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Introduction

Hepatitis B virus (HBV) infection is a major public health problem worldwide, which can lead to substantial morbidity and mortality[1, 2]. China has made significant progress in reducing HBV infection rates over the past 30 years, transitioning from a high-prevalence to an intermediate-prevalence region[3]. Despite significant advancements, China faces considerable challenges in reducing HBV-related mortality. To address the issue, Huazhou City in Guangdong launched a comprehensive HBV and HCC screening and management program in January 2022 (i.e. "the screening program"). This study used real-world data from the Huazhou screening program to evaluate the economic benefits of mass HBV and HCC screening and management from a societal perspective.

Objectives

China faces considerable challenges in reducing hepatitis B virus (HBV)-related mortality. This study aimed to evaluate the economic benefits of a comprehensive screening and disease management program conducted in Huazhou City in China (i.e. "the screening program"), which included mass HBV screening for the general population and subsequent HBV management and hepatocellular carcinoma (HCC) screening for HBV patients.

Methods

A decision-tree Markov model was developed to compare the cost-effectiveness of the screening program compared to the status quo in Huazhou city. The screening program initially offered a rapid HBsAg screening test to 104,112 individuals aged 20 to 70 years. Individuals with a positive rapid test result (8,903 individuals) were invited back for a confirmatory five-test panel. Out of the 7,100 individuals who underwent further testing, 6,623 were diagnosed with HBV infection (Fig 1).
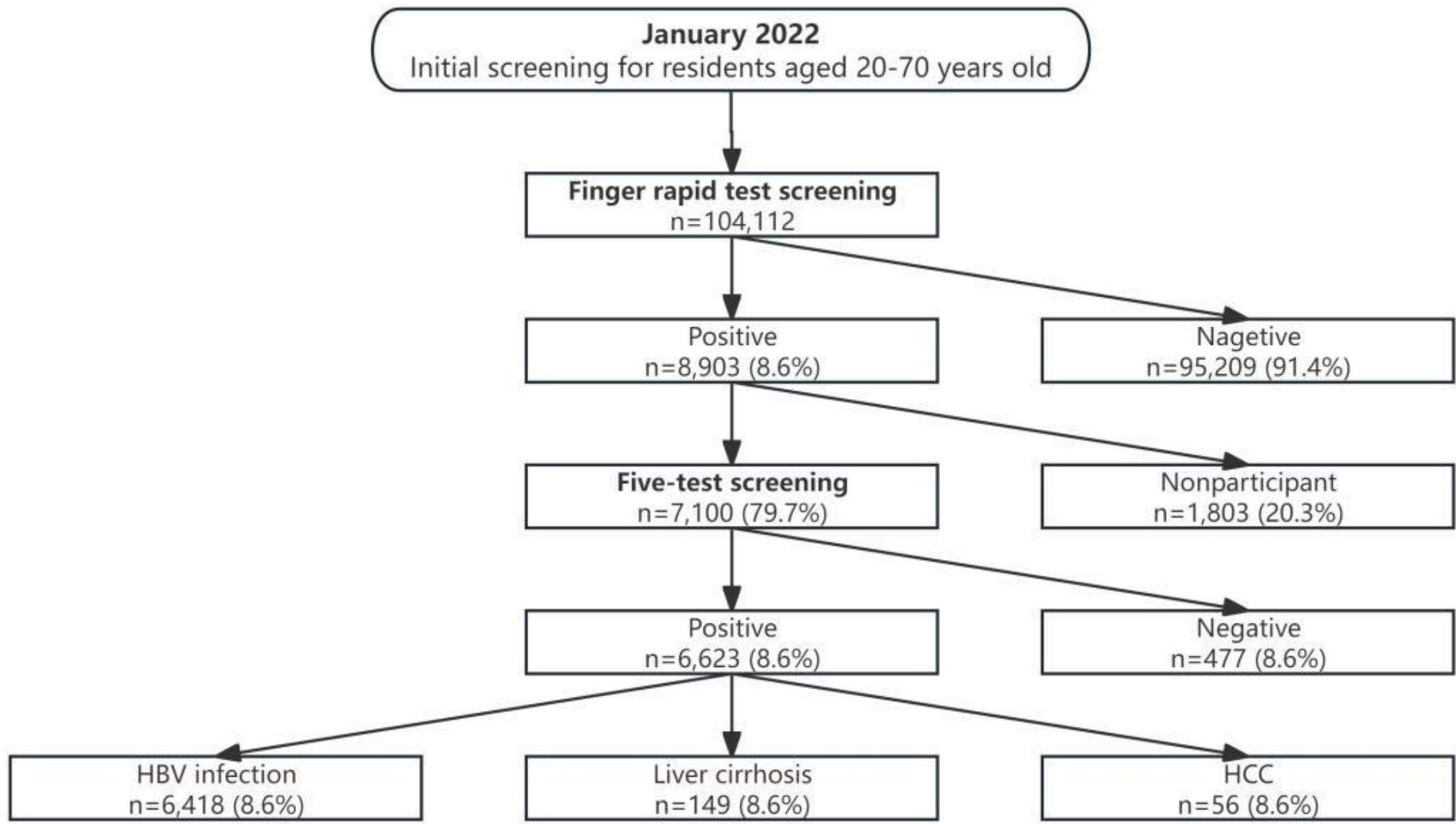

