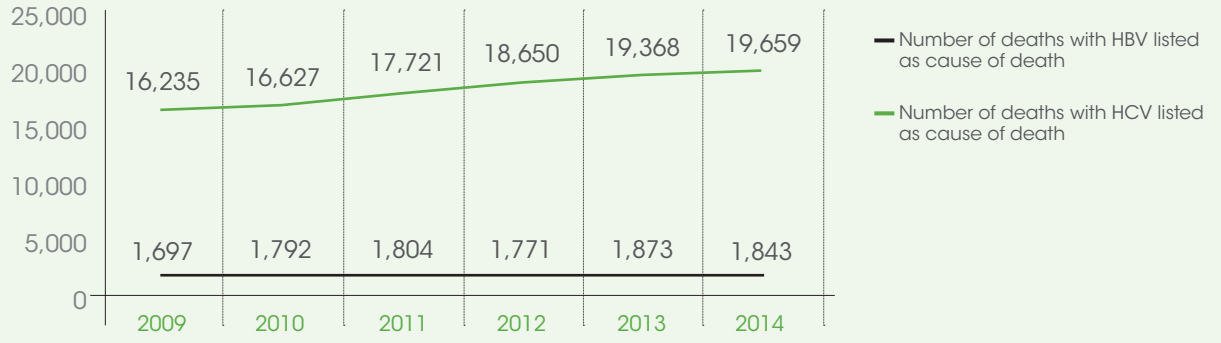
Given challenges in the diagnosis, recording, and coding of deaths associated with HBV and HCV in vital records systems, such deaths are likely to be underestimated. Countries should make a concerted effort to obtain more accurate estimates of mortality from VH. For example, studies in the United States comparing data from health care systems to multiple causes-of-death data found that HCV infection is

Box 1. Using vital statistics data to estimate viral hepatitis mortality in the United States

In The United States, the CDC studied multiple causes of death listed on death certificates to quantify the mortality burden associated with hepatitis B and C. Deaths related to HCV infection presented an upward trend from 1999 to 2013, especially among people aged 55–64 [75]. The CDC reported that approximately 1,800 and 19,600 deaths from HBV and HCV, respectively, were reported on death certificates in 2014, a 9% increase in HBV-related deaths and a 21% increase in HCV-related deaths over 2009 (Figure 7). The CDC notes that these figures are likely underestimated and that the mortality burden associated with VH, particularly HCV, is greater.

In addition, a cohort study evaluating mortality among people in treatment for HCV infection in the United States compared data from 4 U.S. health care systems with multiple causes-of-death (MCOD) data from death certificates, examining premortem diagnoses and liver biopsies, and reported HCV infection to be vastly underdocumented on death certificates. It further stated that the number of people with HCV listed on death certificates in 2010 may represent only one-fifth of the HCV-infected people deceased that year [76]. An additional CDC study examining HCV mortality in the United States reported an upward trend in the number of hepatitis C–related deaths documented from 1999 to 2013, especially among people aged 55–64 [75].

Figure 7. Number of death certificates in the United States listing HBV or HCV as a cause of death, 2009-2013



Source: Centers for Disease Control and Prevention (CDC) [77].

Note: The CDC notes that current information indicates that the number of death certificates in the United States listing HCV as a cause of death represents but a fraction of deaths attributable in whole or in part to chronic hepatitis C.

4. Response to viral hepatitis B and C

Leading the way toward the SDGs, the *WHO Global Health Sector Strategy on Viral Hepatitis, 2016-2021* outlined five core intervention areas for enhancing and expanding the response to end the viral hepatitis epidemics by 2030: vaccines; prevention of mother-to-child transmission of the hepatitis B virus; injection, blood, and surgical safety; harm reduction for PWID; and treatment. This strategy steers countries toward an intensified and expanded national response.

4.1 POLICIES AND PLANS

- 15 out of 35 countries reported to have national strategies or plans for the prevention, treatment and control of viral hepatitis.
- 8 out of 35 reported goals for the elimination of hepatitis B.
- 7 out of 18 have treatment guidelines for chronic HCV aligned with WHO recommendations.

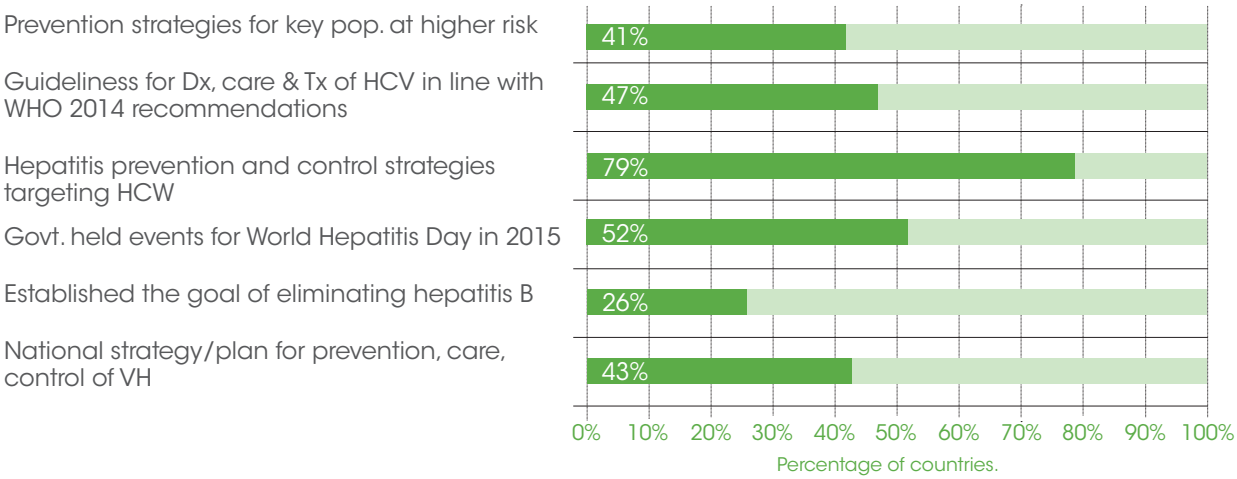
Fewer than half the responding countries in the Americas have national strategies or plans for the prevention, treatment, and control of viral hepatitis (43%, 15/35), and 26% of countries (8/31) indicated having goals for the elimination of hepatitis B. Thirty-nine percent of countries (7/18) have national guidelines for the treatment of chronic HCV aligned with the WHO 2014 recommendations.

In 2010, WHO proclaimed July 28th as World Hepatitis Day to raise awareness about hepatitis. Thirty-nine percent of national governments (12/31) in 2014 and 52% (14/27) in 2015 held events to mark the day [78]. Additional awareness efforts in the Region include Peru's proclamation of June 20th as National Hepatitis B Day and the United States' proclamation of May as Hepatitis Awareness Month and May 19th as Hepatitis Testing Day.

The majority of countries and territories reported having specific prevention and control policies and strategies in place for HCW (79%, 26/33), but fewer than half (41%, 11/27) indicated having plans or strategies for populations at higher risk, specifically men who have sex with men (MSM), sex workers, PWID, or prison inmates (***Figure 8***).

Nineteen countries in the Region have integrated VH into national programs, 14 of which are under national HIV/AIDS entities. Five countries have separate programs for VH (***Figure 9***).

Figure 8. Policies for prevention and control of viral hepatitis, 2015.



Notes: Pop.= populations; Dx= diagnosis; Tx=treatment; HCW= health care workers; Govt.=government; VH= viral hepatitis
Source: PAHO [65]; WHO [79]; World Hepatitis Alliance [80].

Figure 9. Countries that have created specific organic structures within the Ministry of Health to lead and coordinate the response to VH, 2016

Note: Responses as of January 2016
Source: PAHO, Internal Communication with Ministry of Health focal points, 2016.

Policies for the prevention of mother-to-child-transmission of hepatitis B

- Every country in the Region administers the hepatitis B as part of childhood immunization schedules.
- 42% (22/52) of the countries reported a universal birth-dose policy.
- 27% (14/52) of the countries reported an exclusively targeted birth-dose policy for babies born to HBsAg positive mothers.

Few countries report having set goals for the elimination of MTCT of HBV (Argentina, British Virgin Islands, Canada, Cuba, and the United States). Nevertheless, every country in the Region administers the hepatitis B vaccine in combination with the DTP vaccine as part of childhood immunization schedules, a mainstay of perinatal hepatitis B transmission prevention.

By 2012, every country and territory had policies for universal vaccination of children under 1 year of age with hepatitis B vaccine, the majority beginning vaccination between 1997 and 2000 [81] [82]. The second key element for preventing perinatal transmission of HBV is birth-dose vaccination before the first 24 hours. By 2016, a universal birth-dose policy[5] had been introduced in 42% of the countries (22/52) (***Figure 10***), and 27% (14/52) had a targeted policy for infants born to HBsAg-positive mothers or mothers with acute hepatitis during pregnancy (***Annex Tables 3 and 4***). In addition, policies for systematic screening of pregnant women for HBsAg were in place in 71% (20 of 28) of the reporting countries and territories, and 75% of reporting countries (18 of 24) indicated using hepatitis B immunoglobulin (HBIG) among exposed infants (***Figure 10***). Seven countries in the Region provided coverage for the pregnant women tested and/or for the use of HBIG and birth dose in infants born to HBV-positive mothers (***Table 14***).

