

Estimating the burden of hepatitis C virus infection in Iran: How the enhanced antiviral treatments can prevent the rising burden

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Introduction

- Given the **high coverage of hepatitis B virus (HBV) vaccination in infants** and also implementation of **HBV vaccination programs among adolescent in Iran, hepatitis C virus (HCV) seems to emerge as the leading cause of viral hepatitis-related advanced liver disease and death** in the near future.
- Development of **interferon (IFN)-free direct-acting antiviral (DAA) therapies** have resulted in realistic optimism for treatment of patients with HCV and **decreasing the burden of HCV infection**.
- There are **limited data estimating HCV-related mortality and morbidity in Iran** which is crucial to **guide public health strategies** for reducing the burden of HCV infection in the new era of IFN-free treatments.

Methods

Table 1: Model inputs and assumptions

Input variable	Value	Year	Source
Total population	77,447,170	2013	United Nations World Population Prospects
Anti-HCV Ab prevalence in adult population	0.5%	2006	Merat Sh, <i>et al.</i> Int J Infect Dis 2010
Anti-HCV Ab prevalence in general population	0.39%	2006	Extrapolated from Merat 2010
Viremic proportion out of anti-HCV positive people	62%	2008	Poustchi H, <i>et al.</i> PLoS ONE 2011
Viremic prevalence	0.24%	2006	Calculated
HCV diagnosis rate	32%	2013	Expert Opinion of 6,000 diagnosis per year and 60,000 already diagnosed. It is estimated as diagnosed/total viremic population
HCV incidence (annual)	11 per 100,000	2013	Estimated: $Prevalence_{Year(t,y)} = \sum_{Year=t}^{Year=y} (New\ Cases - Mortality - Cured)$
HCV treatment rate (annual)	2.4%	2013	Expert Opinion of 4,500 per year based on estimated PegIFN units sold per year
Infected via injecting drug use	75%	2007	Zamani S, <i>et al.</i> Int J Drug Policy 2007; WHO, HIV Surveillance in EMRO 2012
Genotype distribution	G1: 64%; G2: 2%; G3: 33%; G4: 1%	2003-05	Keyvani H, <i>et al.</i> Hepatol Res 2007

Table 2: Scenarios considered in projecting HCV burden

Scenario	Treatment regimen	Newly Diagnosed rate (annually)	Treatment rate (annually)
Base case	IFN-based	6,000	4,500
Increase SVR only	IFN-free DAA	6,000	4,500
Double treatment rate	IFN-free DAA	6,000	In 2016: ↑ 9,000
Treat advanced liver fibrosis	IFN-free DAA	6,000	↓ only liver fibrosis stage ≥F3
Stepwise treatment increase	IFN-free DAA	6,000	In 2016: ↑ 9,000 In 2018: ↑ 13,500
Target 50% reduction in HCC incidence by 2025	IFN-free DAA	6,000	In 2016: ↑ 9,000 In 2018: ↑ 18,500
Target HCV elimination by 2030 (>90% reduction in total infected cases)	IFN-free DAA	In 2016: 6,000 In 2018: ↑ 12,000 In 2020: ↑ 24,000	In 2016: ↑ 9,000 In 2018: ↑ 18,000

Aim

- To estimate the **current and future burden of HCV infection in Iran**
- To assess the **impact of various HCV treatment strategies in reducing the projected burden of HCV infection in Iran**

