CDA Foundation

HBV Disease Burden and Achieving the WHO Elimination Targets in New Zealand

October 6, 2017

Topics

- Base Assumptions
- Outputs
  - General Population
  - 5-year old outputs and scenarios
  - Treatment scenario and outputs
- Next Steps

HBV
General Population

- 5.7% of the population was HBsAg+ in 2001(Robinson 2005)
  - To report on screening coverage and the distribution of HBsAg (a marker of chronic hepatitis B virus infection) among participants in the New Zealand Hepatitis B Screening Programme.

- 29% of the HBsAg+ WoCBA were HBeAg+
  - Applied a regional average from Australasia

  - Percent of HBeAg+ with high viral load
    - 90% (Wiseman 2009)
  - Percent of HBeAg- with a high viral load
    - 13% (Wiseman 2009)

Robinson T, Bullen C, Humphries W, et al., The New Zealand Hepatitis B Screening Programme: screening coverage and prevalence of chronic hepatitis B infection. The New Zealand Medical Journal 2005; 118(1211): 1-11
Wiseman E, Fraser MA, Holden S, et al. Perinatal transmission of hepatitis B virus: an Australian experience. MJA. 2009 190(9): 489-92.

HBV
General Population

Table 2. HBsAg prevalence by age, sex, ethnicity and region

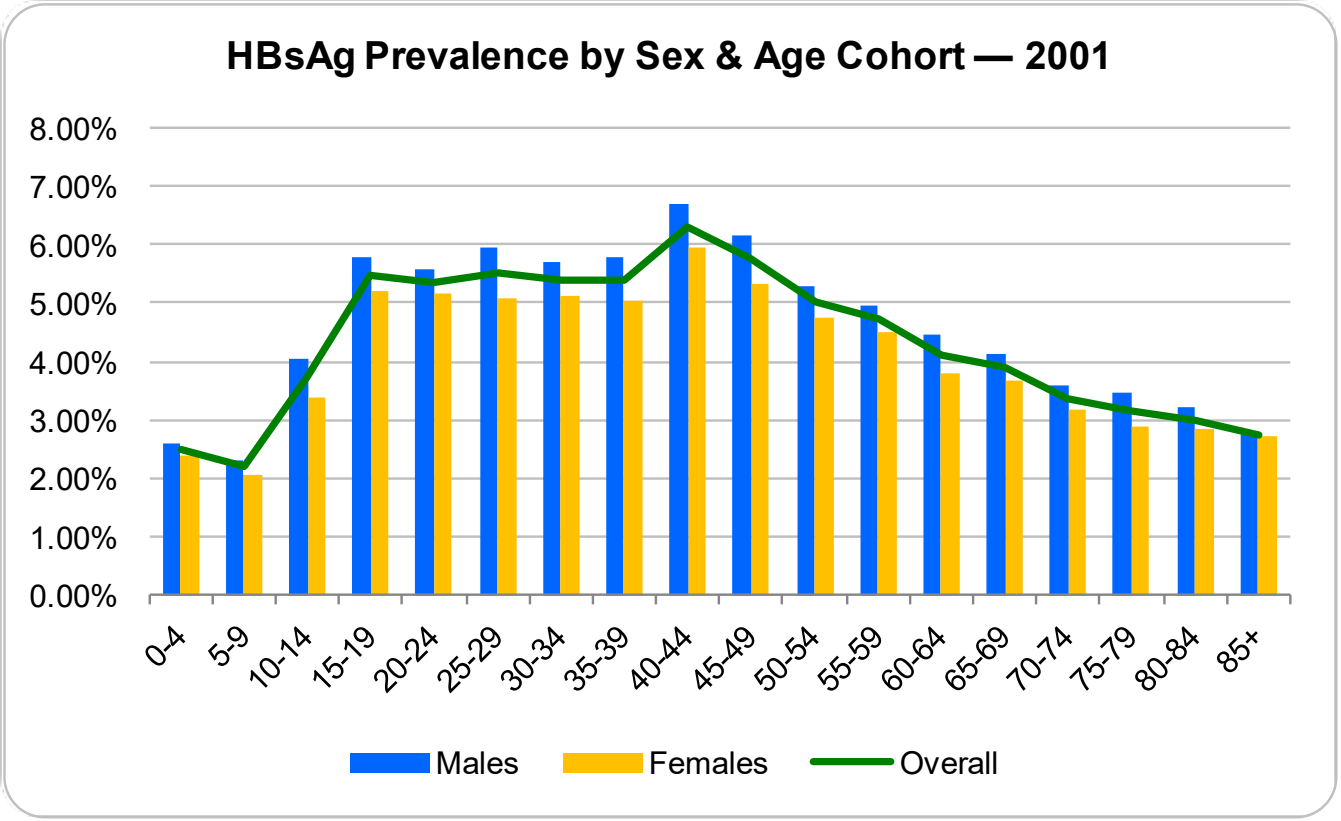
Category	Variable	Sample size	Number of HBsAg-positive participants	HBsAg+ prevalence (%)	95% CI
Age	<15	3107	109	3.5	2.9–4.2
	15-40	118779	6492	5.5	5.3–5.6
	>40	55406	3575	6.5	6.2–6.7
Sex	Male	79195	4835	6.1	5.9–6.3
	Female	97794	5318	5.4	5.3–5.6
Ethnicity	Maori	81219	4081	5.6	5.4–5.7
	Pacific	43734	2633	7.3	7.0–7.5
	Asian	31484	1522	6.2	5.9–6.5
	Other	18838	462	2.8	2.6–3.0
	Pacific groups:				
	-Samoan	19298	867	4.5	4.2–4.7
	-Cook Islands	7041	446	6.3	5.7–6.9
	-Tongan	10478	1370	13.1	12.4–13.7
	-Niuean	1995	172	8.6	7.3–9.8
	-Tokelauan	1080	41	3.8	2.6–4.9
	-Fijian	1109	38	3.4	2.3–4.4
	Asian groups:				
	-SE Asian	2950	240	8.1	7.1–9.1
	-Chinese	14160	1258	8.9	8.4–9.3
	-Indian	7497	44	0.6	0.4–0.7
Region	Northland	9092	430	4.7	4.3–5.2
	Auckland	81036	5650	7.0	6.8–7.1
	Waikato	20149	765	3.8	3.5–4.1
	BOP	18907	887	4.7	4.4–5.0
	Gisborne	7666	349	4.6	4.1–5.0
	Taranaki	1311	42	3.2	2.3–4.2
	Hawke's Bay	8581	343	4.0	3.6–4.4
	Man*-Wanganui	5245	221	4.2	3.7–4.8
	Wellington	22441	801	3.6	3.3–3.8
Total		**177328**	**10176**	**5.7**	**5.6–5.8**

BOP=Bay of Plenty; SE Asian=South-East Asian (e.g. Thai); CI=confidence interval; *Manawatu.

