

Epidemiology and Health Care Planning: Estimating the Burden of Hepatitis C in Canada

Zou S, El Saadany S, Forrester L, Zaniewski G, Shi Y, Giulivi A
Health Care Acquired Infections Division, Centre for Infectious Disease Prevention & Control

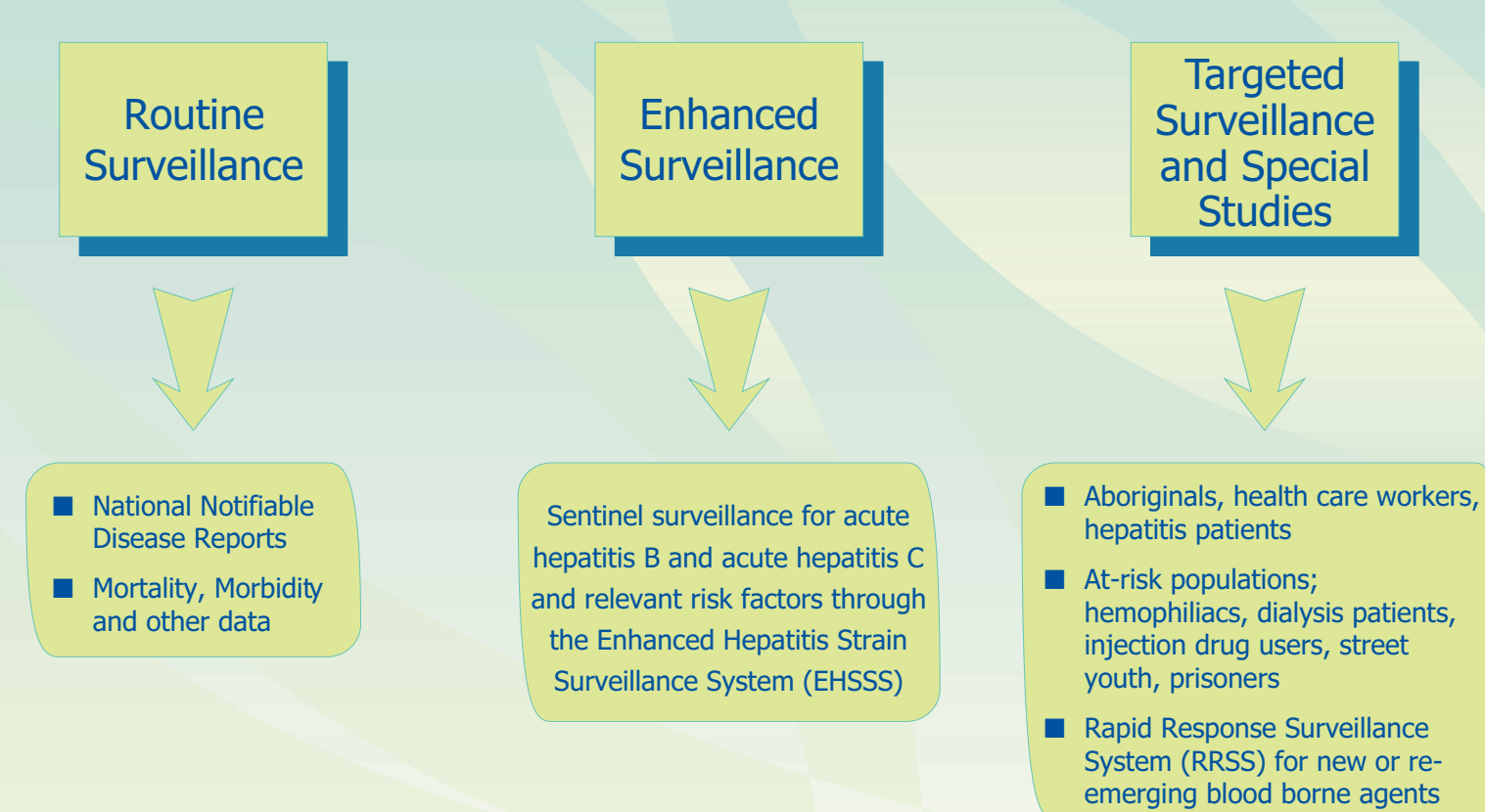
INTRODUCTION

- Identification or emergence of an infectious disease calls for determination of its burden to help guide health care planning
- Lack of adequate information hampers any such effort
- Various efforts have been made to estimate the burden of hepatitis C in Canada since the identification of the disease

Objectives

- Current and future burden of hepatitis C was estimated to support decision-making in Canada
 - ▶ for prevention and control of the disease and
 - ▶ for planning of health-care services in Canada

