Screening strategies for Hepatitis C Virus elimination in Italy

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BACKGROUND

Hepatitis C virus (HCV) elimination could be achieved in Italy by newly linking 36,400 patients to care and treating 38,000 patients annually by 2025. Cost-effective screening strategies are needed.

METHODS

Markov disease burden model, was populated with Italian data to quantify the annual HCV-infected population by liver disease stage, sex, and age. An economic impact module was added to quantify medical costs (costs of screening, antiviral treatment, including assessment and monitoring, and liver-related complications) and health effects, denominated in quality-adjusted life years (QALYs), associated with HCV infection, as well as the corresponding incremental cost-effectiveness ratio (ICER). Prevalence of asymptomatic HCV infections not yet linked to care was used to calculate the number of HCV antibody screens needed annually to diagnose one case. Modeled outcomes for disease burden, medical costs, and health effects of HCV infection were assessed under the status quo and as well as a scenario to achieve the World Health Organization's (WHO) Global Health Sector Strategy (GHSS) targets for eliminating HCV by 2030 under four screening strategies. The screening strategies included universal or targeted screening by birth cohort: the 1948–78 cohort, the 1958–78 cohort, and graduated birth cohort screening (birth years 1948–1958 beginning in 2020, expanding to 1948–88 gradually by 2026).

Table 1. Direct medical cost and health effect input parameters

	Parameter	Base (Range)	Distribution Type	Reference
Diagnostic and Treatment Costs (€)	Anti-HCV	5 (1–9)	Beta-PERT	Assumption and [5]
	RNA Test/PCR	63.01		Ministero della Salute 2013 (code 91.19.3)
	Genotyping	77.47		Ministero della Salute 2013 (code 91.20.2)
	Fibroscan	50.00		[2, 3]
	Lab costs	50.00		[2, 3]
	Antiviral Treatment	4000		[2, 3]
Healthcare Costs (€)	Fibrotic (F0–F3)	277		[2, 3]
	Comp. Cirrhosis	876		[2, 3]
	DCC	6,626		[2, 3]
	HCC	12,896		[2, 3]
	LTx, first year	73,774		[2, 3]
	LTx, subs years	2,365		[2]
	Death	–		[3]
	Post SVR Monitoring for cirrhotic patients	50.00		Cost of 1 ultrasound
QALY Utility Weights Pre-SVR	Fibrotic (F0–F3)	0.88		[4]
	Comp. Cirrhosis	0.83		[4]
	DCC	0.73		[4]
	HCC	0.53		[4]
	LTx, first year	0.73		[4]
	LTx, subs years	0.73		[4]
	Healthy	1		[4]
QALY Utility Weights Post-SVR	Fibrotic (F0–F3)	1		[4]
	Comp. Cirrhosis	0.83		[4]
	DCC	0.73		[4]
	HCC	0.53		[4]
	LTx, first year	0.73		[4]
	LTx, subs years	0.73		[4]

HCV — hepatitis C virus; RNA — ribonucleic acid; PCR — polymerase chain reaction; comp. cirrhos — compensated cirrhosis; DCC — decompensated cirrhosis; HCC — hepatocellular carcinoma; LTx — liver transplant; LTx, subs years — liver transplant, subsequent years; QALY — quality-adjusted life years; SVR — sustained virologic response

A formal healthcare sector approach was considered, over a time horizon of 2018–2031. This time frame was considered to ensure that all costs associated with achieving the GHSS targets by 2030 would be captured. All future costs and clinical benefits were discounted a rate of 3% per year. Costs were expressed in 2018 euros (€). A cost-effectiveness threshold of €25,000 is commonly accepted in the Italian guidelines , so we interpreted our results according to this threshold.

Input parameters. The study population consisted of the Italian HCV-infected population, with or without a prior HCV diagnosis. Disease burden [1], cost [2, 3] and health-related quality of life measures [4] were obtained from recently published literature. The number of patients treated in 2018 was available through the Agenzia Italiana del Farmaco (AIFA).