Robinson T, Bullen C, Humphries W, et al., The New Zealand Hepatitis B Screening Programme: screening coverage and prevalence of chronic hepatitis B infection. The New Zealand Medical Journal 2005; 118(1211): 1-11

HBsAg+ Prevalence by Age

- Robinson 2005



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HBV
Percent of HBeAg+ and HBeAg- WoCBA with a High Viral Load

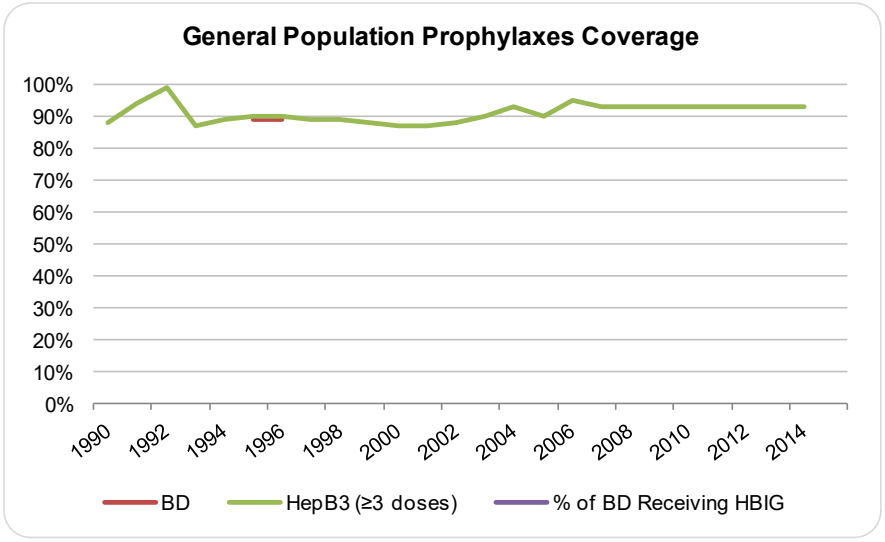
1 HBeAg status and viral load in 213 HBsAg-positive pregnant women with detectable HBV DNA

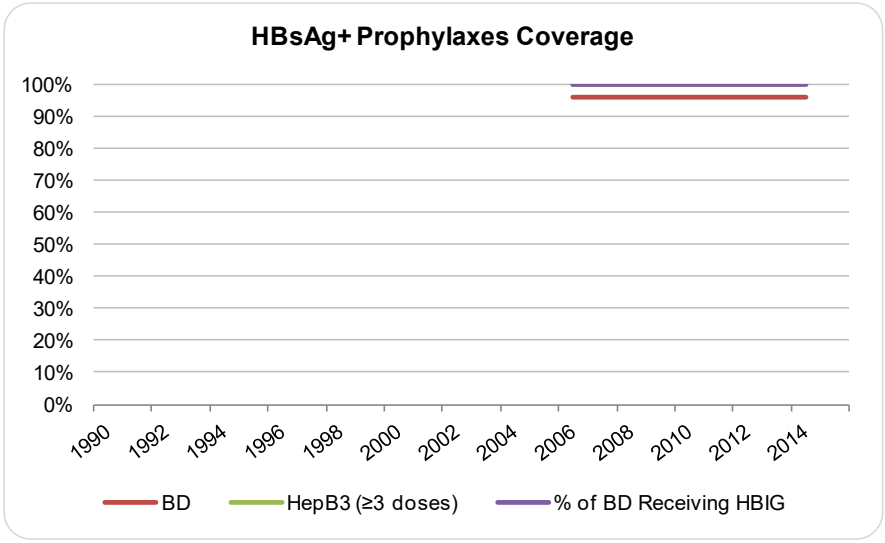
HBV DNA level	HBeAg-negative mothers ($n = 122$)	HBeAg-positive mothers ($n = 91$)
$< 10^5$ copies/mL	106 (87%)	9 (10%)
10^5–10^8 copies/mL	16 (13%)	13 (14%)
$> 10^8$ copies/mL	0	69 (76%)

HBeAg = hepatitis B "e" antigen. HBsAg = hepatitis B surface antigen. HBV = hepatitis B virus. ◆

Wiseman E, Fraser MA, Holden S, et al. Perinatal transmission of hepatitis B virus: an Australian experience. MJA. 2009 190(9): 489-92.

HBV
Perinatal Transmission Prophylaxes





- In 2014, 93% coverage of three doses
- In 2014, BD was provided to infants of mother who are HBsAg+
- HBIG to all infants born to HBsAg+ mothers
  - » Currently, do infants receive BD and HBIG?
- All mothers with a HVL receive Tenofovir (all HBeAg+ are DNA tested and if >10log, then are treated)

Diagnosis of the General Population

- In 2016, it is assumed that 50,000 individuals have been diagnosed with chronic hepatitis B – 25K in the NZHF and another 25K are diagnosed by GPs and are not reported (expert input)

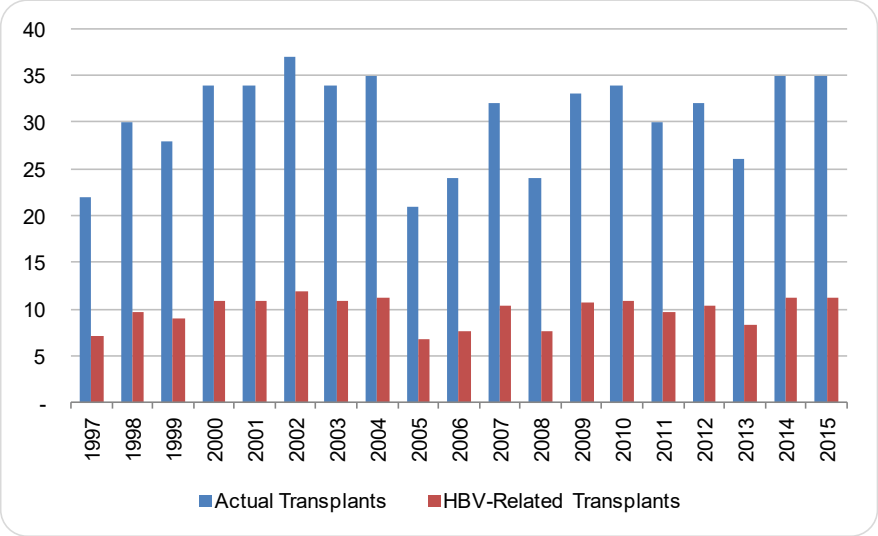
- Based on data from 2016, 800 new cases are referred to NZHF per year but about 400 seroconvert per year. At the national level about an estimated 1,000 are newly diagnosed annually (expert input)

HBV
Treatment in 2015

Input	Value
# of adults receiving treatment	
% treated with entecavir	
% treated with tenofovir	
% treated with adefovir	
% treated with lamivudine	
% treated with interferon	

- 3,416 patients currently on treatment (PHARMAC)
- What is the number of new patients put on treatment per year?