Sources of Data



ESTIMATING AND PREDICTING

- **Estimating hepatitis C incidence in Canada**
 - ◆ Collection of epidemiological data of hepatitis C in Canada
 - ◆ Collection of relevant laboratory, clinical, epidemiological and natural history data about hepatitis C
 - ◆ Assumption formulation, simulation and estimation
- **Prediction of hepatitis C burden in Canada**
 - ◆ Collection of all of the above data on hepatitis C
 - ◆ Collection of disease progression data
 - ◆ Simulation by using an established hepatitis C model
 - ◆ Verification, validation and consultation
 - ◆ Communication

ESTIMATING THE INCIDENCE OF HEPATITIS C VIRUS INFECTION IN CANADA

Methods

Extrapolation based on data of acute hepatitis C cases from the enhanced sentinel site surveillance

- The enhanced surveillance provides national incidence estimates of clinically recognized acute hepatitis C cases in Canada.
- Information about the proportion of asymptomatic HCV infections and about the extent of under-reporting of HCV infections were obtained from literature search.
- Scenario analysis with Monte Carlo simulation has been used to accommodate the uncertainty inherent to the extrapolation.

Estimation according to exposure categories

- The method was adopted from Dr. Robert Remis' report on HCV-HIV coinfection in Canada.
- It is estimated that there are 75,000-125,000 injection drug users in Canada.

- According to the enhanced surveillance and other studies, approximately two-thirds of HCV infections are associated with injection drug use.
- Available data indicated that about 90% of current injection drug users are already infected with HCV.
- Further, among anti-HCV negative injection drug users, the annual seroconversion rate is approximately 27 per 100 person years.
- Scenario analysis with Monte Carlo simulation was used to accommodate the uncertainty inherent to the extrapolation.

Estimation based on national anti-HCV prevalence

- It was estimated in 1998 that 240,000 Canadians had evidence of HCV infection, namely, anti-HCV positivity.
- Assuming that the current anti-HCV prevalence remains the same in this country.
- Applying proposed incidence rates of HCV infection to the Canadian population each year, taking into consideration variations in incidence over time and among age groups.
- Simulated HCV infected individuals were then subjected to standard mortality rates for different age groups.

- The number of prevalent anti-HCV positives was determined for year 2001.
- The incidences used in simulation were modified as needed to arrive at a simulated current anti-HCV prevalence of approximately 240,000.
- The incidences were taken as national estimates of HCV incidence rates.

Results and Discussion

- **The overall incidence of HCV in Canada was estimated at 3,000-7,000, or approximately 10-20 per 100,000.**

- Limitations: any significant variation of the assumptions from the actual data of HCV infection will impact on the accuracy of the incidence estimates
- More data will become available and will help refine the estimating process and results

PREDICTION OF HEPATITIS C BURDEN IN CANADA

Methods

- Based on prevalence estimate of hepatitis C infections in the Canadian population
- Determined the possible time of exposure for those infected persons
- Applied natural history of the disease and progression probabilities to each of different stages
- Calculated expected numbers of cases who would be at different stages of the disease in the years to come (for 10 years)