[5] Single antigen vaccine in the first 24 hours

Figure 10. Policies on mother-to-child-transmission of hepatitis B in the Americas, 2015

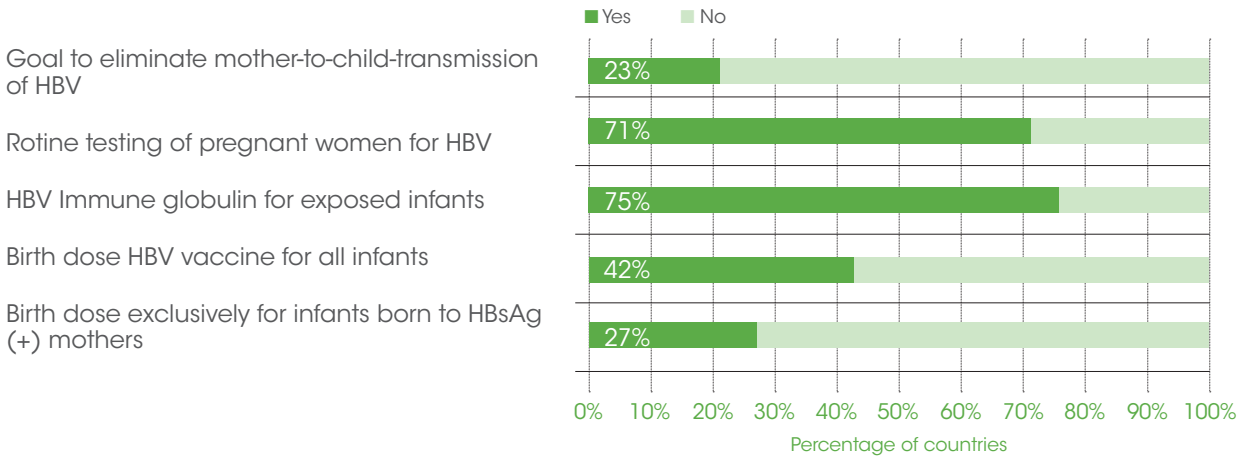


Table 14. Number and coverage of pregnant women tested and positive for HBV and infants that received birth dose and HBIG in selected countries in the Americas, 2014

	Average annual births	Reported number of pregnant women tested for HBV (HBsAg)	Number of pregnant women tested/ annual births (%)	Reported number of pregnant women positive for HBV out of those tested	Reported number of infants born to mothers with HBV infection that received birth dose & HBIG	Reported total infants born to HBV-infected mothers	Number infants born to mothers HBV (+) that received BD & HBIG/total infants born to HBV (+) mothers (%)
Anguilla	200	150	75%	1	1	1	100%
Antigua and Barbuda	1500	N/A		5	5	5	100%
Argentina	693,500	198,649	29%	224	2,100	N/A	
Barbados	3,500	N/A		N/A	N/A	N/A	
Belize	7,800	2,403	31%	8	0	8	0%
Brazil	2,979,500	N/A		1,820	N/A	578	
British Virgin Islands	1,100	281	26%	0	0	N/A	
Canada	400,400	N/A		N/A	N/A	N/A	
Cayman Islands	700	N/A		N/A	N/A	N/A	
Chile	245,100	No R/T		3	4	4	100%
Colombia[a]	903,100	N/A		6,491	405	N/A	
Costa Rica	73,600	N/A		N/A	N/A	N/A	
Cuba[b]	105,900	119,460	113%	64	54	54	100%
El Salvador	127,600	No R/T		N/A	N/A	N/A	
Guatemala	485,800	2,395	0%	84	N/A	N/A	
Haiti	264,300	No R/T		N/A	N/A	N/A	
Honduras	210,100	No R/T		N/A	N/A	N/A	
Jamaica	5,000	No R/T		N/A	N/A	N/A	
Mexico	2,235,200	N/A		N/A	N/A	N/A	
Panama	75,300	1,526	2%	2	N/A	N/A	
Paraguay	162,700	No R/T		N/A	N/A	N/A	
Peru	597,900	N/A		N/A	11	14	79%
St. Vincent and the Grenadines	1,400	N/A		N/A	N/A	N/A	
USA	4,242,400	N/A		9,649	11,484	11,901	96%
Total	13,823,600	324,864		18,351	14,064	12,565	

[a] Reported number of infants born to mothers with HBV infection that received HBIG without birth dose in 2014

[b] The total number of pregnant women tested was reported to be higher than the average number of annual births

No R/T= No routine testing

N/A=Not available

Source: PAHO [65, 83, 84].

4.2 HBV AND HCV SURVEILLANCE SYSTEMS AND CANCER REGISTRIES

- The surveillance of acute cases of hepatitis will support the detection of outbreaks, monitoring of incidence trends, and identification of risk factors and groups at highest risk.
- Routine notification of chronic cases can provide information to support the planning of service delivery.
- 94% (30/32) of the countries reported surveillance systems that include national reporting of acute hepatitis B cases and 81% (26/32) of acute hepatitis C cases.
- 61% (20/33) and 53% (17/32) of the countries have case reporting systems for chronic HBV and chronic HCV respectively.

The detection of outbreaks, monitoring of incidence trends, and identification of risk factors and groups at highest risk for new infections are achieved through surveillance of acute cases of hepatitis [85]. Program planning and evaluation, such as focusing vaccination and other preventive efforts, will be supported by surveillance activities.

The majority of countries and territories (94%, 30/32) have surveillance systems that include national reporting of acute hepatitis B cases and 81% (26/32), acute hepatitis C cases [***Annex Table 5***]. Standardized case definitions make it possible to distinguish between acute and chronic cases of viral hepatitis, but in some countries they were not readily available, and in some cases varied from WHO recommended definitions [47].

Chronic hepatitis B surveillance is conducted mainly through HBsAg prevalence studies. This helps to ascertain burden of disease and treatment and care needs. Twelve countries reported having at least one prevalence study for the general population. Routine notification of chronic HBV cases can provide information on chronic cases who know their status and will support the planning of service delivery. Chronic HBV case reporting currently exists in only 61% (20/33) of the countries. Surveillance of chronic HCV occurs in approximately half of reporting countries (53%, 17/32) [***Annex Table 5***].

Monitoring the occurrence of hepatocellular carcinoma contributes to measurement of the HBV and HCV disease burden and its impact on the health care system [86]. Cancer registries, useful for cancer control planning and evaluation [87], may help countries better understand the HBV and HCV burden associated with hepatocellular carcinoma. Seventy-one percent (24/34) of countries have cancer registries, the majority nationally, while 9 have subnational registries [***Annex Table 5***].

4.3 HEPATITIS B VACCINATION COVERAGE FOR BIRTH DOSE AND THIRD DOSE AMONG CHILDREN UNDER 1 YEAR

- Routine infant vaccination is the cornerstone for achieving population-based immunity to HBV to prevent transmission among all age groups.
- It is feasible to eliminate MTCT and early childhood transmission in the Region by ensuring 95% third-dose coverage among infants under 1 year, and 95% coverage of birth dose vaccination among all newborns within 24 hours of birth.
- 36 of 52 (69%) countries/territories have included an HB birth dose in their immunization policies.
  - 22 of them as a universal vaccination policy
  - 14 of them as a targeted policy to infants born to HBsAg positive mothers
- In 2015, the Regional coverage of the third dose in children under 1 year was 89%. Birth-dose vaccination coverage among 19 countries with universal birth-dose vaccination was 83%.

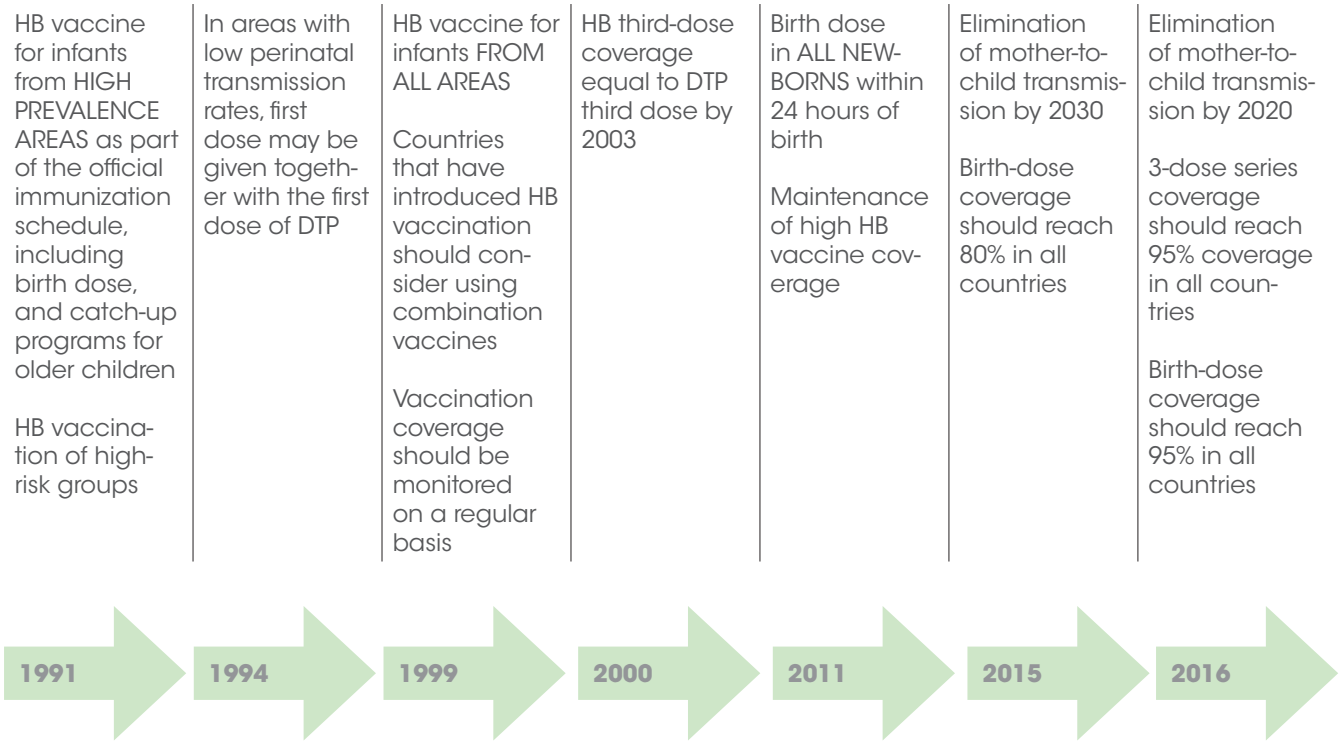
The World Health Organization set the target of integrating HB vaccination into the national immunization programs of countries with an HBV carrier rate of >8% by 1995 [88], and in all countries irrespective of prevalence, by 1997 [89]; advocated for an HBV birth dose in all newborns within 24 hours of birth in 2009 [1]; and set the goal of eliminating HBV infection as a major public health threat by 2030. Prevention of MTCT through timely HBV birth-dose vaccination, universal infant vaccination, and vaccination of high-risk groups, together with other actions related to the diagnosis and management of the disease, are strategies needed to eliminate HBV infection.

The Pan American Health Organization´s Technical Advisory Group (TAG) on vaccine-preventable diseases has been tailoring its recommendations for HBV prevention and control to region-specific characteristics, also following the WHO recommendations issued since 1990.