Fig 1. Screening flow chart

The decision tree model simulated the initial HBV screening process (Fig 2), establishing the initial cohort for the Markov model (Fig 3). The Markov model simulated HBV disease progression through ten states. We evaluated from a healthcare system perspective over a lifetime horizon with a 3% discounting rate. Disease progression parameters, costs, and utilities were sourced from published literature and real-world data from the screening program.
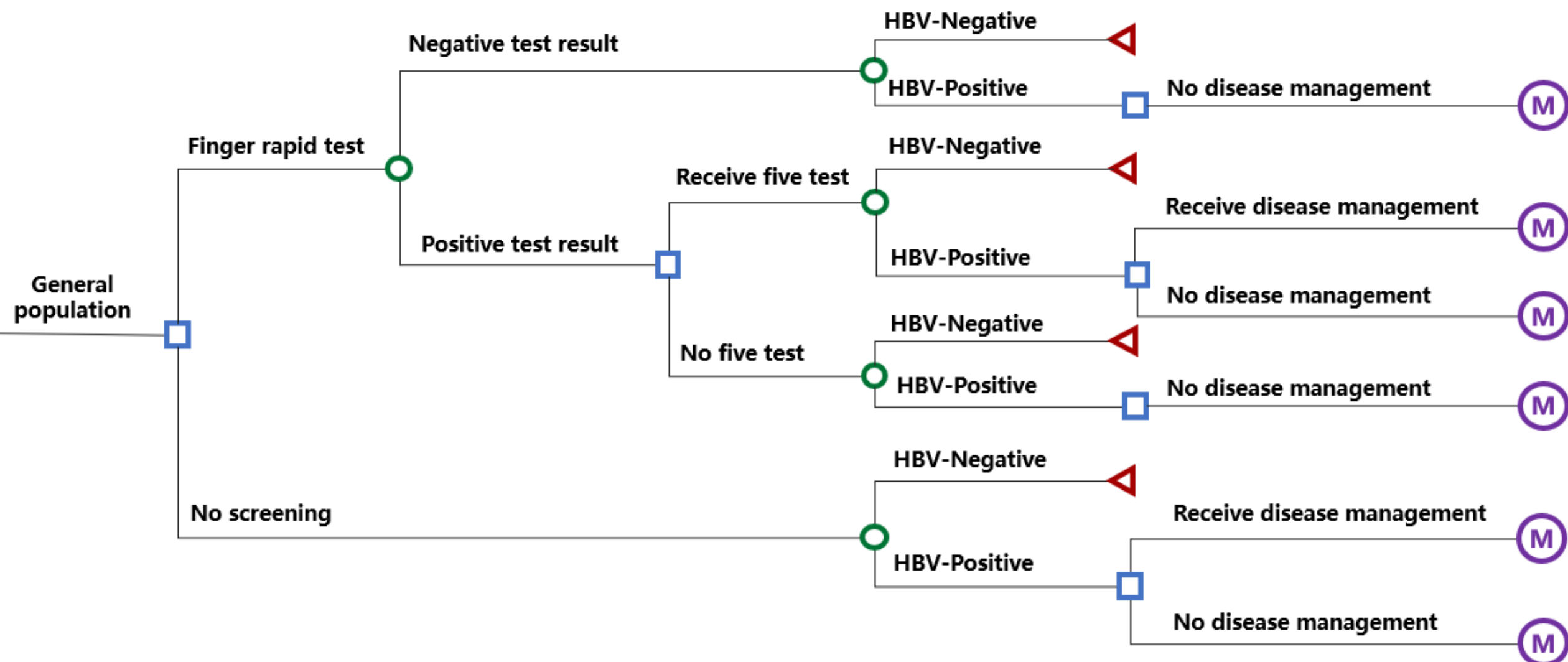