Determination of time of hepatitis C infection for the 192,000 cases

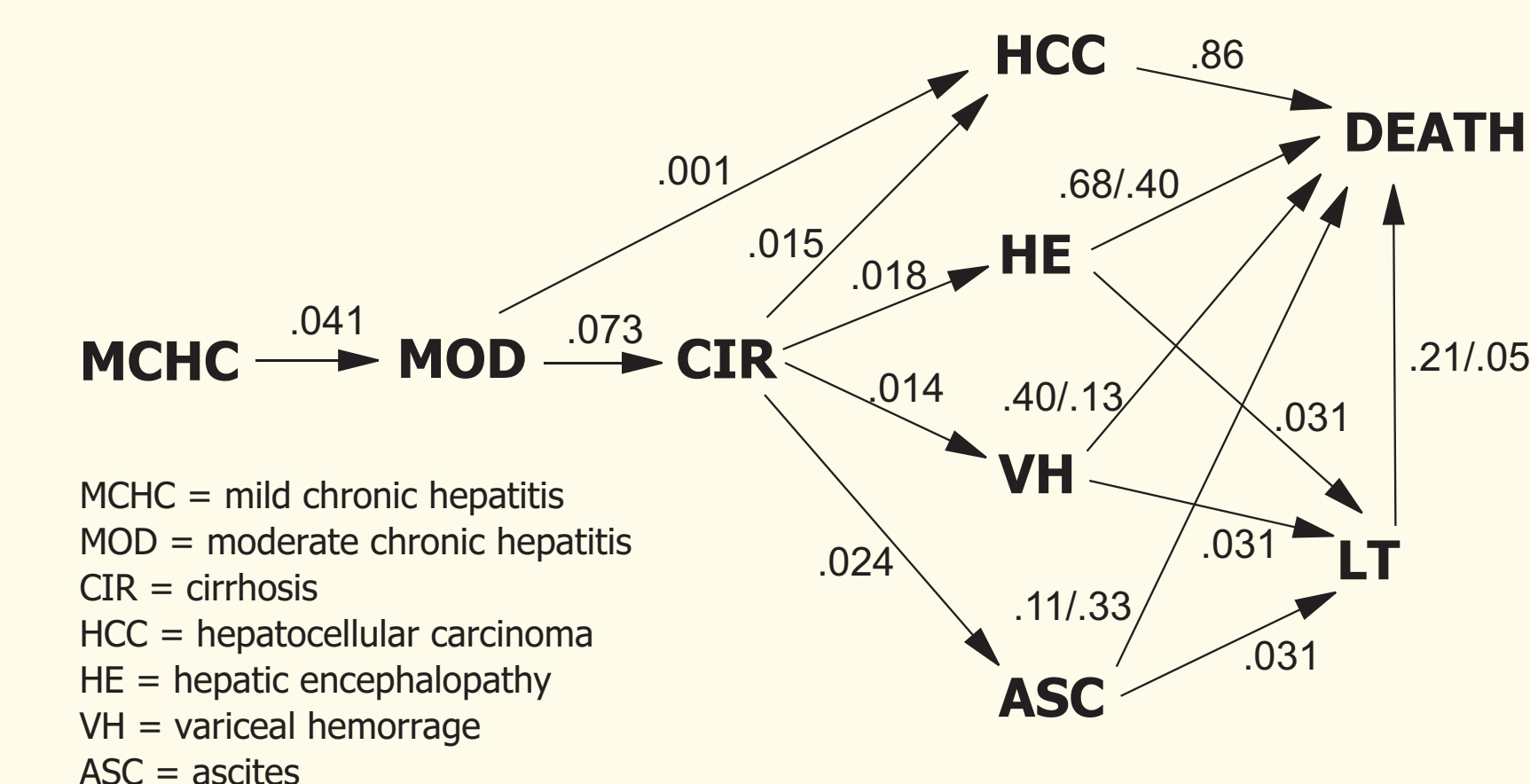
Age group	Age distribution (%)	Mean age	No. of cases	Time of exposure	Age of infection
0-19	3.5	10	6,651	Recent	10
20-29	12.5	26	23,978	Recent	26
30-39	35.6	35	68,259	5 yrs ago	30
40-59	43.1	46	82,786	16 yrs ago	30
60+	5.4	70	10,326	20 yrs ago	50
Total	100.0	40	192,000		

According to data from an enhanced surveillance project in four health regions in Canada, 1998-1999.

Results and Discussion

- **Chronic liver diseases associated with hepatitis C and the need for care of those patients and for liver transplantation will likely double or triple in the years ahead**
- Consistent with other data/studies: mortality data, liver transplant data, and a US study
- Limitations: preliminary, no hepatitis C incident cases included in simulation, and no treatment effort incorporated.

Key Annual Progression Probabilities



Analysis of Hepatitis C Mortality

Trends of Hepatitis C Mortality in Canada, 1979-1997

- Mortality data from 1979 to 1997 from Statistics Canada analyzed for temporal trends and burden of illness
- NANBH (mostly Hepatitis C) mortality increased over time but decreased for hepatitis B since 1995
- Mortality consistently higher in males
- Approx. 1000 deaths were estimated to have been caused by hepatitis C annually in Canada

SUMMARY AND CONCLUSION

Summary

- Approximately 1000 deaths could be caused by hepatitis C annually in Canada
- Approximately 3000-7000 new HCV infections are estimated to occur each year in Canada
- Number of hepatitis C-associated chronic hepatitis, cirrhosis, liver failure, liver death and the need for liver transplants will likely double or triple in the next decade

Implication: Health Care Planning

- Hepatitis C is an important health threat to Canadians
- Prevention and control of hepatitis C should be a priority of levels of governments
- The need for care and support for hepatitis C infected and affected should be incorporated into planning for future health care services in this country:
 - ◆ Education and Training
 - ◆ General care and specific treatments
 - ◆ Special needs such as for liver transplants

Conclusion

- Epidemiology supports health-care planning and will continue to guide decision-making for prevention and control of hepatitis C and for care of Canadians who are infected with or affected by the disease