Results

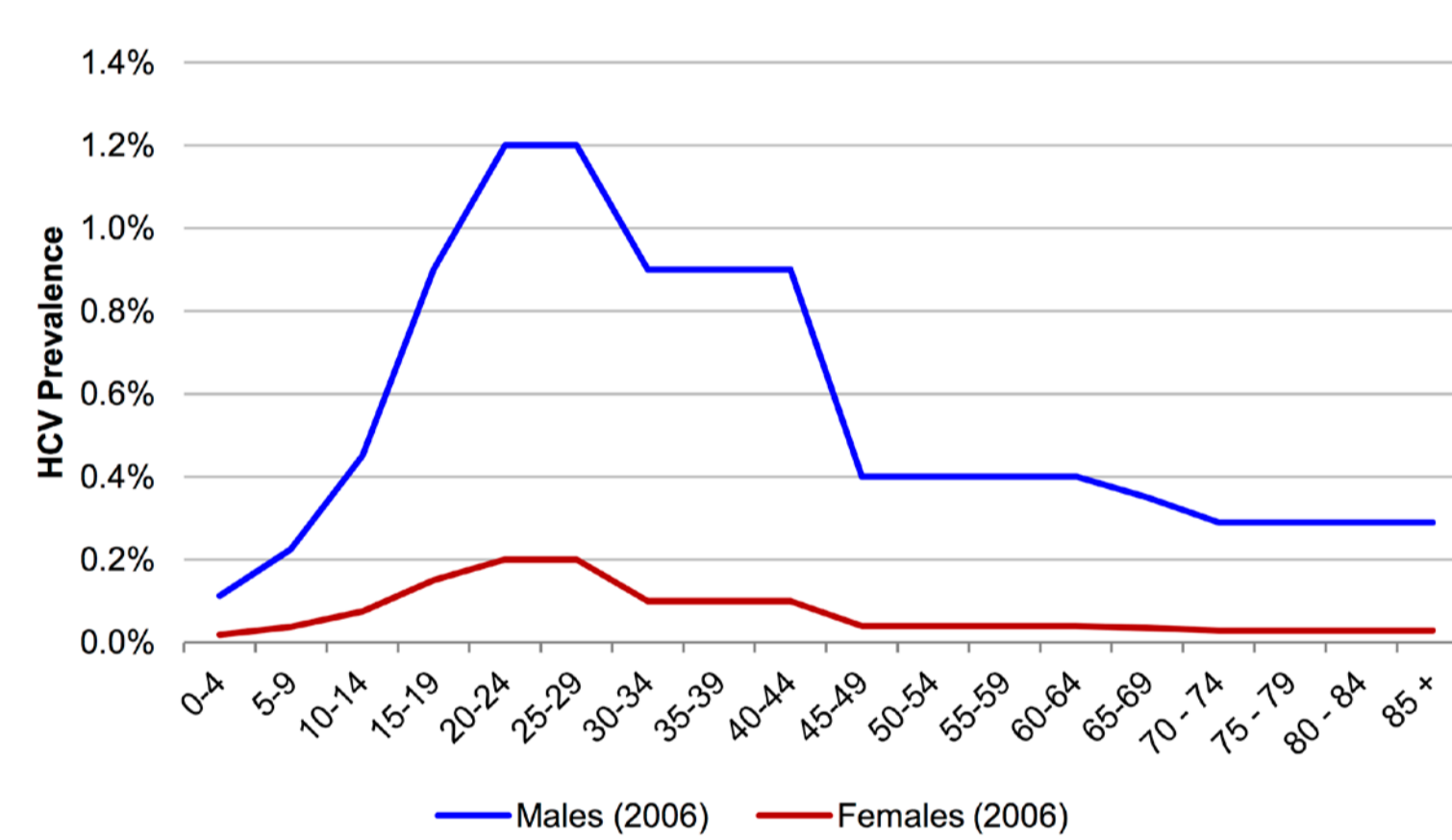


Figure 1. Age and gender specific HCV prevalence (anti-HCV Ab) in general population in 2006