Fig 2. Decision tree model structure

References

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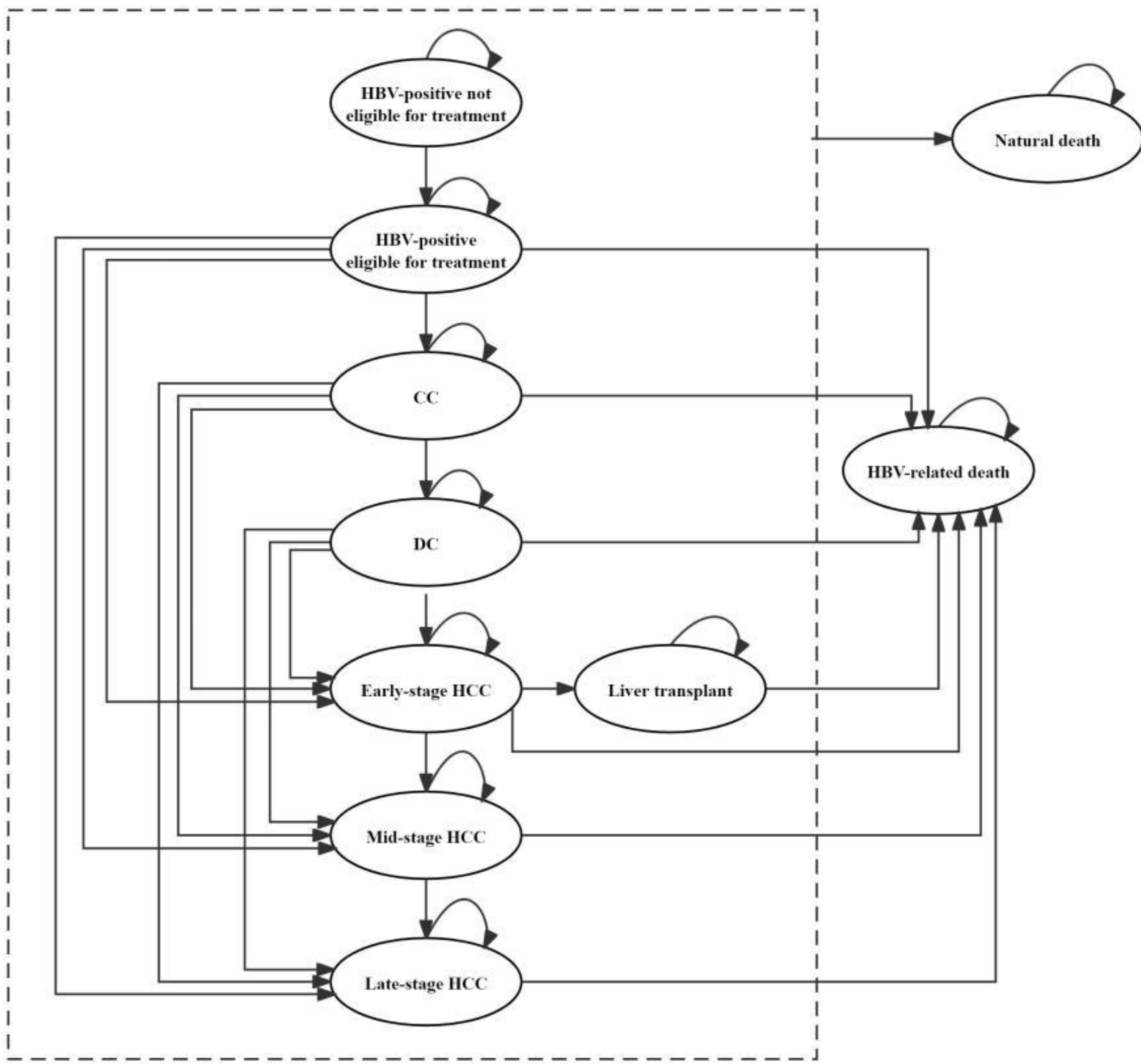
Methods

Fig 3. Markov model   structure

Conclusion

The screening program reduced the number of HBV-related deaths from 1,950.65 (21.14% mortality rate) to 1,836.40 (19.90% mortality rate), a reduction of 114.24 deaths. The program increased the number of QALYs from 166,762.71 to 167,580.64, an improvement of 817.93 QALYs, with an additional cost of 39.92 million CNY (from 232.49 million CNY to 269.28 million CNY). The incremental cost-effectiveness ratio (ICER) was 44,983.68 CNY/QALY, which is below the per capita GDP of China in 2023 (89,358 CNY).

The initial costs for the screening program included 3.18 million CNY for various tests and 0.70 million CNY for labor, resulting in a total initial screening cost of 3.88 million CNY.

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Table 2. Base case results

	Status quo	Screening program	Increment
Cost effects			
Total costs (million CNY)	2146.54	2106.61	-39.92
Direct costs (million CNY)	232.49	269.28	36.79
Indirect costs (million CNY)	1914.05	1837.33	-76.71
Health effects			
QALY	166762.71	167580.64	817.93
Life years	351493.44	353870.99	2377.55
HBV-related deaths (n)	1950.65	1836.40	-114.24
HCC occurrence (n)	962.45	912.44	-50.01
ICER			
Total costs ICER			-48807.48
Direct costs ICER			44983.68

Conclusion

The implementation of the screening program significantly reduced long-term HBV-related mortality and was cost-effective compared to the status quo in Huazhou City.

According to our results, it is cost effective to establish a comprehensive pathway from HBV screening to end-stage liver disease management, ensuring timely detection and appropriate treatment of disease progression. The strategy should be tailored to the regional prevalence and specific circumstances of HBV.