Methodology to Estimate Liver Transplants Attributed to HBV



- Actual liver transplant data for 1997-2016 was available through ANZA Data.
- Assumed 32% of all transplants were due to HBV (Gane 2002)

Australia and New Zealand Organ Donation Registry Annual Report 2016
Gane E, McCall J, Streat S, et al., Liver transplantation in New Zealand: the first four years. The New Zealand Medical Journal 2002; 115(1159):1-13

HDV

- 21.0% anti-HDV prevalence in HBsAg infected population (Gane 1998)
  - » All patients treated for HBV-related conditions at Middlemore Hospital from January 1995 to January 1997.

Gane E, Chronic hepatitis B virus infection in South Auckland. New Zealand Medical Journal 1998l; 120-123

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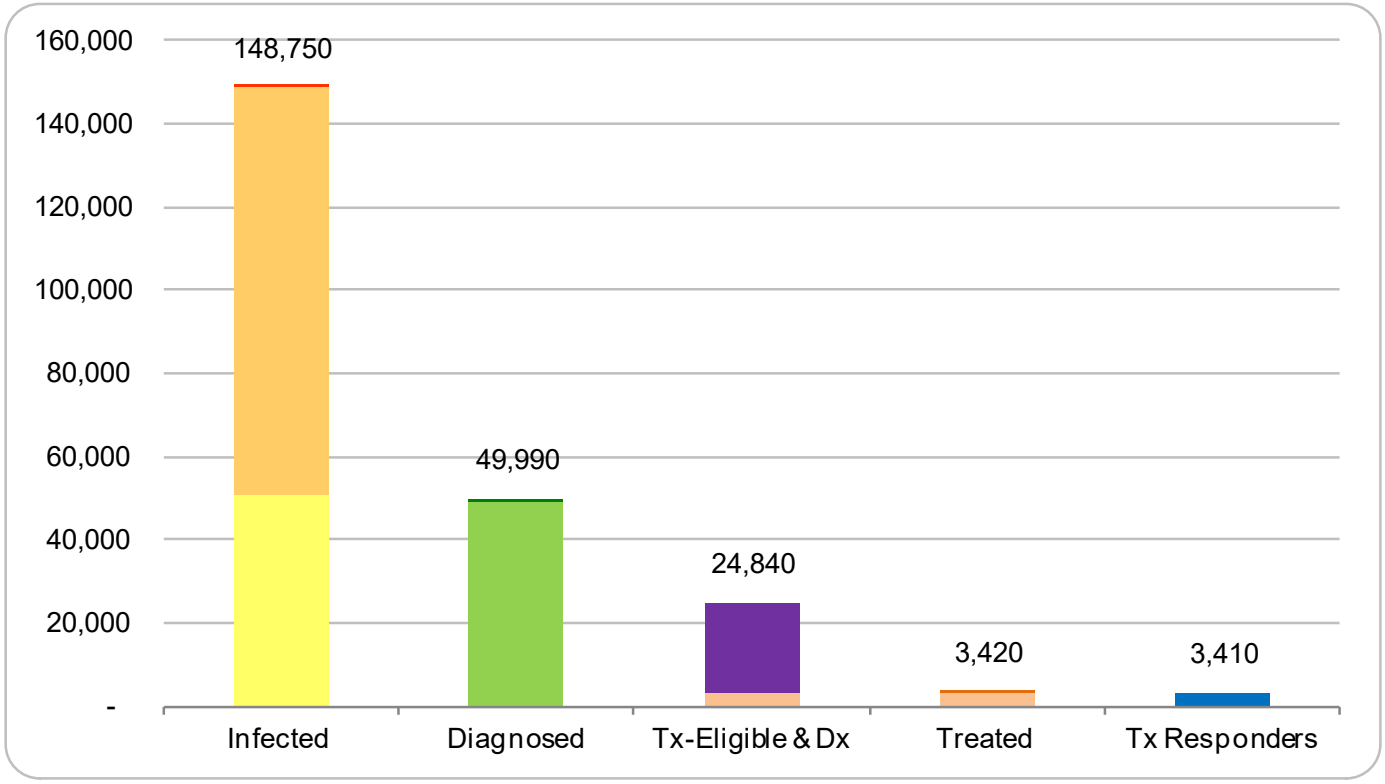
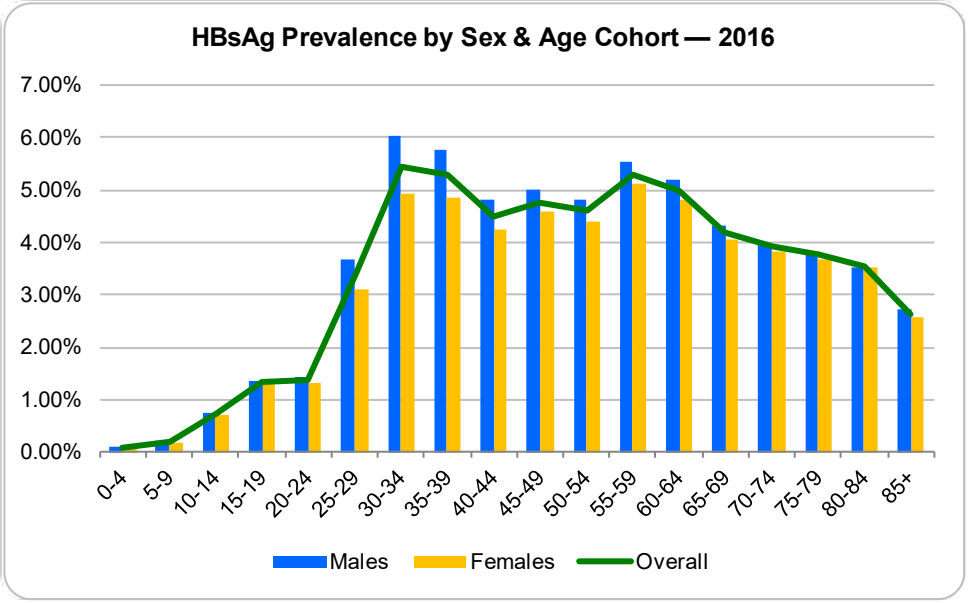
Cascade of Care in 2016