Gradual introduction of HB vaccination in the Americas began in 1982 [90]. The TAG assessed the feasibility of establishing HB programs under the Expanded Program on Immunization (EPI) in 1990. Given the cost of the HB vaccine, in 1991, the TAG recommended use of the vaccine only for children in high-prevalence areas, including the administration of a dose at birth, as well as HBV vaccination among high-risk groups in all countries, regardless of their HB prevalence. Catch-up vaccination of older children as part of the official immunization schedule was added to those recommendations in 1992. The TAG also encouraged HBV vaccination among high-risk groups in all countries, regardless of their HB prevalence. Subsequently, in 1994, the advisory group proposed administering the HBV vaccine in conjunction with the first dose of diphtheria/tetanus/pertussis (DTP) vaccine in areas where perinatal transmission of HBV was uncommon, scheduling the next two doses to coincide with other childhood

immunizations. In 1999, it recommended routine universal infant immunization against HBV and regular monitoring of vaccine coverage for all countries in the Americas. Furthermore, given the recent availability of combination vaccines, it also encouraged the use of tetravalent (DTP+HBV) or pentavalent (DTP/HBV+Hib) vaccines. At the 14th TAG meeting, held in 2000, the objective of equal DTP and HB third-dose coverage by 2003 was established. The inclusion of an HBV birth dose for all newborns within 24 hours of birth while maintaining high three-dose HBV coverage, was recommended for all national immunization programs in 2011. In line with the WHO elimination objective, the 23rd TAG meeting, held in 2015, reminded countries to introduce the HBV birth dose, monitor its administration within 24 hours of birth, and reach at least 80% coverage in all countries. The TAG also recommended assessing the feasibility of eliminating HBV infection at the regional level; this was done during its 24th meeting in 2016. The experts considered it feasible to eliminate MTCT and early childhood transmission, defined as HBsAg prevalence of ≤0.1% among children under 5, in the Region and all individual countries and territories by ensuring 95% third-dose coverage among infants under 1 year, and 95% coverage of birth dose vaccination among all newborns within 24 hours of birth (***Figure 10***).

Figure 10. Evolution of the PAHO TAG recommendations for HBV vaccination in the Americas, 2016



Acronyms: DTP (Diphtheria/tetanus/pertussis); HB (Hepatitis B); HBV (Hepatitis B virus)

Source: Technical Advisory Group (TAG). Final reports. Accessed 26 June 2016 at http://www.paho.org/hq/index.php?option=com_content&view=article&id=1862%3Atechnical-advisory-group&catid=1549%3Ainformation-products&Itemid=39430&lang=en.)

In 2015, 89% of children under 1 year of age received the third dose of hepatitis B vaccine in the Region (*Figure 11*). Birth-dose vaccination coverage in the 17 countries reporting countries with a universal birth-dose vaccination policy was 83%. The trend in HBV birth-dose coverage has been steadily upward over the past decade. (*Annex table 4*).

Figure 11. Reported HepB3 coverage in children <1 year in Latin America and the Caribbean, 2015

Source: PAHO, [46]

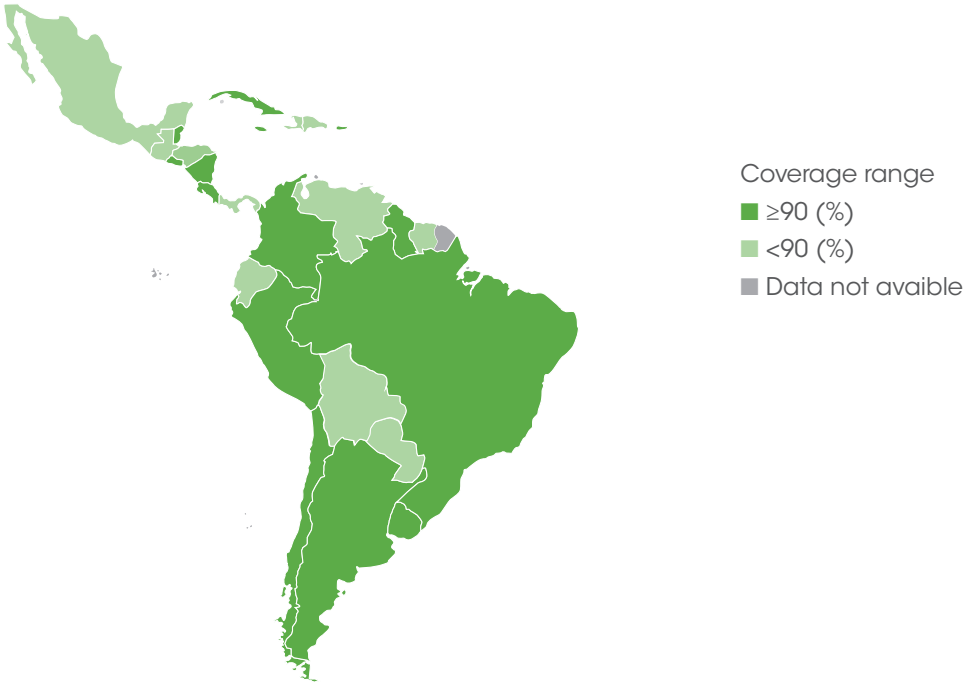
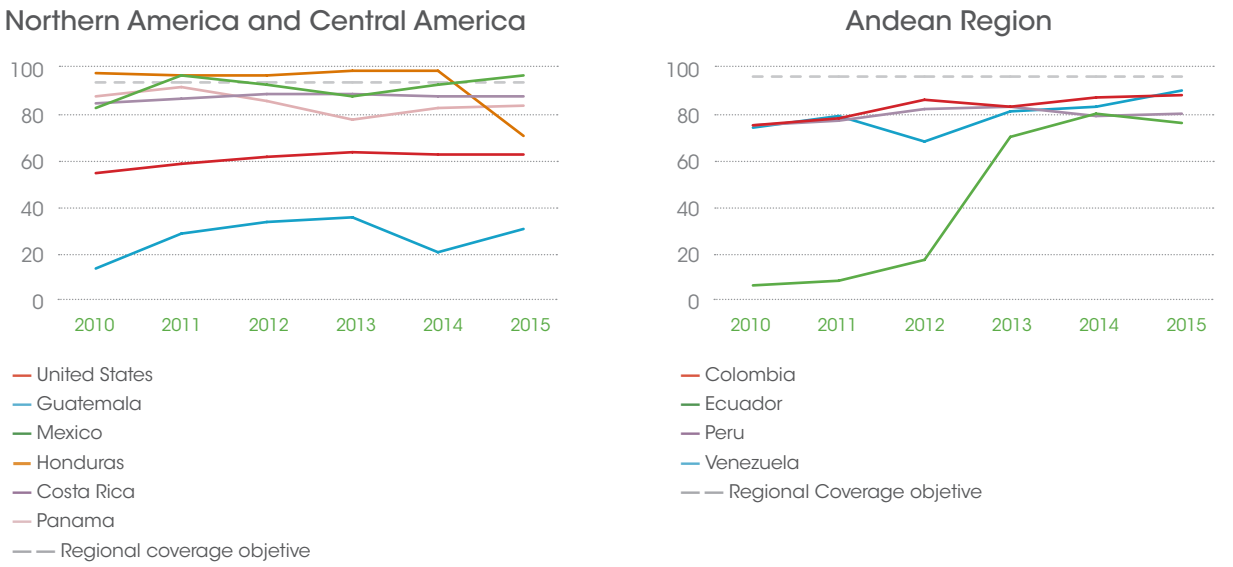
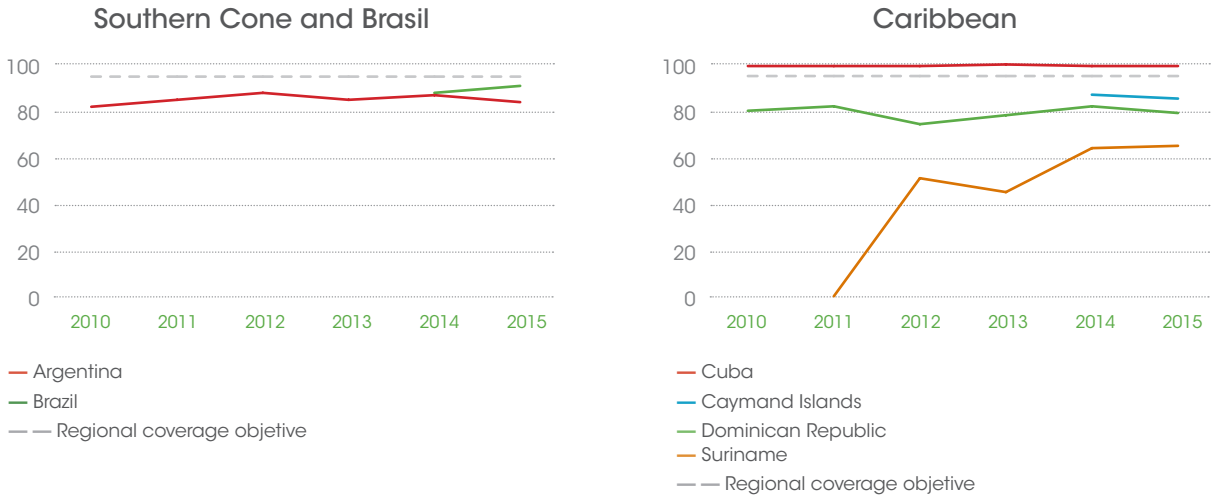


Figure 12. Hepatitis B vaccination birth-dose coverage among newborns in the Americas, 2010-2015.





Source: Country reports through PAHO-WHO/UNICEF Joint Reporting Forms (JRFs) and CDC vaccination coverage estimates
Figure provided by the Unit of Comprehensive Family Immunization, PAHO/WHO

Box 2. The PAHO Revolving Fund and HB vaccine prices

The Revolving Fund is a component of the PAHO Regional Immunization Program's technical cooperation [91] and assists the 41 participating countries with their annual demand forecasts and budgeting plans while facilitating timely access to high-quality vaccines and immunization supplies

It began procuring hepatitis B vaccine at a price of US$10.95 per dose (10-dose vial) in 1994 and in 1998, the price dropped to US$0.82 due to higher-volume procurement.

Countries in the Region were among the first worldwide to introduce the pentavalent (DPT-HepB-Hib) vaccine in 1999 via the Revolving Fund.

As of 2016, use of the HBV vaccine has been key to maintaining high protection against hepatitis B and other vaccine-preventable diseases in up to 80% of the children born in Latin America and the Caribbean every year [92].