Table 2. Scenario inputs, 2017–2031

Status quo	2017	2018	2019	2020	2021	2022	2025+
Treated	45,000	56,400	44,600	33,700	23,200	15,100	15,100
Newly diagnosed/newly linked to care	30,400	30,400	20,000	20,000	20,000	20,000	20,000
Fibrosis score restriction	≥F0	≥F0	≥F0	≥F0	≥F0	≥F0	≥F0
New infections	8,700	7,900	7,000	6,300	5,700	5,300	5,300
Treated ages	15+	15+	15+	15+	15+	15+	15+
SVR	95%	95%	98%	98%	98%	98%	98%
GHSS elimination	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2025+**
Treated	45,000	56,400	44,600	35,700	35,700	36,700	38,000
Incremental newly diagnosed/newly linked to care	–	–	10,400	13,400	13,400	15,400	16,400
Fibrosis score restriction	≥F0	≥F0	≥F0	≥F0	≥F0	≥F0	≥F0
New infections	8,700	7,900	7,000	6,300	6,300	5,200	3,600
Treated ages	15+	15+	15+	15+	15+	15+	15+
SVR	95%	95%	95%	95%	95%	98%	98%

SVR — sustained virologic response; GHSS — Global Health Sector Strategy

Table 3. Screening scenario inputs, 2018–2031

GHSS elimination	<2020	2020-2021	2022-2023	2024-2025	2026-2027
Screening 1948–1978	Risk	1948–1978	1948–1978	1948–1978	1948–1978
Screening 1958–1978	Risk	1958–1978	1958–1978	1958–1978	1958–1978
Graduated Screening	Risk	1948–1958	1948–1968	1948–1978	1948–1988
Universal Screening	Risk	All ages	All ages	All ages	All ages

GHSS — Global Health Sector Strategy; Risk — risk-based screening assumes that those offered a test are approximately 5 times more likely to be infected than the general population

Table 4. Direct costs and health effects, by scenario, 2018–2031

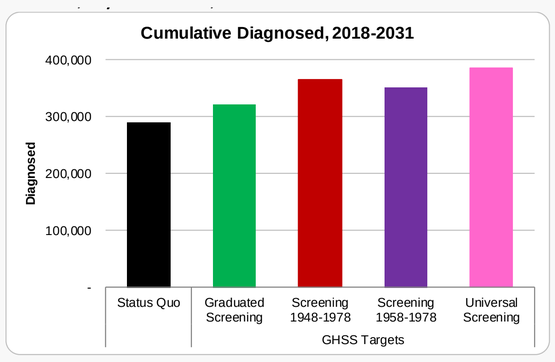
Scenario		Cost (EUR Millions) 2018–2031	QALYs Gained 2018–2031	ICER (EUR/QALY) Relative to Status quo	ICER (EUR/QALY) Relative to prior scenario
Status quo		5,458	–	–	–
GHSS Targets	Graduated Screening	5,846	141,000	2,755	2,755
	Screening 1948-1978	5,939	137,000	3,523	**
	Screening 1958-1978	5,966	123,000	4,136	**
	Universal Screening	6,095	140,000	4,559	**

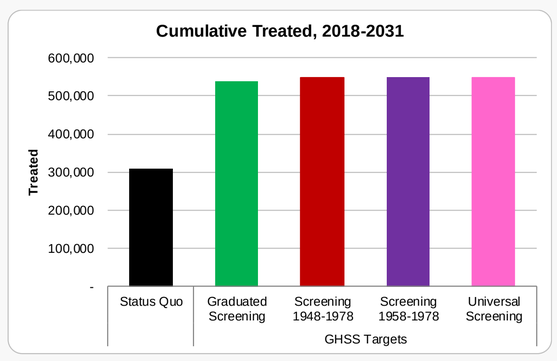
Values have been rounded, so ICERs may not be reproducible using table values

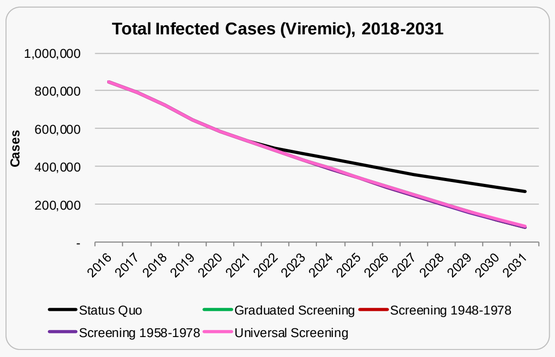
***Strongly dominated (costs more, yields less)*