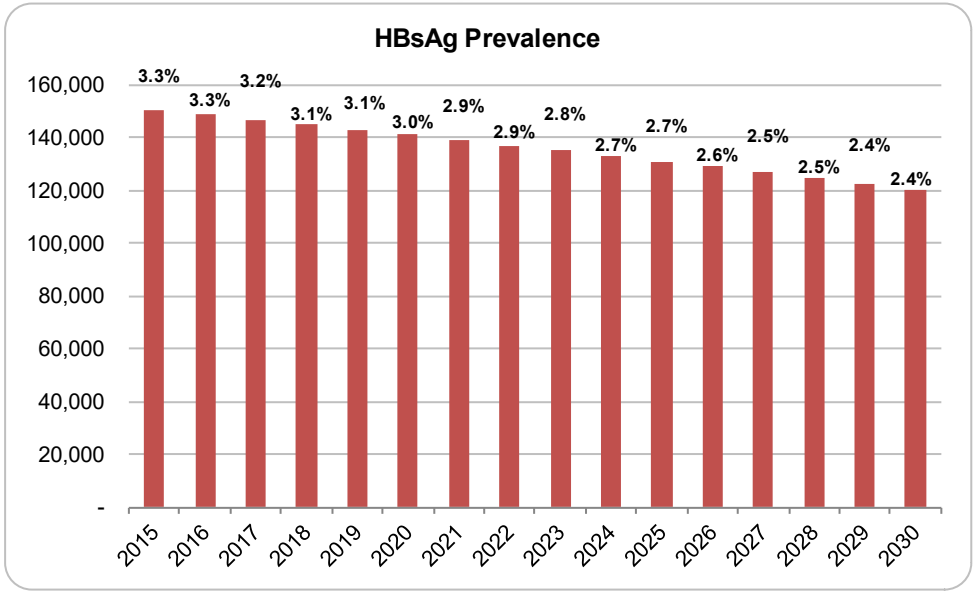


Newly Infected - 120	Newly Dx 1,000	Tx-Eligible & Dx 21,490	Initiate Tx 70
Previously Inf - Tx Ineligible - 97,510			
Previously Inf - Tx Eligible - 51,120	Previously Dx 48,990	Previously Tx 3,350	Tx Responders 3,410

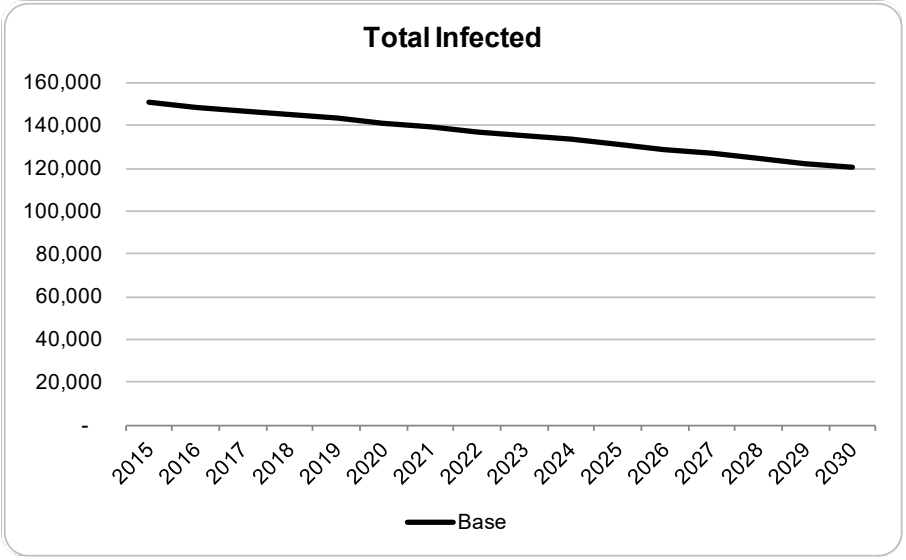
Outputs – General Population

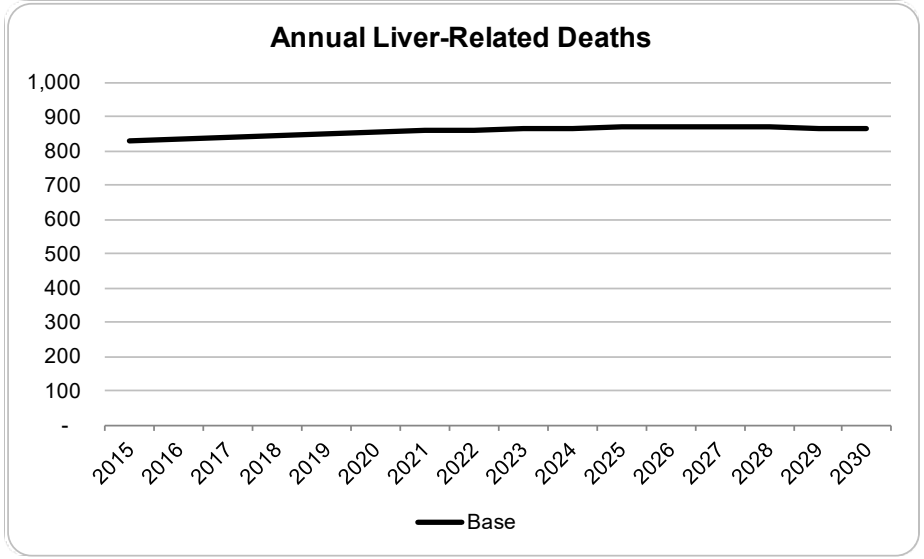
In 2016, it is estimated that the prevalence of chronic hepatitis B in New Zealand is 3.3%, representing 148,750 chronic infections, dropping to 2.4%, 120,300 chronic infections by 2030