Vaccine	RF Procurement price	Number of countries that procure via the RF
Pentavalenta	US $2.10 per single-dose vial	27 countries
Hep B Pediatric	US $0.224 per single-dose vial	22 countries
Hep B Adult	US $0.25 per ten-dose vial	25 countries
Hep B Adult	US $0.326 per single-dose vial	25 countries

4.5 BLOOD SAFETY WITH A FOCUS ON HBV AND HCV PREVENTION

- Screening of 100% of blood units for HBsAg and HCV was implemented in Latin America on 2012 and 2013, except in Bolivia, Chile, Ecuador, Mexico, Paraguay, Peru, and Venezuela. In that same period, all blood units in the Caribbean were screened, except in Anguilla, Antigua and Barbuda, Belize, Dominica, the Dominican Republic, Jamaica, Montserrat, and St. Kitts and Nevis [56].

Screening for HBV and HCC, through testing for the biomarkers HBsAg and anti-HCV, is essential for ensuring the use of safe blood.

In 2012 and 2013, screening of 100% of blood units for HBsAg and HCV was implemented in all countries with the exception of Bolivia, Chile, Ecuador, Mexico, Paraguay, Peru, and Venezuela in Latin America and Anguilla, Antigua and Barbuda, Belize, Dominica, the Dominican Republic, Jamaica, Montserrat, and St. Kitts and Nevis in the Caribbean [56].

Box 1. Policies for blood safety regarding HBV and HCV in the Americas

National policies to guarantee the safety of the blood supply in blood banks in the Americas began to appear in the 1960s and 1970s in some countries, including Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Ecuador, Paraguay, Uruguay, United States, and Venezuela [93]. In 1975, Resolution WHA28.72 of the Twenty-eighth World Health Assembly called for the development of national blood transfusion services based on voluntary blood donation to ensure safe, adequate, and sustainable blood supplies. This was endorsed 30 years later in Resolution WHA58.13, which emphasized the appropriate clinical use, testing, and processing of all donated blood supplies, in addition to scaled-up recruitment of voluntary blood donors, the phasing out of family/replacement donation and the elimination of paid donation. The first countries in Latin America to achieve 100% HBV screening coverage were Costa Rica and Venezuela in 1993, and in the Caribbean, Anguilla, The Bahamas, Belize, British Virgin Islands, Dominica, the Dominican Republic, Jamaica, St. Kitts and Nevis, St. Vincent and the Grenadines, and Trinidad and Tobago in 1996. Screening of all blood units for hepatitis C was accomplished in Uruguay in 1994, with two-thirds of reporting countries (16/23) achieving 100% screening between 2000 and 2010.

In the United States screening blood donors for HBsAg began in 1969 and became mandatory in 1972. HCV screening started in 1990 being widely implemented in 1992. Canada implemented HBsAg testing in 1972 and Anti-HCV in 1990. The United States and Canada have reported 100% HBV and HCV screening in 2011 and 2015 respectively [94].

Additional measures for blood safety included routine screening for total hepatitis B core antibody (anti-HBc), a marker that detects prior or ongoing infection with HBV, screened for in all blood units in Argentina, Brazil, Costa Rica, Guatemala, Panama, Paraguay, Peru, Uruguay (8/12 reporting countries) in 2012-13 (*Table 15*); and voluntary blood donation.The countries in the Caribbean that achieved 100% voluntary blood donation in 2013 include Aruba, Bermuda, Cayman Islands, Curaçao, Guadeloupe, Suriname, and Montserrat and in Latin America, Cuba and Nicaragua [56]. The average percentage of blood units from voluntary donors in 2013 was 44% from 38 reporting countries in LAC, with a median of 38% (*Table 15*).

Table 15.Year of 100% HBV and HCV screening coverage, percentage of voluntary blood donation in Latin America and the Caribbean, 2015

	First year country achieved 100% coverage for HBV (HBsAg)	First year country achieved 100% coverage for HCV (Anti-HCV)	% of total blood supply from voluntary donors in 2013[a]
Anguilla	1996	2008	32%
Antigua and Barbuda	1996	2006	5%[b]
Argentina	1999[c]	2001[c]	38%
Aruba	1996	1996	100%
Bahamas (The)	1996	1996	42%
Barbados	1996	1996	15%[b]
Belize	1996	2008	14%
Bermuda	1996	1996	100%
Bolivia (Plurina-tional State of)	2006[c]	2007[c]	45%
Brazil	1999	1999	60%[d]
British Virgin Islands	1996	1996	0%
Cayman Islands	1996	1996	100%
Chile	1997	1997	24%
Colombia	1997	1997	87%
Costa Rica	1993	1997	68%
Cuba	1996	2001	100%
Curaçao	1996	2000	100%
Dominica	1996	2000	9%
Dominican Republic	1996	2002	16%
Ecuador	1997	2002	57%
El Salvador	1997	1997	14%
Grenada	2000	2003	39%[d]
Guatemala	1999	2003[b]	5%

	First year country achieved 100% coverage for HBV (HBsAg)	First year country achieved 100% coverage for HCV (Anti-HCV)	% of total blood supply from voluntary donors in 2013[a]
Guyana	1996	2002	96%
Haiti	1996	2000	60%
Honduras	1999	2003	15%
Jamaica	1996	2000	16%
Mexico	1999	1999	3%
Montserrat	1996	2009	100%
Nicaragua	1997	1999	100%
Panama	1997	2001	6%
Paraguay	1997	2006	9%
Peru	1997	2000	5%
St. Kitts and Nevis	1996	2010	21%
St. Lucia	1996	2000	64%
St. Vincent and the Grenadines	1996	2001	14%
Suriname	1996	1996	100%
Trinidad and Tobago	1996	2000	0%[d]
Turks and Caicos Islands	1996	2011	58%[d]
Uruguay	1994	1994	46%
Venezuela (Bolivarian Republic of)	1993	1997	7%[d]

[a] from allogeneic donors
[b] data from 2009
[c] screened 99.9% of all units
[d] data from 2012
Source: Schmunis [93]; Cruz [95]; PAHO [56, 8, 96, 97].

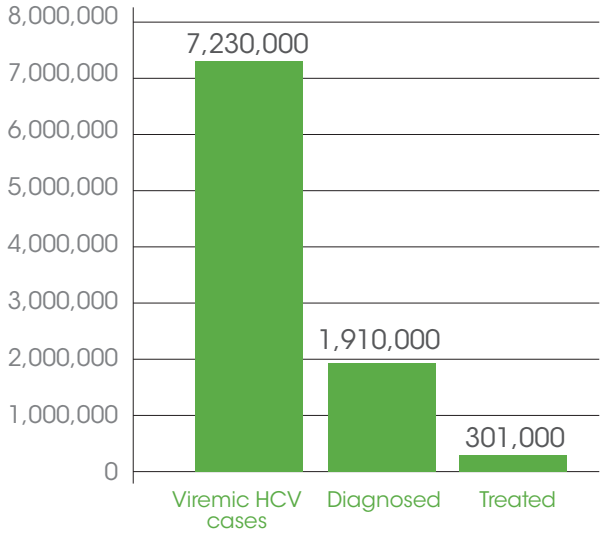
4.6 CONTINUUM OF CARE AND TREATMENT FOR HBV AND HCV

- In 2016, an estimated 25% of people with chronic HCV are diagnosed (14% in Latin America and the Caribbean).
- In 2016, an estimated 301,000 people were treated for HCV (16% of the diagnosed population in the Americas and 5% in Latin America and the Caribbean).
- In 2015, eight countries in the Region reported having diagnosis, care, and treatment guidelines aligned with the WHO guidelines for HCV.

In the Americas, the number of people infected with HCV that are diagnosed and subsequently treated is extremely low: an estimated 25% of people with chronic HCV are diagnosed (14% in Latin America and the Caribbean, with an unknown number that know their status and are effectively connected with care). In 2016, an estimated 301,000 people were treated for HCV (16% of the diagnosed population received treatment in the Americas, 5% in Latin America and the Caribbean). (*Figure 13*).

Estimated diagnosis rates range from 67% in Canada to 8% in Colombia, and treatment coverage, from 15% in the United States to less than 1% in Argentina (*Table 19*). Some countries, such as Mexico, are currently developing plans with the object of scaling up treatment for HCV, but while the figures for patients in treatment are rapidly increasing in many countries, coverage for patients in need of treatment is still unacceptably low.

Figure 13. Continuum of care and treatment for HBV and HCV, 2016



Source: Center for Disease Analysis, 2015.

Table 19. HCV continuum of care, total number of infections, people diagnosed, and people in treatment in 10 countries in the Americas, 2015

Country	Estimated number of HCV infections	Estimated number of people diagnosed with HCV	Percentage of people infected with HCV diagnosed	Reported number of people in treatment for HCV	Percentage of people diagnosed with HCV in treatment
Argentina	332,000	116,000	35%	140	0.01%
Brazil[a]	1,862,000	283,000	15%	15,800	6%
Canada[b]	217,000	146,000	67%	3,600	2%
Chile	58,700	18,900	32%	230	1%
Colombia	436,000	34,600	8%	N/A	N/A
Dominican Republic	68,600	6,900	10%	N/A	N/A
Panama	12,500	1200	10%	N/A	N/A
Puerto Rico	36,100	6400	18%	N/A	N/A
USA	2,959,000	1,734,000	59%	260,000	15%
Venezuela (Bolivarian Republic of)	137,000	25,300	18%	N/A	N/A

N/A=Not available
[a] From 2014
[b] The total number of people in treatment for HCV is from 2013
Source: Center for Disease Analysis [98].

WHO recommends tenofovir and entecavir for the treatment of HBV, instead of lamivudine, adefovir, and telbivudine, due to their low barrier to resistance. The medicines most frequently recommended in national guidelines for HBV in the Region include lamivudine, followed by tenofovir and pegylated interferon. The recent first-ever WHO guidelines for HBV treatment were released in 2015 to support countries in the review and adaptation of their national essential medicines list and guidelines for a public health response. We currently observe a varying landscape of medicines used; 58% of countries recommend treatment regimens that are partially aligned with the WHO recommendations, with some use of medicines not recommended by WHO for HBV treatment (7/12 reporting countries) (*Table 16*).