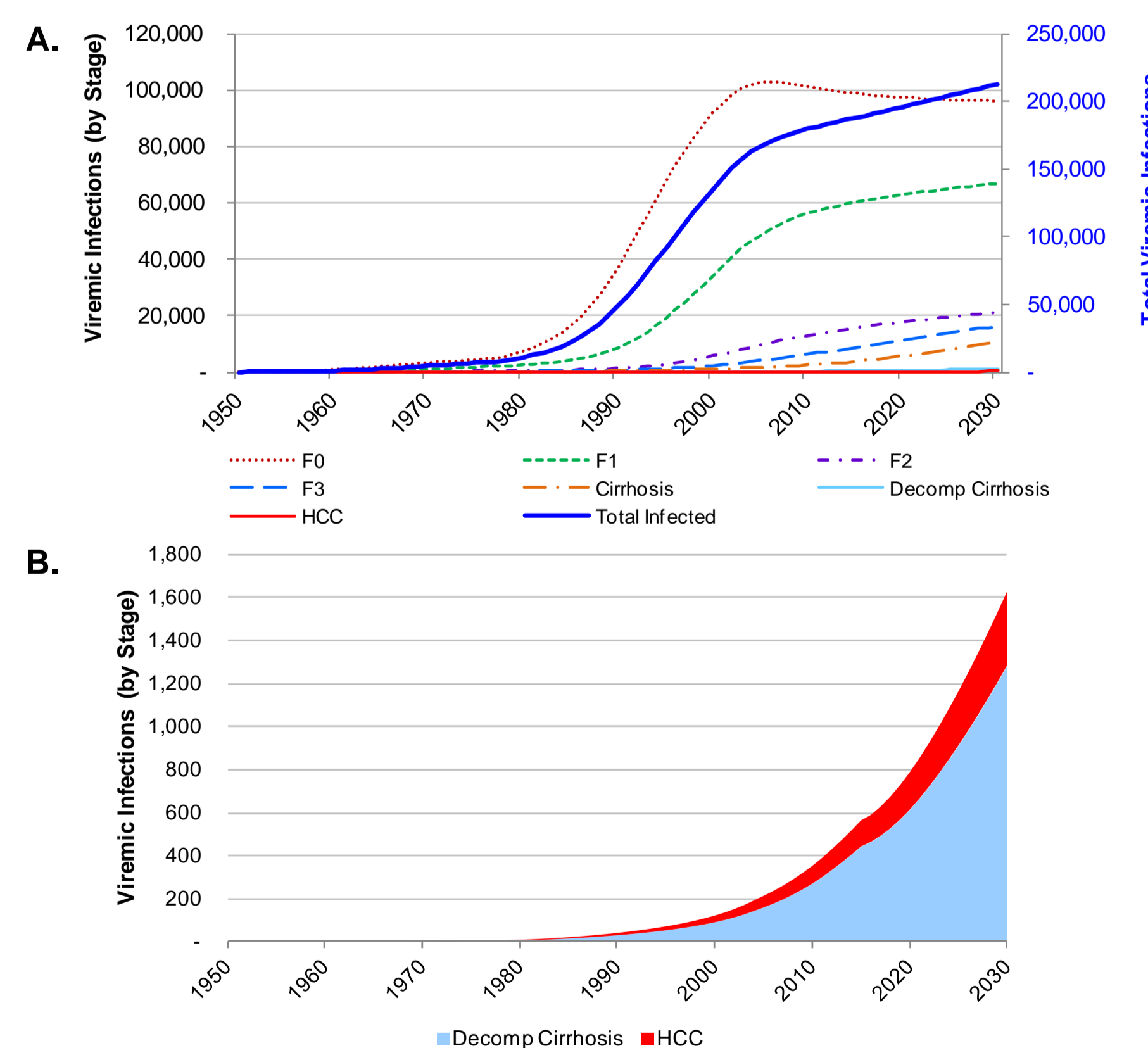


Figure 2. Projection of HCV disease burden by 2030 (A) Total infected people and various liver fibrosis stages; (B) Decompensated cirrhosis and hepatocellular carcinoma