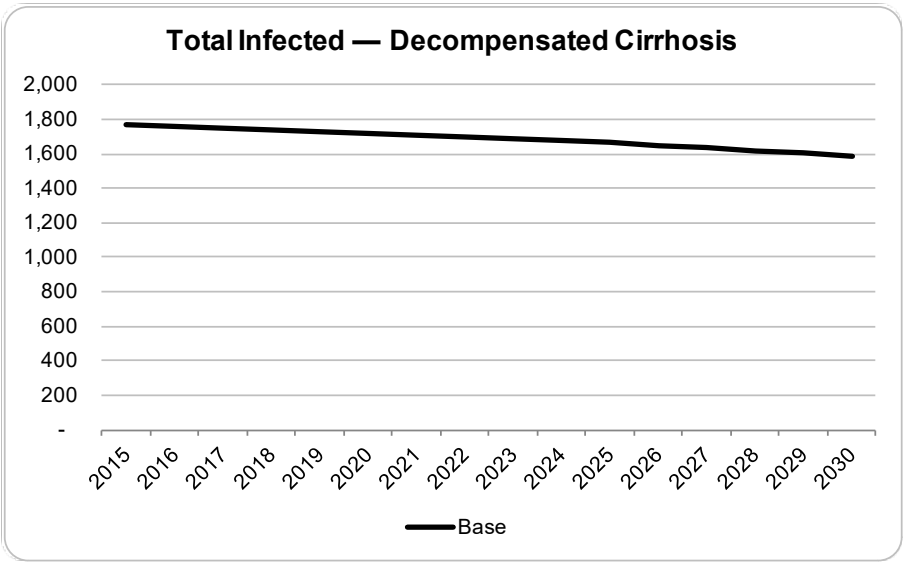


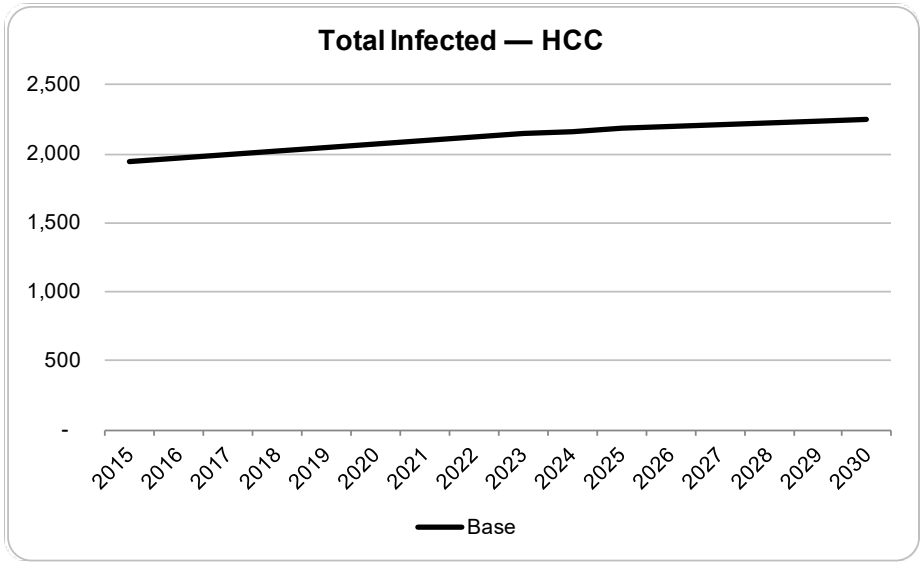


Although total infections is expected to decrease, the number of liver related deaths & HCC is expected to increase









WHO Hepatitis Elimination Targets

Target areas				Baseline 2015	2020 target	2030 target
Service coverage	Prevention	❶ Three-dose hepatitis B vaccine for infants (coverage %)		82%	90%	90%
		❷ Prevention of mother-to-child transmission of HBV: hepatitis B birth-dose vaccination or other approaches (coverage %)		38%	50%	90%
		❸ Blood and injection safety (coverage %)	Blood safety: donations screened with quality assurance	89%	95%	100%
			Injection safety: use of engineered devices	5%	50%	90%
		❹ Harm reduction (sterile syringe/needle set distributed per person per year for people who inject drugs [PWID])		20	200	300
	❺ Treatment	5a. Diagnosis of HBV and HCV (coverage %)		<5%	30%	90%
		5b. Treatment of HBV and HCV (coverage %)		<1%	5 million (HBV) 3 million (HCV)	80% eligible treated
Impact leading to elimination	Incidence of chronic HBV and HCV infections			6–10 million	30% reduction	90% reduction
	Mortality from chronic HBV and HCV infections			1.46 million	10% reduction	65% reduction

WHO. Combating Hepatitis B and C to Reach Elimination by 2030. Geneva, Switzerland: WHO, 2016.

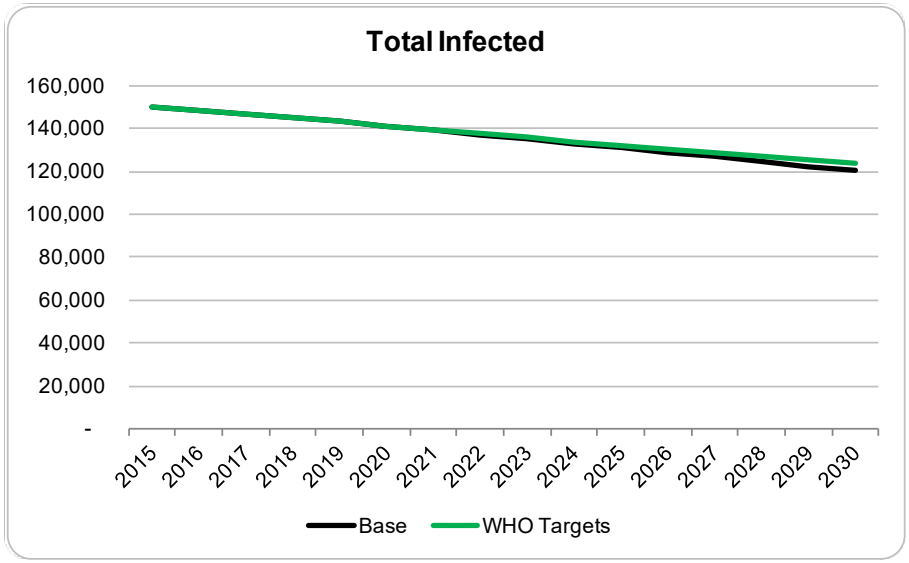
To meet the WHO elimination targets, screening and treatment need to be expanded

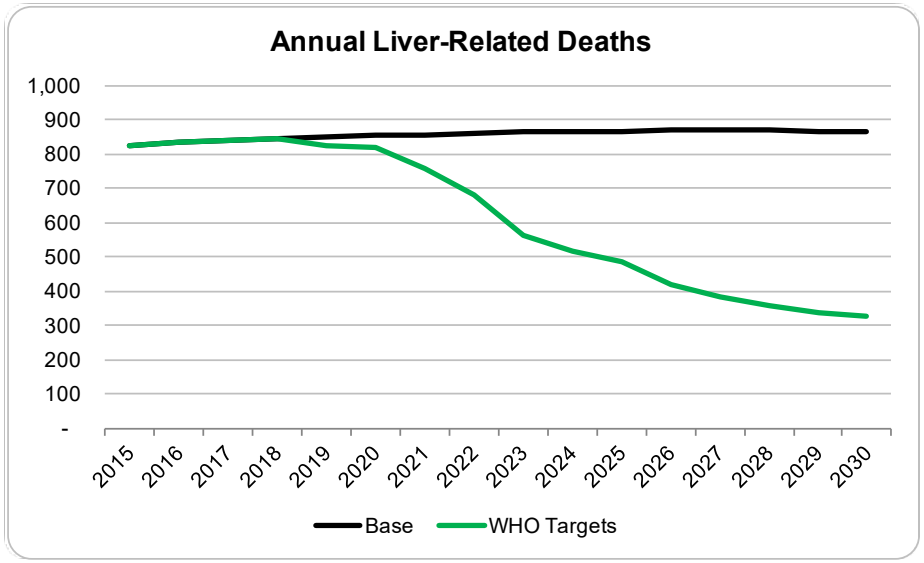
- The number of newly diagnosed cases needs to increase from 1,000 cases today to 8,000 per year in 2025
- The number of diagnosed high viral load and cirrhotic patients that are on treatment needs to increase from 3,400 to 37,000
- The anti-virals are going generic and the price is expected to drop over 90% in the next two years.