Table 16. Antiviral treatment medicines for chronic HBV infection: percentage of countries that have the antiviral on their national essential medicines list and recommended in national guidelines, 2015

Antiviral medicines for HBV	Countries with medicine recommended in national guidelines	Countries with medicine on EML	Comments
Entecavir	Argentina, Chile, Peru, USA	Argentina, Bahamas, Brazil, Canada, Chile, Mexico, USA	On 19th WHO Model List of Essential Medicines (April 2015), high potency against HBV, resistance barrier, and cost
Tenofovir	Argentina, BVI, Chile, Cuba, Honduras, Paraguay, Peru, USA	Argentina, Bahamas, Barbados, Belize, Brazil, BVI, Canada, Chile, Colombia, Costa Rica, Cuba, Grenada, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Vincent and the Grenadines	On 19th WHO Model List of Essential Medicines (April 2015), low cost, moderate-to-high potency
Adefovir	Chile, Cuba, USA	Argentina, Brazil, Canada, Cuba, Mexico, USA	High cost and low potency against HBV
Lamivudine	Argentina, Barbados, BVI, Chile, Cuba, Mexico, Paraguay, Peru	Anguilla, Argentina, Bahamas, Barbados, Belize, Brazil, BVI, Canada, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Grenada, Guatemala, Jamaica, Mexico, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Vincent and the Grenadines, USA, Uruguay	Low cost, moderate-to-high potency
Telbivudine	Chile, Mexico, USA	Argentina, Bahamas, Mexico, USA	High potency against HBV, low resistance barrier, high cost
Pegylated interferon alpha (PEG-IFN)	Argentina, Chile, Cuba, Mexico, USA	Argentina, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Guatemala, Mexico, Panama, St. Vincent and the Grenadines, USA	Less feasible in resource-limited settings, due to the inconvenience of administering them, low tolerance, and strict monitoring
Standard Interferon (IFN)	Peru	Argentina, Bahamas, Barbados, Brazil, Costa Rica, Dominican Republic, Guatemala, Mexico, Nicaragua, Peru, St. Vincent and the Grenadines, USA, Uruguay	Less feasible in resource-limited settings, due to the inconvenience of administering them, low tolerance, and strict monitoring

Source: PAHO [65]; WHO [79] WHA [80] [78]

WHO recommends DAA-only combinations, rather than regimens with pegylated interferon and ribavirin[6], for treating HCV. In 2015, eight countries in the Region reported having diagnosis, care, and treatment guidelines aligned with the WHO guidelines for HCV: Anguilla, Argentina, Brazil, Canada, Chile, Cuba, El Salvador, and the United States (21 total reporting countries).

In April 2015, WHO released the 19th Model List of Essential Medicines, which for the first time included direct-acting antiviral drugs for HCV treatment (*Table 17*).

[6] WHO recommended alternative treatment options for persons with HCV genotype 3 infection with cirrhosis and patients with genotypes 5 and 6 infection with and without cirrhosis include an interferon-based regimen.

Table 17. WHO Model List of Essential Medicines, 19th list 2015 drugs for HCV treatment

Medicines for hepatitis C	
Based on current evidence, medicines in the following classes of direct-acting antiviral medicines are included as essential medicines for the treatment of hepatitis C virus infection. WHO guidelines recommend specific combination therapy utilizing medicines from different classes.	
Nucleotide polymerase inhibitors	
sofosbuvir	Tablet: 400 mg
Protease inhibitors	
simeprevir	Capsule: 150mg
NS5A inhibitors	
daclatasvir	Tablet: 30 mg; 60 mg (as hydrochloride)
Non-nucleoside polymerase inhibitors	
dasabuvir	Tablet: 250 mg
Other antivirals	
ribavirin*	Injection for intravenous administration: 800 mg and 1 g in 10- mL phosphate buffer solution Solid oral dosage form: 200 mg; 400 mg; 600 mg * For the treatment of hepatitis C, in combination with peginterferon and/or direct-acting antiviral medicines
Complementary List	
*pegylated interferon alfa (2a or 2b)**	Vial or prefilled syringe: *180 mcg (peginterferon alfa-2a),* *80 mcg, 100 mcg (peginterferon alfa-2b)* ** To be used in combination with ribavirin*
Fixed-dose combinations ***Alternative combinations of DAAs from different pharmacological classes are possible***	
ledipasvir + sofosbuvir	Tablet: 90 mg + 400 mg
ombitasvir + paritaprevir + ritonavir	Tablet: 12.5 mg + 75 mg + 50 mg

The medicines used to treat HCV that are most frequently recommended in national guidelines include pegylated interferon (12 reporting countries), ribavirin (12 reporting countries), and daclatasvir (5 reporting countries) (*Table 18*). Nonrecommended medicines are still in use. For example, boceprevir, which is no longer recommended by WHO due to high rates of severe adverse events, is on the EML of Argentina, Brazil, and Canada and recommended in guidelines in Argentina, Brazil, and Chile. Telaprevir is on the EML of Argentina, Bahamas, Brazil, and Canada and recommended in national guidelines in Argentina, Brazil, and Chile. This is a landscape in transition, and some countries have modified their guidelines since this was reported and PAHO will update and regularly report on the situation of national HCV treatment guidelines.

Table 18. Antiviral treatment for chronic HCV infection: percentage of countries with antivirals in the essential medicines list and recommended in national guidelines, 2015

Antiviral medicines for HCV	Countries with medicine recommended in national guidelines	Countries with medicine on EML	Comments
Sofosbuvir	Argentina, Chile, and USA	Argentina, Brazil, Canada, Chile, and USA	On 19th WHO Model List of Essential Medicines (April 2015); recommended to be used always in combination with DAA or interferon-containing regimens
Simeprevir	Argentina, Chile, and USA	Argentina, Brazil, Canada, Chile, Mexico, and USA	On 19th WHO Model List of Essential Medicines (April 2015), requires genotyping for proper prescription
Ribavirin	Argentina, Brazil, Chile, Costa Rica, Cuba, St. Vincent and the Grenadines, Peru, USA	Argentina, Bahamas, Brazil, Canada, Chile, Costa Rica, Cuba, Guatemala, Mexico, Peru, St. Vincent and the Grenadines, USA, Uruguay	On 19th WHO Model List of Essential Medicines (April 2015); recommended by WHO as an alternative regimen in patients with both cirrhosis and genotype 3 infection, and those infected with genotypes 5 and 6, in combination with other DAA or interferon-containing regimens
Pegylated interferon alpha (PEG-IFN)	Argentina, Brazil, Cayman Islands, Chile, Costa Rica, Cuba, Peru, USA	Argentina, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Guatemala, Honduras, Mexico, Panama, Peru, St. Vincent and the Grenadines, USA, Uruguay	On 19th WHO Model List of Essential Medicines (April 2015); recommended by WHO as an alternative regimen for certain patients, including those who have both cirrhosis and genotype 3 infection, and those infected with genotypes 5 and 6

Source: PAHO [65]; WHO [79]; WHA [80, 78].

Daclatasvir, which is on the 19th WHO Model List of Essential Medicines (April 2015), is also found on the EML of Argentina, Brazil, Chile, Mexico, and the United States.

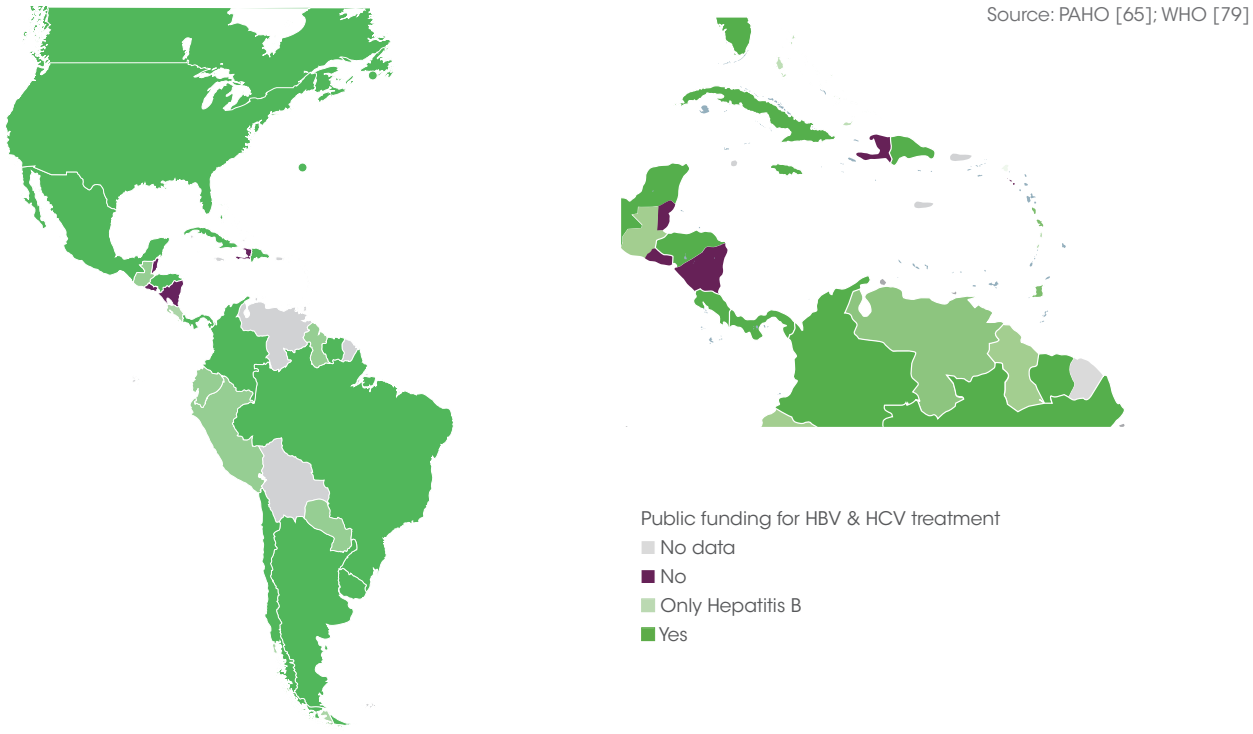
Fixed-dose combination medicines, including ledipasvir with sofosbuvir, are on the EML of Canada, Chile, and the United States, and combination ombitasvir, paritaprevir, ritonavir, and dasabuvir is available on the EMLs of Canada, Chile, Mexico, and the United States.

Funding HCV Treatment

- **Public funding for HBV treatment is provided in 73% of reporting countries (24/33), while 59% (19/32) fund HCV treatment.**

Access to treatment is at a turning point, with a growing number of countries launching public treatment initiatives for chronic HCV. Public funding for HBV treatment is provided in 73% of reporting countries (24/33), while only 59% (19/32) fund HCV treatment (information on funding for specific regimens was not available) (***Figure 11***). Honduras reported that publicly funded treatment is available only for patients co-infected with HIV. Transitions in a programmatic response to HCV treatment are occurring in Latin America and the Caribbean with a few countries starting to provide direct acting antivirals (DAAs) for HCV. It is expected that this landscape will be changing in the close future with more countries transitioning to provide public funding for DAAs.