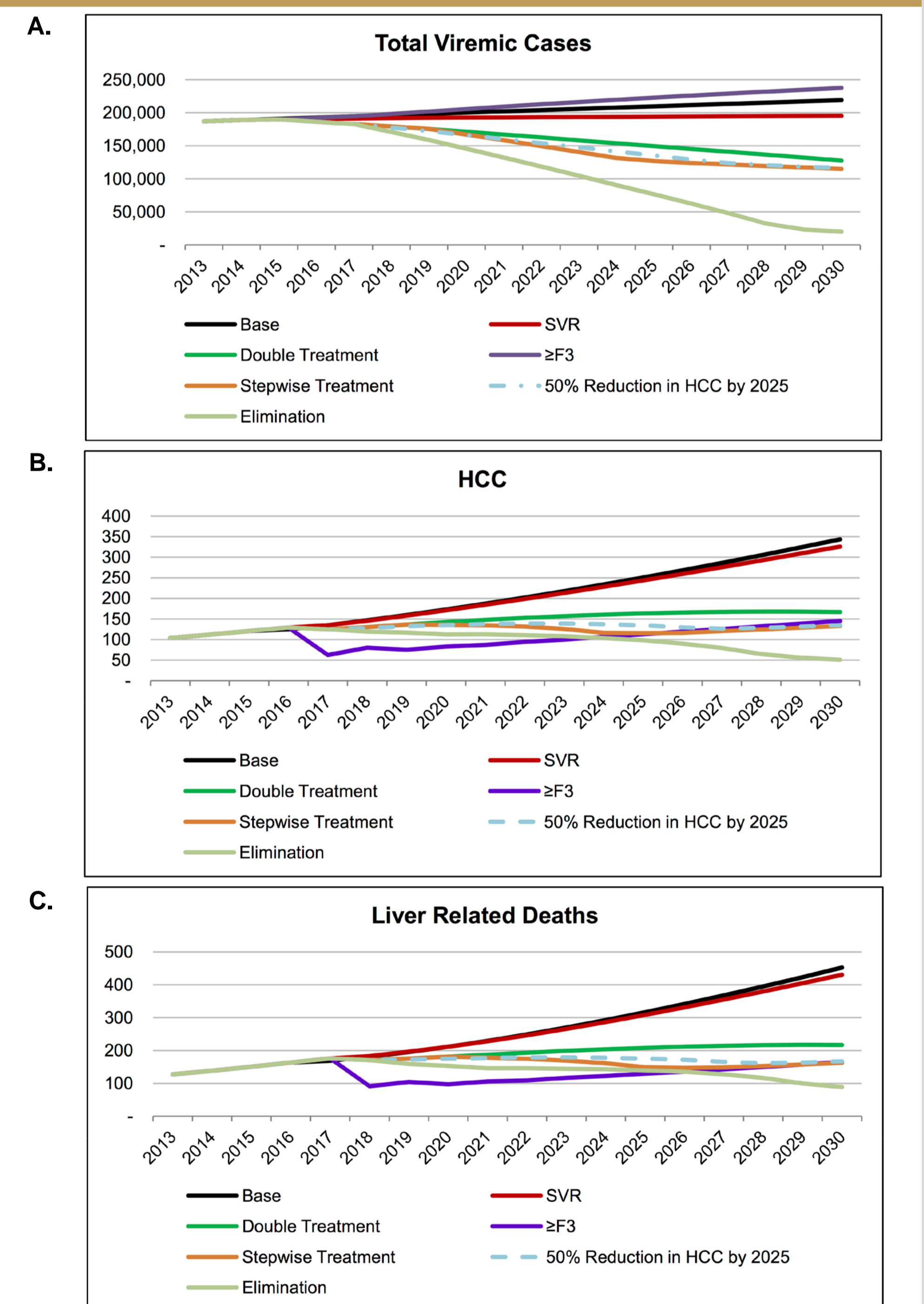


Figure 3. Change in HCV morbidity and mortality by scenario (A) Total infected people; (B) Hepatocellular carcinoma; (C) Liver-related death

Methods

- The historical epidemiology of HCV was gathered through a literature search, analysis of unpublished data and discussion with expert panels.
- A disease progression model was constructed to quantify the size of the HCV infected population, by the liver disease stages in each age and gender group, from 1950–2030.
- The progression rates, transition probabilities to hepatocellular carcinoma (HCC), and mortality rates were gathered from literature review.
- Given that the number of new HCV infections was not available, it was back-calculated, using the number of prevalent infections and the rates of spontaneous clearance, treatment and mortality.
- Relative incidence was set to one in 1950, and a discussion with the expert panel was used to identify the years when new infections peaked using the risk factors common in the country.
- Given that the number of diagnosed cases and annual diagnosis rate was not available, these data were estimated based on expert consensus.
- Number of treated patients were estimated based on expert consensus using annual Pegylated-Interferon (Peg-IFN) sale data.
- The annual number of cured patients was estimated using the average sustained viral response (SVR) rate of various regimens.

Conclusion

- Increasing burden of HCV-related advanced liver disease and death is expected in Iran** under the current diagnosis and treatment levels.
- IFN-free DAA regimens will have limited impact on HCV disease burden given the low diagnosis rate and treatment up-take
- Increased diagnosis rate and treatment up-take is needed** in combination with enhanced treatment efficacy (IFN-free DAA regimens) to reduce the burden of HCV in Iran.