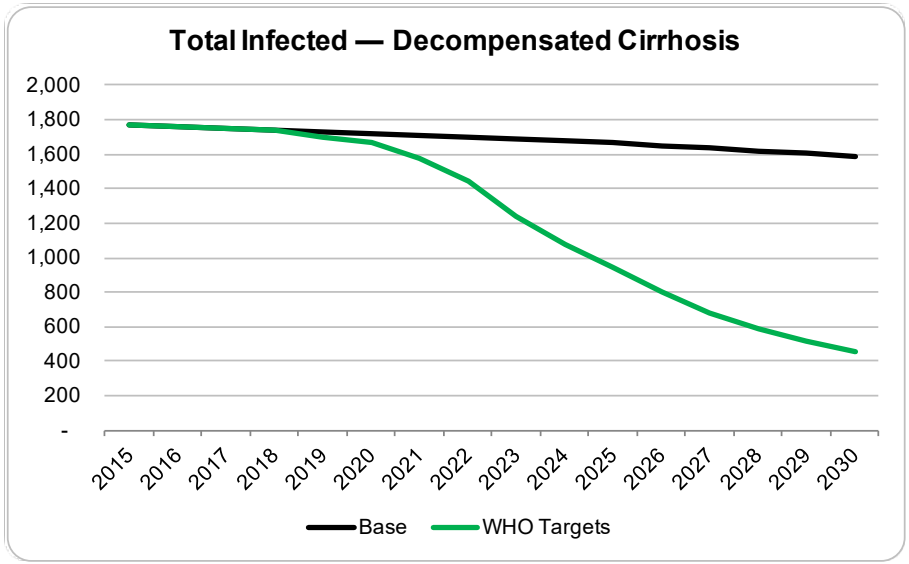
	2016	2018	2020	2021	2022	2025
Newly Diagnosed	1,000	2,000	3,000	5,000	7,000	8,000
Treated	3,420	6,800	13,600	20,000	30,000	37,000
Treated Age	15-85	15-85	15-85	15-85	15-85	15-85

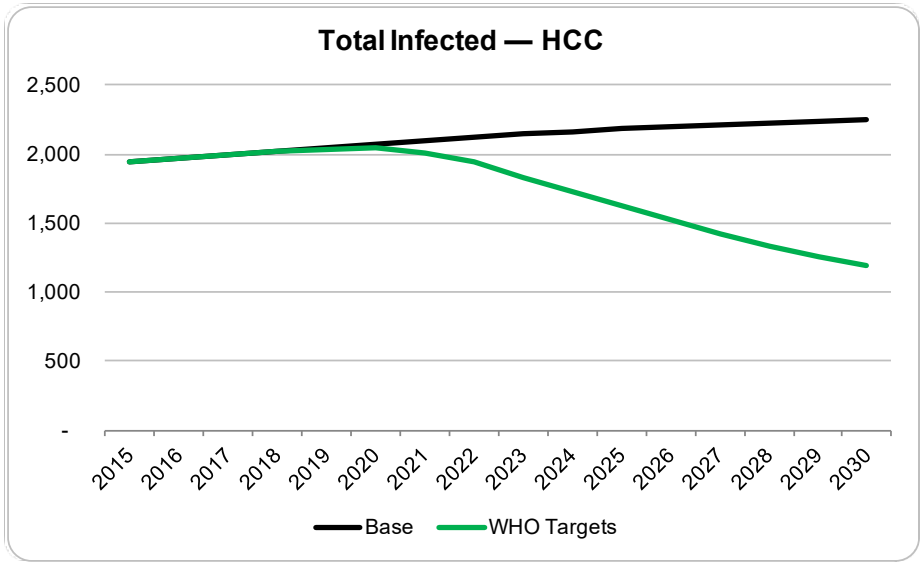
The Global Health Sector Strategy for Viral Hepatitis (GHSSVH) at The World Health Assembly, May 2016

With current treatment, the total number of infections will remain constant, but HBV related morbidity & mortality will decline by 40-75%