Figure 14. Public funding for HBV and HCV treatment, 2015



Information on the costs associated with medicines to treat HCV was not readily available; nevertheless, the costs of some medicines in Argentina, Brazil, and the United States vary widely (*Table 19*). Two sofosbuvir product dossiers are currently under assessment in the WHO Prequalification Programme.

Table 19. Cost of medications for treating HCV in selected countries, 2016

Medicine used to treat HCV	Country	Cost per pill (USD)	Cost of 12-week regimen (USD)	Cost of 24-week regimen (USD)	Comments
Sofosbuvir	USA[b]	$1,000	$84,000	$168,000	
	Argentina	≈$70	$5,850	N/A	Cost for innovator
	Brazil	N/A	$6,900	$13,800	
Simeprevir	USA[b]	$790	$66,360	$85,000	Cost of 12-week regimen on simeprevir, followed by 12- week regimen on pegylated interferon and ribavirin
	Brazil	N/A	$3,000	N/A	
Daclatasvir	Brazil	N/A	$2,650	N/A	
	Argentina	$43	$3,612	N/A	
	USA[b]	$750	$63,000	N/A	
Pegylated Interferon alfa 2[a]	USA[b]	$770[a]	$9,250	$18,500	48-week regimen ≈$37,000
Pegylated Interferon alfa-2b	USA[b]		≈ $8,400	≈$16,800	48-week regimen ≈$33,600
Combination ledipasvir and sofosbuvir	USA[b]	$1,125	$94,500	$189,000	
Combination ombitasvir, paritaprevir, ritonavir, dasabuvir	USA[b]		$83,319	N/A	

[a] 180 mcg dose

[b] Costs in USA refer to the wholesale procurement cost (WAC)

N/A=not available

Source: PAHO, communication via email with Ministry of Health focal points in 2015 and 2016. For cost of medicines in the USA: University of Washington [99].

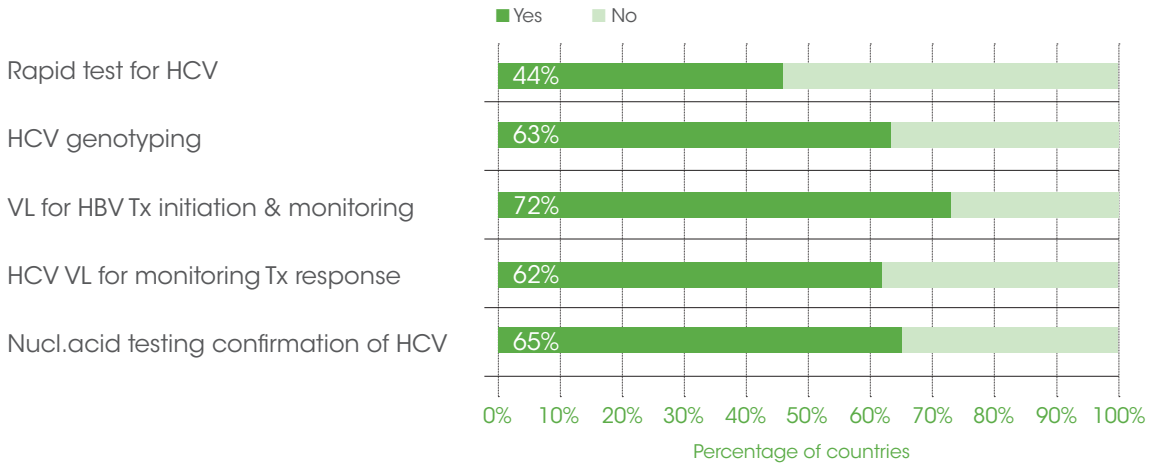
Laboratory components of diagnosis, care, and treatment

- 72% (13/18) of reporting countries have diagnostic and monitoring capabilities for HBV and HCV treatment.

Treatment for HBV and HCV includes diagnostic and monitoring capabilities in countries. Quantitative HBV viral load testing, used for differentiating active from inactive chronic infection, decisions to treat chronic HBV, and monitoring the response to treatment, is available in 72% (13/18) of countries.

Confirmation of HCV diagnosis through qualitative nucleic acid testing (NAT) for HCV-RNA is available in almost two-thirds of reporting countries (65%, 13/20). Genotyping of HCV, needed for determining appropriate treatment regimens, is available in 63% (12 out of 19 reporting countries).The response to treatment can be monitored through quantitative HCV viral load testing, which is available in 63% (12 out of 19 reporting countries) The rapid test for HCV is available in 4 out of 9 reporting countries (***Figure 12***).

Figure 15. Laboratory capabilities for the diagnosis, care, and treatment of HBV and HCV, 2015



Note: Results from the 2015 and 2016 PAHO survey on VH were combined, along with the results from WHO, leading to differences in the number of reporting countries.
- VL: Viral Load
- Tx: Treatment
- Ncl.acid: Nucleic Acid

Source: PAHO [65]; WHO [79].

Liver transplants

- Fifteen countries performed approximately 18,100 liver transplants in 2014t
- Hepatitis C infection is the primary indication for liver transplants

Fifteen countries perform liver transplantation in the Region, with hepatitis C infection the primary indication for transplants [100]. Fifteen countries performed approximately 18,100 liver transplants in 2014, 82% of them in the United States (*Table 20*). Panama reported that approximately 9.4% of liver transplants were due to hepatitis C infection, and Chile reported that almost 4% were due to HCV [83]. Brazil reported that an estimated 8-10% of liver transplants were due to HBV infection, and Argentina reported that approximately 1% of transplants were due to HBV in 2012 [83].

Table 20. Number of liver transplants in the Americas, 2014

Countries	Liver transplants in 2014
Argentina	323
Brazil	1,767
Canada	509
Chile	77
Colombia	222
Costa Rica	9
Cuba	32
Dominican Republic	6
Ecuador	13
Mexico	104
Panama	6
Peru[a]	38
USA	15,027
Uruguay	18
Venezuela (Bolivarian Republic of)	9
Total	18,160

[a] Data for total number of liver transplants for Peru is from 2011.
Source: PAHO [65]; Salvalaggio [100].

5. Conclusions

This first report focused on Hepatitis B and C in the Americas provides a baseline understanding of key issues in the public health response to HBV and HCV in the Region. HCV epidemics have been called the "silent epidemic," due to the substantial but somewhat unrecognized burden of disease. Overall, HBV and HCV are a cause of significant mortality, on a par with that from HIV and TB—mortality that is trending upward, particularly due to HCV. HBV prevalence is on the decline in the Region, possibly thanks to the high childhood immunization coverage in recent decades.

Approaches to HBV and HCV are different. Prevention of HBV, with vaccination, should be given the highest priority. Diagnosis and linkage of patients with hepatitis B and C to care and treatment will alleviate the burden of disease and/or cure those with chronic infection and prevent further infections. Countries must realize that investments in prevention, care, and treatment of viral hepatitis will have a significant impact on individuals and society as a whole.

The public health approach consists of simplified and scaled-up prevention, diagnosis, and treatment interventions. In the Americas, most people with HCV are unaware of their status, and few countries have treatment programs in place. One of the main barriers to the treatment of HCV is the cost. Strategies, such as pooled procurement, price negotiations etc., will be needed for countries to provide affordable treatment. Many other parallel actions are necessary. Countries need to develop or review their treatment guidelines, aligning them with the new WHO recommendations for a public health approach to HBV and HCV treatment. Adding the new treatments to the countries' essential medicines lists is also a next step, as are reviewing and updating laboratory capabilities for diagnosis and monitoring of patients in care and treatment and implementing strategies to expand diagnosis of chronic carriers, with a focus on the needs of key populations.

Country commitment is key to meeting the targets set in the WHO Global Health Sector Strategy on Viral Hepatitis 2016–2021 and the Regional Plan of Action for the Prevention and Control of Viral Hepatitis. The collaboration of governments, civil society, clinicians, and academia will be required to fully address the challenges posed by these epidemics. The Pan American Health Organization is committed to supporting countries on their path toward eliminating these epidemics.

Annex

Annex Table 1. Estimated number of deaths from cirrhosis secondary to HBV and HCV by country in the Americas, 1990-2013

	1990		1995		2000		2005		2010		2013	
	HBV	HCV	HBV	HCV	HBV	HCV	HBV	HCV	HBV	HCV	HBV	HCV
Antigua and Barbuda	0	2	1	2	1	3	1	3	1	4	1	3
Argentina	424	1264	485	1338	587	2123	593	2423	733	2746	802	2745
Bahamas (The)	3	8	3	11	3	12	3	14	5	19	5	20
Barbados	3	7	2	10	3	12	3	13	4	15	3	14
Belize	1	3	1	5	2	9	2	9	4	14	4	12
Bolivia (Plurinational State of)	365	502	311	650	316	775	381	845	402	1181	513	1072
Brazil	1504	6894	1923	7183	1602	9305	1962	8796	3080	10892	2583	11886
Canada	198	1023	241	1117	274	1293	283	1694	348	1942	346	2043
Chile	397	1200	446	1118	474	1283	472	1466	457	1925	586	2006
Colombia	60	807	80	1025	89	1129	96	1388	125	1678	141	1827
Costa Rica	7	101	12	137	16	190	21	217	24	290	27	317
Cuba	85	252	83	387	84	433	106	480	139	560	136	473
Dominica	1	2	1	2	1	2	1	3	1	3	1	3
Dominican Republic	160	410	122	540	147	576	109	627	121	705	153	687
Ecuador	196	210	212	391	276	535	340	749	427	1175	494	1096
El Salvador	14	203	23	247	30	394	39	447	40	514	47	543
Grenada	1	3	1	3	1	4	1	5	1	6	1	5
Guatemala	50	554	61	718	78	930	99	1321	122	1380	138	1296
Guyana	11	22	9	34	9	47	13	49	14	58	13	44
Haiti	117	306	72	397	83	368	81	408	133	467	112	475
Honduras	15	193	19	234	25	268	30	346	32	408	41	439
Jamaica	12	35	11	48	15	65	14	69	16	68	18	74
Mexico	623	8022	773	9179	841	9821	1001	11849	1168	13928	1405	15358
Nicaragua	10	119	15	169	21	242	26	349	32	379	34	398
Panama	4	55	5	71	7	88	10	115	12	161	13	166
Paraguay	13	51	19	81	25	143	32	145	69	182	53	241
Peru	427	505	484	1016	613	1184	608	1413	747	2316	857	2033
Saint Lucia	2	4	1	6	1	6	1	6	2	7	2	8
Saint Vincent and the Grenadines	1	3	1	4	1	5	1	5	1	5	1	5
Suriname	4	11	3	15	4	19	5	23	7	28	7	25
Trinidad and Tobago	11	33	9	35	9	51	13	54	17	71	15	68
United States	2764	12807	2771	14238	3158	16167	3501	20103	4533	24339	4355	27759
Uruguay	53	143	54	167	68	166	56	226	70	203	53	226
Venezuela (Bolivarian Republic of)	42	588	52	678	57	762	76	924	101	1228	100	1197
Total	7575	36340	8306	41254	8920	48411	9982	56583	12989	68896	13059	74564

Source: IHME [59].