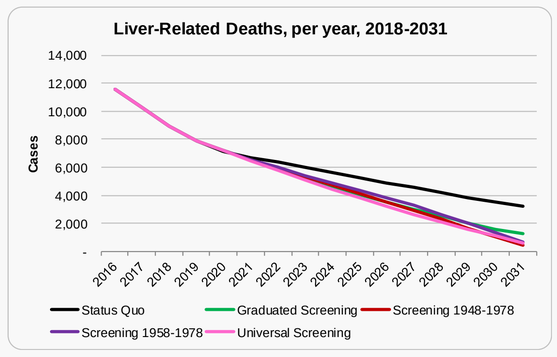
RESULTS

Figure 1. Cumulative diagnosed and treated patients as well as modelled viremic cases and liver-related deaths, by scenario, 2018-2031





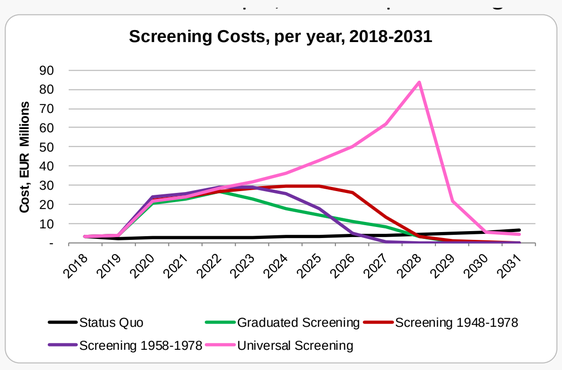


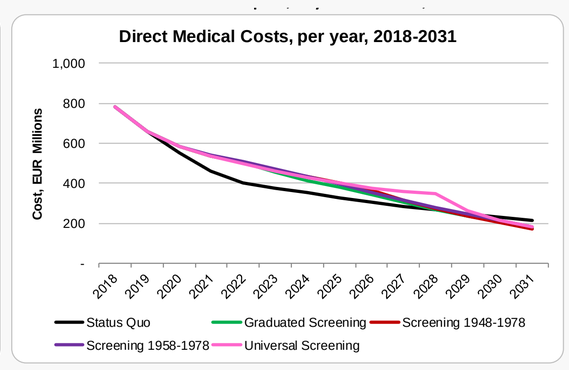


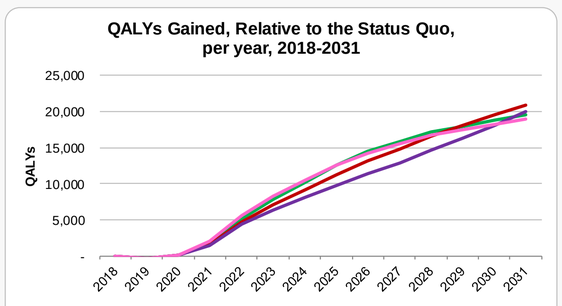
All screening scenarios were found to be highly cost-effective (ICER of less than €5,000 per QALY gained) compared with the status quo.

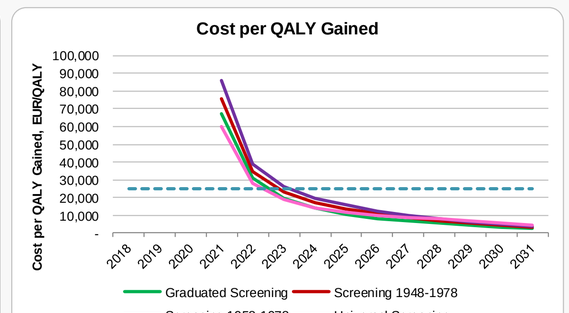
The graduated screening scenario was the least costly, with €5.8 billion in total medical costs by 2031. This was €92.7 million less than screening in the 1948–78 birth cohort, €119.7 million less than screening in the 1958–78 birth cohort, and €248.7 million less than universal screening. Graduated screening would gain approximately 141,000 QALYs by 2031, compared to 140,000, 137,000, and 123,000 QALYs for the universal, 1948–78 birth cohort and 1958–78 birth cohort, respectively.

Figure 2. Economic impact of scenarios as measured by screening costs, direct medical costs, QALYs gained relative to the status quo, and cost per QALY gained relative to the status quo, by scenario 2018-2031









CONCLUSION

In Italy, implementing graduated screening, beginning with the 1948-1958 cohort in 2020, was the most cost-effective option, and showed the greatest reductions in overall disease burden by 2030. This strategy should be considered to sustain Italy's momentum towards achieving HCV elimination goals.

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