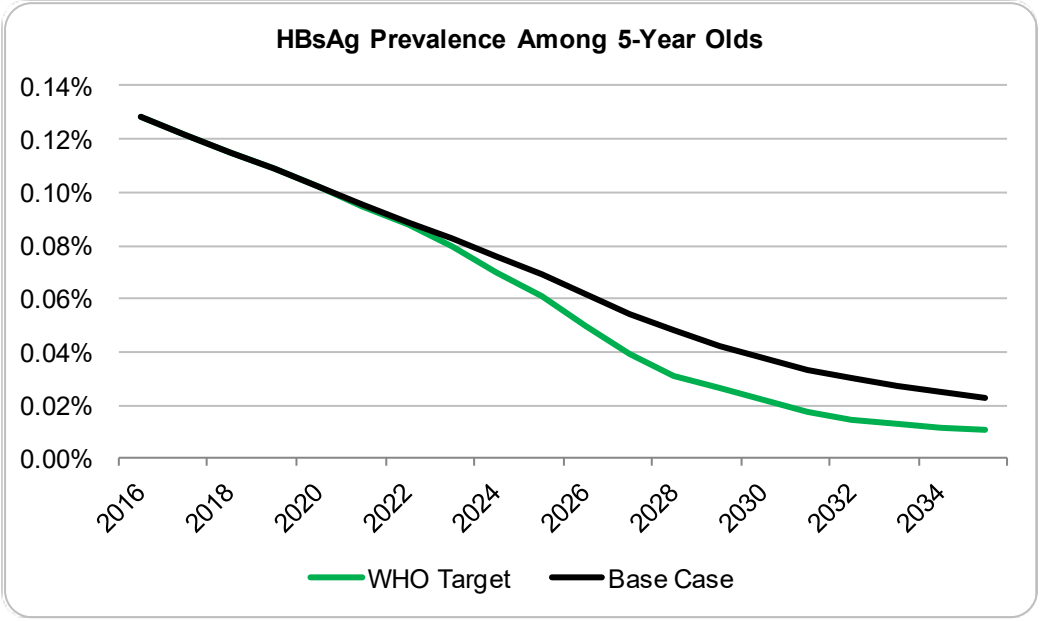






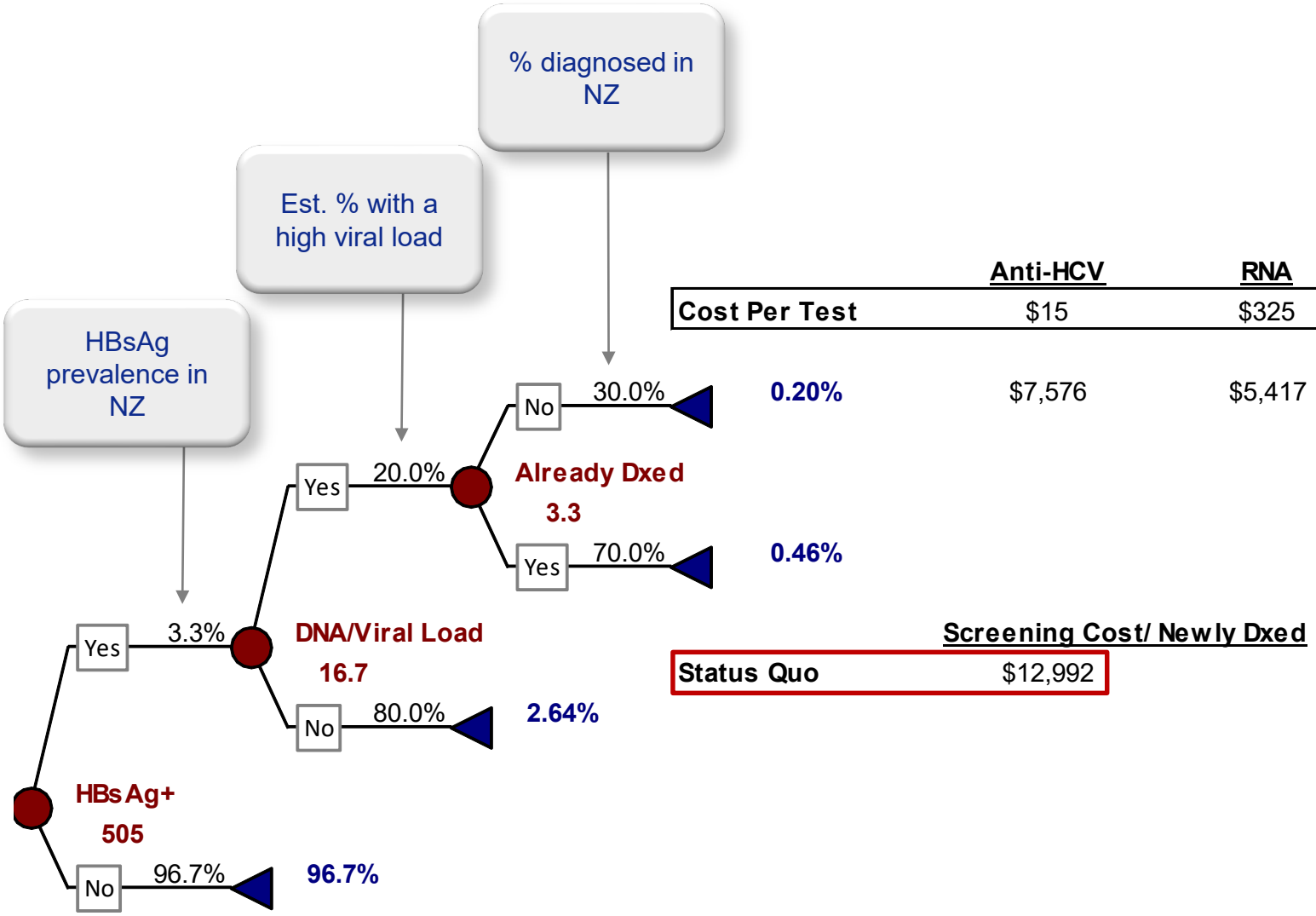
New Zealand is already on track to meet the vaccination targets as the result of its current perinatal prophylaxes coverage

- In the base scenario, HBsAg+ prevalence among 5-year olds will reach ~0.02% in 2030 (below WHO and regional targets)
- With expanded screening & treatment, viral load among pregnant women will drop. leading to a further decrease in mother to child transmission

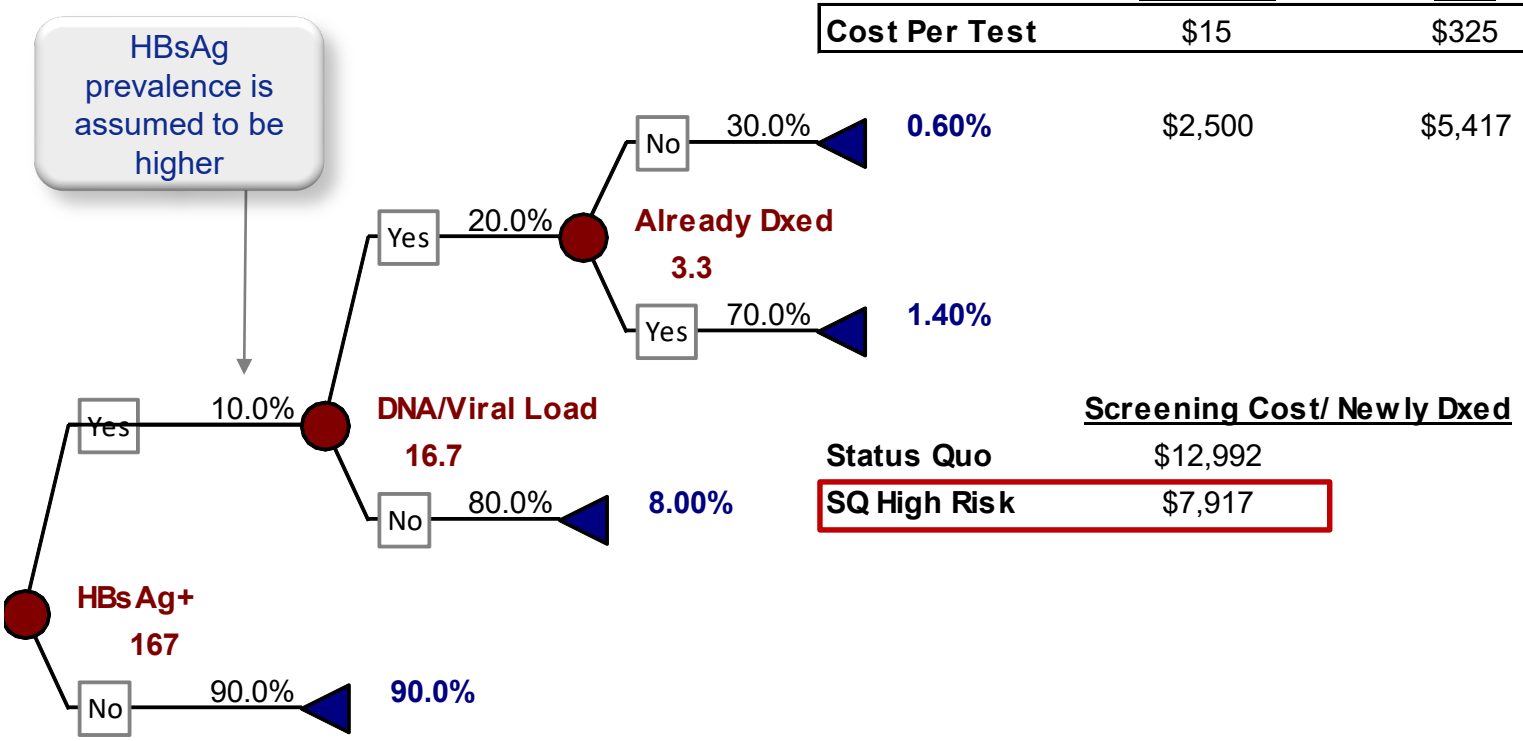


The Global Health Sector Strategy for Viral Hepatitis (GHSSVH) at The World Health Assembly, May 2016

The average cost to find one undiagnosed high viral load patient is estimated at $13,000 in the general population