Annex Table 2. Policies and laboratory capability for HBV and HCV care in the Americas, 2015

	National strategy /plan on prevention, care, & control of viral hepatitis	Established the goal of eliminating hepatitis B	Held events for World Hepatitis Day in 2014	Held events for World Hepatitis Day in 2015	Viral hepatitis prevention and control strategies targeting health workers	Guidelines for Dx, care & Tx of HCV in line with WHO 2014 recommendations	Prevention strategies for MSM, DU, prison inmates, indigenous, sex workers, Trans	Nucleic acid testing confirmation of HCV	HCV VL for monitoring Tx response	VL for HBV Tx initiation & monitoring	HCV genotyping
Anguilla	No	No	No		No	Yes	No	No	No	No	No
Antigua and Barbuda	No	No	No		Yes	No	No	No	No	No	No
Argentina	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bahamas (The)	No	No	No	No	No		Yes				
Barbados	No	No	No		Yes	No	No				
Belize	No	No	No		No	No	No	No	No	No	No
Bolivia (Plurinational State of)				No							
Brazil	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
British Virgin Islands	No	No	No		No	Unknown	No	Yes	No	No	No
Canada	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cayman Islands	Unknown	Unknown	Unknown			Unknown		No	No		No
Chile	Yes	No	Yes	Yes		Yes	No	Yes	Yes	Yes	Yes
Colombia	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Costa Rica	No	Yes	No	No	Yes		No		Yes		
Cuba	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Dominican Republic	No	No	No		Yes						
Ecuador	Yes	No	Unknown		Yes						
El Salvador	Yes	No	No		Yes	Yes	Yes	Yes	No		No
Grenada	No	No	No		Yes						
Guatemala	No	Unknown	Yes		Yes	Unknown	No	No	Yes	Yes	No
Guyana	No	No	No		Yes		No				
Haiti	No	No	No			Unknown		Yes	Yes	Yes	
Honduras	No	No	Yes		Yes	No	No				

Annex Table 2 continued

	National strategy /plan on prevention, care, & control of viral hepatitis	Established the goal of eliminating hepatitis B	Held events for World Hepatitis Day in 2014	Held events for World Hepatitis Day in 2015	Viral hepatitis prevention and control strategies targeting health workers	Guidelines for Dx, care & Tx of HCV in line with WHO 2014 recommendations	Prevention strategies for MSM, DU, prison inmates, indigenous, sex workers, Trans	Nucleic acid testing confirmation of HCV	HCV VL for monitoring Tx response	VL for HBV Tx initiation & monitoring	HCV genotyping
Jamaica	No	No	No		Yes		No				
Mexico	Yes	No	Yes		Yes	No	Yes	Yes	Yes	Yes	Yes
Montserrat	Unknown										
Netherlands Antilles	Unknown										
Nicaragua	No	No	No		Yes		No				
Panama	Yes	No	No		Yes	No	No	Yes	No	Yes	Yes
Paraguay	No	No	No		Yes	No	Yes				
Peru	Yes	No	Yes		Yes	No	Yes	Yes	Yes	Yes	No
St. Kitts and Nevis	No	No	No		Yes						
St. Lucia	No	No	No		No		No				
St. Vincent and the Grenadines	No	No	No		No	Unknown	No	No	No	No	No
Suriname	Yes	Yes	Yes		Yes						
Trinidad and Tobago	Yes				Yes						
USA	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Uruguay	No				Yes		Yes				
Venezuela (Bolivarian Republic of)	Yes				No						

Note: Data for Aruba, BES (Bonaire, Sint Eustatius, and Saba), Bermuda, Bolivia, Curaçao, Dominica, French Guiana, Guadeloupe, Martinique, Montserrat, Netherlands Antilles, Puerto Rico, Sint Maarten, Turks and Caicos Islands, Virgin Islands (USA) were not available and thus, not included in the table.

Sources: PAHO [65]; WHO [79]; WHA [78].

Annex Table 3. Policies and practices regarding interventions for HBV prevention of perinatal transmission in countries and territories in the Americas

	Goal of eliminating mother-to-child-transmission of HBV	Routine testing of pregnant women for HBV	HBV immuno globulin for exposed infants	Year introduction of HB as part of the official immunization schedule	HB third dose vaccine coverage (%) 2015	Birth-dose HBV vaccine policy (as of July 2016)	HB birth-dose vaccine coverage (%) 2015
Anguilla	No	Yes	Yes	1997	99[a]	No	
Antigua and Barbuda	No	Yes	Yes	2000	99[a]	No	
Argentina	Yes	Yes	Yes	2000	94	Yes	84
Aruba				2003	92	No	
Bahamas (The)		Yes	Yes	2001	95	No	
Barbados	No			2001	97	No	
Belize	No	Yes		1999	94	No	
Bermuda				1998	85	Pos Mothers	
Bolivia (Plurinational State of)				2000	89	No	
Bonaire				2012	-	No	
Brazil	No	Yes	Yes	1989[b]; 1998	96	Yes	89
British Virgin Islands	Yes	Yes		1999	97	No	
Canada	Yes	Yes	Yes	1995[b], 1998	73	Yes[c]	
Cayman Islands		Yes	Yes	1997	87	Yes	85
Chile	No	No	Yes	2005	96	Pos Mothers	
Colombia	No	Yes	Yes	1992[b], 1994	91	Yes	87
Costa Rica		Yes	Yes	2000	92	Yes	89
Cuba	Yes	Yes	Yes	1990	99a	Yes	99
Curaçao				2011	-	No	
Dominica				2006	98	Pos Mothers	
Dominican Republic				1994	81	Yes	79
Ecuador		Yes	Yes	1999	78	Yes	75
El Salvador	No	No	No	1999	91	Pos Mothers	
French Guiana				1994	-	Yes	
Grenada		Yes	Yes	2001	92	Pos Mothers	
Guadeloupe				-	-	Pos Mothers	
Guatemala	No	Yes	No	2005	74	Yes	32
Guyana		Yes	No	2001	95	Pos Mothers	

Annex Table 3 continued

	Goal of eliminating mother-to-child-transmission of HBV	Routine testing of pregnant women for HBV	HBV immuno globulin for exposed infants	Year introduction of HB as part of the official immunization schedule	HB third dose vaccine coverage (%) 2015	Birth-dose HBV vaccine policy (as of July 2016)	HB birth-dose vaccine coverage (%) 2015
Haiti	No	No	No	2012	72	No	
Honduras	No	No	No	2000	85	Yes	72
Jamaica	No	No	Yes	2003	91	No	
Martinique				-	-	Pos Mothers	
Mexico	No			1999	82	Yes	98
Montserrat				1999	100	Pos Mothers	
Nicaragua				1999	99[a]	No	
Panama	No	No	No	1999	73	Yes	85
Paraguay	No	No		2002	80	Pos Mothers	
Peru	No	Yes	Yes	1991[b], 2003	90	Yes	79
Puerto Rico				-	-	Yes	77*
Saba				2012	-	Pos Mothers	
Sint Eustatius				1997	-	No	
Sint Maarten				2000	97	No	
St. Kitts and Nevis				1999	94	Yes	100
St. Lucia				2002	99[a]	Pos Mothers	
St. Vincent and the Grenadines	No			2003	99[a]	Pos Mothers	
Suriname		Yes	Yes	2003[b]; 2005	89	Yes	65
Trinidad and Tobago				2003	90	No	
Turks and Caicos Islands				1999	94	Pos Mothers	
USA	Yes	Yes	Yes	1991	92	Yes	64*
Uruguay		Yes	Yes	1999	95	Pos Mothers	
Venezuela (Bolivarian Republic of)		No		2000	87	Yes	50
Virgin Islands (US)						Yes	

Note: "Pos Mothers" refers to positive mothers, meaning HBV birth dose is given only to infants born to HBsAg-positive mothers or mothers with acute hepatitis during pregnancy

[a] The country reported more than 100% coverage

[b] Year of introduction in areas with higher risk of contracting HBV

[c] Each province in Canada decides which vaccination policy to implement within the NACI (National Advisory Committee on Immunization) recommendations; currently, only New Brunswick, Northwest Territories, and Nunavut are administering a dose at birth

Sources: For goal of eliminating MTCT of HBV, routine testing and HBIG, PAHO [65, 83]; for birth-dose HBV vaccine, year country introduced complete HBV infant vaccination, coverage for HBV vaccine and HBV BD, PAHO [46]; for birth-dose HBV vaccine, year country introduced complete HBV infant vaccination, coverage for HBV vaccine and HBV BD for Puerto Rico, United States, and Virgin Islands (US), CDC [101, 102].