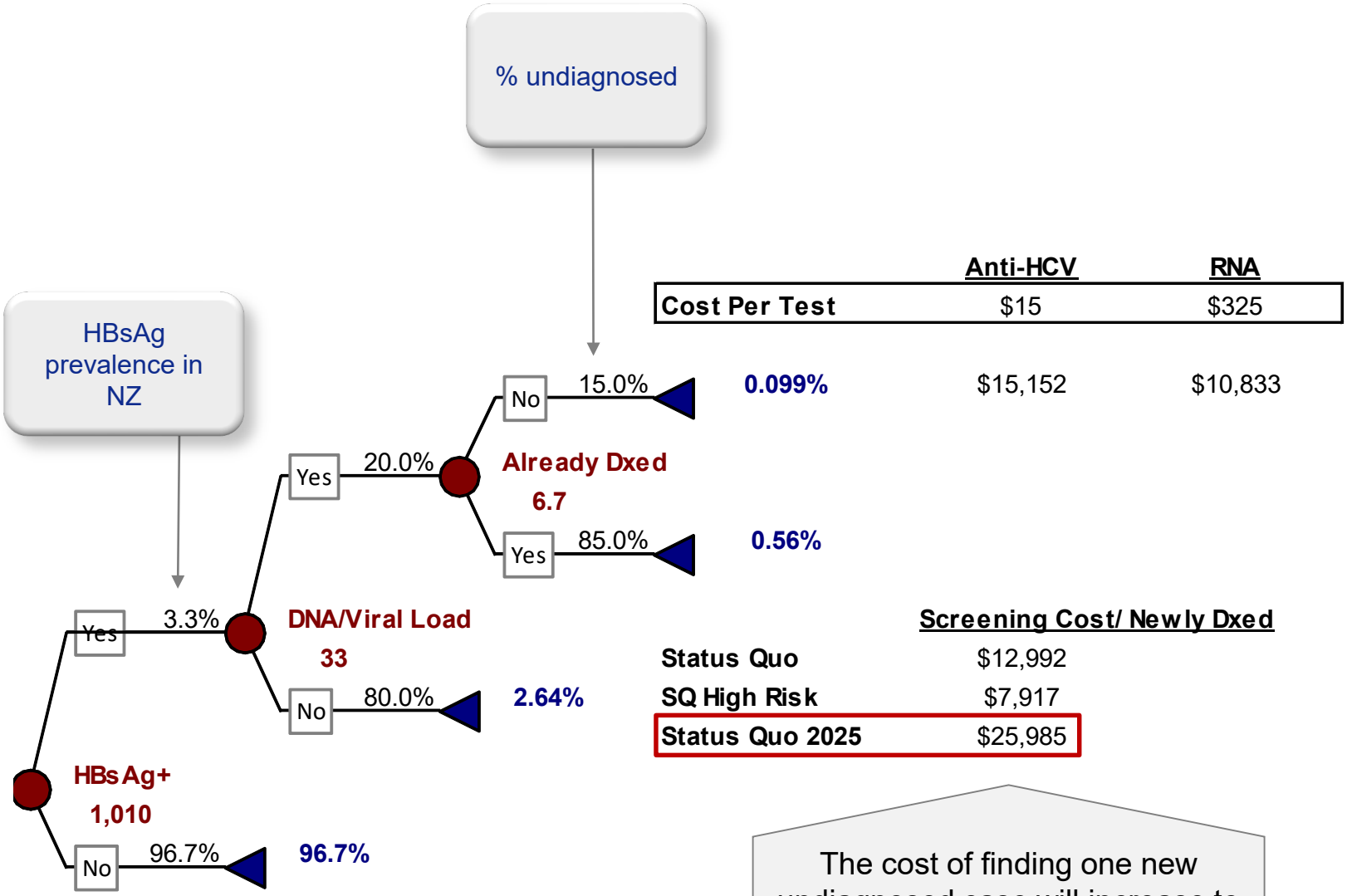
The cost finding a new case drops to $8,000 if screening is conducted in high prevalence populations



	Anti-HCV	RNA
Cost Per Test	$15	$325

Screening Cost/ Newly Dxed	
Status Quo	$12,992
SQ High Risk	$7,917

Under the WHO elimination scenario, by 2025 the % of the population already diagnosed will increase as result of expanded screening



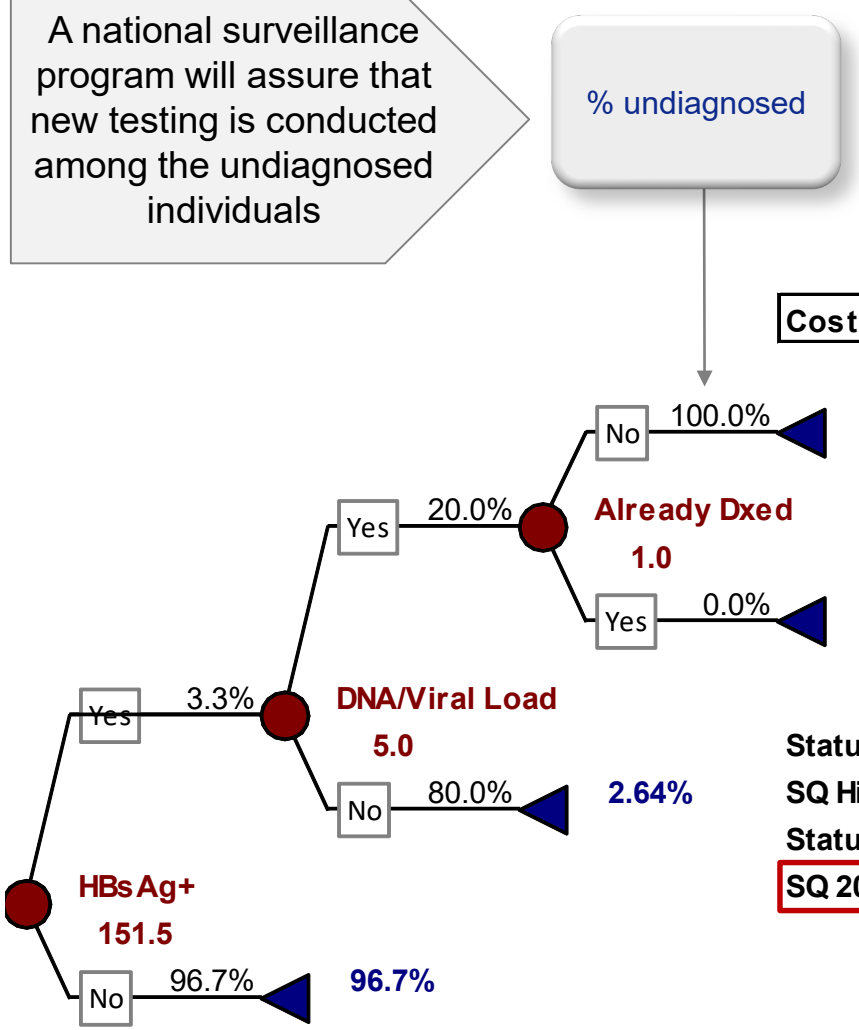
	Anti-HCV	RNA
Cost Per Test	$15	$325

	Screening Cost/ Newly Dxed
Status Quo	$12,992
SQ High Risk	$7,917
Status Quo 2025	$25,985

The cost of finding one new undiagnosed case will increase to $26,000 per case

A surveillance system will assure that most of the newly diagnosed cases have not been tested before, which will reduce the cost/case

A national surveillance program will assure that new testing is conducted among the undiagnosed individuals



	Anti-HCV	RNA
Cost Per Test	$15	$325

Screening Cost/ Newly Dxed	
Status Quo	$12,992
SQ High Risk	$7,917
Status Quo 2025	$25,985
SQ 2025 w Surveillance	$3,898

Similar economic analyses can be used to negotiate diagnostic prices

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