Annex Table 4. Hepatitis B official vaccination schedule, year of vaccine introduction, reported third-dose coverage, year of birth dose introduction, and reported birth dose coverage by country/territory in the region of the Americas, 2010-2015

		Three-dose series among infants ages <1 year[1]							Birth dose						
	Current vaccination schedule	Introduction	Vaccine coverage (%)						Introduction	Vaccine coverage (%)					
		(Year)	2010	2011	2012	2013	2014	2015	(Year/Status)	2010	2011	2012	2013	2014	2015
Northern America															
Bermuda	6, 7, 12 m	1997	93	90	92	91	97	85	—[7,8]	-	-	-	-	-	-
Canada	0, 2, 6 m2 or 2, 4, 6 m	1993[2]	-	70	70	75	74[6]	73	1983[7], 1993[2]	-	-	-	-	-	-
United States[1]	0, 1-2, 6-18m	1991	92	91	90	91	92	92[6]	1991	56	60	63	65	64	64[5]
Mexico	0, 2, 6 m	1999	93	98	99	79	84	82	2007	84	98	94[5]	89	94[5]	98
Central America															
Belize	2, 4, 6 m	1999	96	95	98	95	95	94	No	0	0	0	0	0	0
Costa Rica	0, 2, 6 m	1992[4],1997	89	84	91	94	91	92	1988[7], 1997	86	88[5]	90	90[5]	89	89[5]
El Salvador	2, 4, 6 m	1999	89	89	92	92	93	91	2015	-	-	-	-	-	-
Guatemala	0, 2, 4, 6 m	2005	94	88	96	93	73	74	2010	15	30	35	37	22	32
Honduras	0, 2, 4, 6 m	2000	100[5]	100[5]	88	87	85	85	2007	99	98	98	100	100	72
Nicaragua	2, 4, 6 m	1999	100[5]	100[5]	100[5]	100[5]	100[5]	100[5]	No	0	0	0	0	0	0
Panama	0, 2, 4, 6 m	1999	94	87	85	80	80	73	2002	89	93	87	79	84	85
Andean area															
Bolivia	2, 4, 6 m	2000	80	82	80	81	85	89	No	0	0	0	0	0	0
Colombia	0, 2, 4, 6 m	1992[4], 1994	88	85	92	91	90	91	1994[4], 2001	74	77	85	82	86	87
Ecuador	0, 2, 4, 6 m	1999	100[5]	100[5]	100[5]	87	83	78	2005[4], 2009[9]	5	7	16	69	79	75
Peru	0, 2, 4, 6 m	1991[3], 19964, 2003	93	91	95	88	88	90	1996[3], 2003	74	76	81	82	78	79
Venezuela	0, 2, 4, 6 m	2000	78	78	81	82	78	87	2008	73	78	67	80	82	89
Southern cone and Brazil															
Argentina	0, 2, 4, 6 m	2000	94	93	91	94	94	94	2000	82	85	88	85	87	84
Brazil[1]	0, 2, 4, 6 m	1989[3]; 1991[4], 1998	96	98	96	100[5]	96	96	1998	-	-	-	39	88	91
Chile	2, 4, 6 m	2005	92	94	90	90	95	96	—[7]	-	-	-	-	-	-
Paraguay	2, 4, 6 m	2002	76	76	74	73	74	80	—[7]	-	-	-	-	-	-
Uruguay	2, 4, 6, 15 m	1999	95	95	95	95	95	95	1991[7]	-	-	-	-	-	-
Latin-Caribbean															
Cuba	0, 2, 4, 6 m	1990	96	1005	100[5]	96	100[5]	100[5]	1992	99	99	99	100	99	99
Dominican Republic	0, 2, 4, 6 m	1994	83	80	74	80	89	81	1997	80	82	74	78	82	79
French Guiana	0, 2 11 m	1994	-	-	-	-	-	-	2008	-	-	-	-	-	-

Annex Table 4 continued

		Three-dose series among infants ages <1 year[1]						Birth dose						
	Current vaccination schedule	Introduction	Vaccine coverage (%)						Introduction	Vaccine coverage (%)					
		(Year)	2010	2011	2012	2013	2014	2015	(Year/Status)	2010	2011	2012	2013	2014	2015
Guadeloupe	2, 4, 11 m	—	-	-	-	-	-	-	—[7]	-	-	-	-	-	-
Haiti	6w 10w 14w	2012	0	0	0	85	60	72	No	0	0	0	0	0	0
Martinique	2, 4, 11 m	—	-	-	-	-	-	-	—[7]	-	-	-	-	-	-
Puerto Rico[1]	0, 1-2, 6-18m	1994	-	-	-	-	93	-	1999	-	-	-	-	77	-
Non-Latin-Caribbean															
Anguilla	2, 4, 6 m	1997	100[5]	100	100[5]	100	100[5]	100[5]	No	0	0	0	0	0	0
Antigua and Barbuda	2, 4, 6 m	2000	98	99	98	98	100[5]	100[5]	No	0	0	0	0	0	0
Aruba	1, 3, 9 m	2003	96	95[6]	94[6]	94[6]	93[6]	92	No	0	0	0	0	0	0
Bahamas, The	2, 4, 6 m	2001	98	95	96	97	96	95	No	0	0	0	0	0	0
Barbados	2, 4, 6 m	2001	86	91	87	91	94	97	No	0	0	0	0	0	0
Bonaire	2m, 14w, 5m, 11 m	2012	-	-	-	-	-	-	No	0	0	0	0	0	0
Cayman Islands	0, 6w, 9m	1997	75	75	94	86	88	87	1997[10]	-	-	-	-	87	85
Curaçao	2, 4, 6 m	2011	0	0	-	95	-	-	No	0	0	0	0	0	0
Dominica	2, 4, 6 m	2006	98	98	97	97	97	98	—[7]	-	-	-	-	-	-
Grenada	6-8w 16-20w 24-28w	2001	97	95	97	100[5]	97	92	—[7]	-	-	-	-	-	-
Guyana	2, 4, 6 m	2001	95	93	97	98	98	95	—[7]	-	-	-	-	-	-
Jamaica	6w 3m 5-6 m	2003	94	92	96	93	92	91	No	0	0	0	0	0	0
Montserrat	2, 4, 6 m	1999	100[5]	100	94	976	100	100	—[7]	-	-	-	-	-	-
Saba	2, 3, 4, 11m	2012	0	0	100	-	-	-	—[7]	-	-	-	-	-	-
St. Kitts & Nevis	0, 2, 4, 6 m	1999	96	98	100[5]	97	98	94	2015	0	0	0	0	0	100
St. Lucia	3, 5, 7 m	2002	97	100	98	100[5]	99	100[5]	—[7]	-	-	-	-	-	-
St. Vincent & Grenadines	2, 4, 6 m	2003	100[5]	96	96	100[5]	98	100[5]	—[7]	-	-	-	-	-	-
Sint Eustatius	2, 3, 4, 11m	1997	-	-	-	-	-	-	No	0	0	0	0	0	0
Sint Maarten	2, 3, 6 m	2000	90	92	91	92	95[6]	97	No	0	0	0	0	0	0
Suriname	2, 4, 6 m	2003[4]; 2005	86	86	84	86	85	89	2005	0	0	51	45	64	65
Trinidad & Tobago	3, 4-5, 6 m	2003	90	90	92	92	92	90	No	0	0	0	0	0	0
Turks & Caicos Islands	2, 4, 6 m	1999	95	87	95	100[5]	91	94	—[7]	-	-	-	-	-	-
Virgin Islands (UK)	2, 4, 6 m	1999	87	92	97	82	80	97	No	0	0	0	0	0	0

NOTE: [1] Vaccination coverage data for the US and Puerto Rico were obtained from the National Immunization Survey (NIS) among children aged 19-35 months (13). Birth dose coverage data for Brazil was obtained from the National Immunization Programme, Ministry of Health

[2] Each province in Canada decides which vaccination policy implements within the NACI recommendations (National Advisory Committee on Immunization). Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia, and Newfoundland and Labrador maintain a school-based immunization programme. Currently, only New Brunswick, Northwest Territories, and Nunavut are administering a dose at birth

[3] Pilot studies/vaccination campaigns.

[4] Year of introduction in risk/selected areas.

[5] The country/territory reported more than 100% coverage

[6] Linear interpolation was used to estimate missing coverage values that two or more values from other years were available. If no coverage data were available for the last year included in this report, the estimate remained the same as the previous year

[7] Only infants born to HBsAg positive mothers or mothers having acute hepatitis during pregnancy

[8] HB vaccine was routinely administered at birth around 1998

[9] The dose was given within 1 month of age until 2013. In 2016, the information systems were changed in order to recognize vaccination within 24 hours.

[10] The dose is given 48 hours from birth

Abbreviations: NA (Non applicable)

Source: Country reports through PAHO-WHO/UNICEF Joint Reporting (JRFs) and CDC vaccination coverage estimates. Information provided by the Unit of Comprehensive Family Immunization, PAHO/WHO [46]

Annex Table 5. Surveillance of acute and chronic HBV and HCV, cancer registries in the Region, 2015

	Case reporting for acute HBV	Case reporting chronic HBV	Case reporting acute HCV	Case reporting chronic HCV	Cancer registry/scope (national/subnational/both)
Anguilla	N/A	Yes	N/A	Yes	No
Antigua and Barbuda	Yes	No	Yes	No	No
Argentina	Yes	Yes	Yes	Yes	Yes/Both
Bahamas (The)	Yes	Yes	Yes	Yes	No
Barbados	Yes	No	Yes	No	Yes/National
Belize	Yes	No	No	Yes	No
Bolivia (Plurinational State of)	N/A	N/A	N/A	N/A	Yes/National
Brazil	Yes	Yes	Yes	Yes	Yes/National
British Virgin Islands	Yes	Yes	Yes	Yes	Unknown
Canada	Yes	Yes	Yes	Yes	Yes/Both
Chile	Yes	Yes	Yes	Yes	Yes/Both
Colombia	Yes	Yes	Yes	Yes	Yes/Both
Costa Rica	Yes	No	Yes	No	Yes/National
Cuba	Yes	Yes	Yes	Yes	Yes/Both
Dominica	N/A	N/A	N/A	N/A	No
Dominican Republic	No	No	No	No	Yes/National
Ecuador	Yes	No	Yes	No	Yes/Subnational
El Salvador	Yes	No	Yes	No	No
Grenada	Yes	Yes	Yes	Yes	No
Guatemala	Yes	No	Yes	No	Yes/Both
Guyana	Yes	Yes	No	No	Yes/National
Haiti	Yes	No	Yes	No	Unknown
Honduras	Yes	Yes	No	No	Yes/National
Jamaica	Yes	Yes	Yes	Yes	Yes/National
Mexico	Yes	No	Yes	No	Yes/National
Nicaragua	Yes	No	Yes	No	Yes/National
Panama	Yes	Yes	Yes	Yes	Yes/National
Paraguay	Yes	Yes	Yes	Yes	No
Peru	Yes	Yes	No	No	Yes/Both
St. Kitts and Nevis	Yes	Yes	Yes	Yes	No
St. Lucia	No	No	No	No	No
St. Vincent and the Grenadines	Yes	N/A	Yes	N/A	N/A
Suriname	Yes	Yes	Yes	Yes	Yes/National
Trinidad and Tobago	N/A	N/A	N/A	N/A	Yes/National
USA	Yes	Yes	Yes	Yes	Yes/Both
Uruguay	Yes	No	Yes	No	Yes/National
Venezuela (Bolivarian Republic of)	N/A	N/A	N/A	N/A	Yes/National

N/A=No information available.

Data for Aruba, BES, Bermuda, Cayman Islands, Curaçao, French Guiana, Guadeloupe, Martinique, Montserrat, Netherlands Antilles, Puerto Rico, Sint Maarten, Turks and Caicos Islands, and Virgin Islands (USA) were not available and thus, not included in the table.

Source: PAHO [65, 103]; WHO [79]; IARC [104]

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