

Estimation of burden of disease -
Sharps injuries in health-care workers

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Estimation of disease burden

- It is the **quantification** of health impacts caused by various environmental risk factors at **population level**, using a comparative framework, definitions and outcome measures
- In 2000-2005, WHO has estimated the disease burden of **25 risk factors to health** (including unsafe injections)
- Purpose: To **raise awareness** on the size of the problem, and to estimate potential of interventions



The model

- **Why a model:** because little data on prevalence and other risks in HCW at global level

Basis of the model: Probability of infection after sharps injury:

$$P = p_v * p_t * p_s$$

- P_v = prevalence of active infection in patients
- P_t = Probability of infection after percutaneous injury
- P_s = Proportion of HCW susceptible to infection

Probability of at least 1 infection/year = Incidence (infection):

$$I_n = 1 - (1 - p)^n \quad (= \text{probability of at least one "success"})$$



Calculated outcome

In terms of

- Incidence of HBV, HCV and HIV due to sharps in health-care workers
- Attributable fraction (values in HCW):

$$AF(occ) = \frac{\text{Incidence (occ)}}{\text{Incidence (occ) + incidence (other causes)}}$$



Additional model details

- Model for 14 regions of the world
- 4 age groups in working age (15-69 years)
- Gender

Difficulties:

- Susceptibility changes with age, and different in GP and HCW
- Poor data on HBV vaccination coverage
- Poor data in certain regions on needlestick injuries
- Prevalence of active infection not always the same in GP and patients



Estimation of number of deaths – assumptions

HBV

- Progression to chronic infection of 6% for adults (McMahon et al. 1985)
- Annual clearance of infection of 1% following chronic infection (Alward et al. 1985)
- Age-dependant mortality according to African and Asian Studies (Gay et al. 2001)

HCV

- Rate of progression to chronic infection of 63% before age 40, and 80% after age 40 (Alter and Seeff 2000)
- Cumulated incidence rate of cirrhosis of 5% (20% after age 40) at 20 years among patients with chronic infection (Alter and Seeff 2000, Freedman 2001)
- Yearly mortality rate associated with hepatocellular carcinoma and chronic liver disease of 2.7% after onset of cirrhosis (Alter and Seeff 2000)



Uncertainties

Uncertainties are reflected in the lower and upper boundaries

Main uncertainties:

- Annual incidence of sharps injuries
- HBV immunization coverage
- Prevalence among hospital populations
 - (factor 3.4 for HCV, 1.9 for HBV, 5.9 for HIV)



Input data

(with focus on industrialized regions)

	Amr A	Eur A	World	Sear D
Number of HCW	7 mio	6 mio	35 mio	1.4 mio
Prop. of HCW in GP	2.5%	1.4%	0.6%	0.11%
Annual number of sharps injuries	0.18	0.64	0.18 - 4.7	2.3
HCW exp. to contam. sharp (thousands)	22 HCV 7 HBV 8 HIV	16 HCV 43 HBV 9 HIV	900 HCV 2 100 HBV 327 HIV	57 HCV 109 HBV 23 HIV
Proportion exp. to contam. sharps	< 0.4%	< 1.1%	< 9%	< 14%



Input data (with focus on industrialized regions)

	Amr A	Eur A	World	Sear D
% immunization HBV in HCW	67%	71%	18 - 77%	39%?

Assumed **risk of transmission** after percutaneous exposure:

- 0.3% for HIV, 18% for HBV, 1.8% for HCV

Assumed **PEP efficacies**:

- 90% for HBV, 81% for HIV



Results, for the year 2000

	Amr A	Eur A	Global
Infections attributable to occ., HCV	390 (240-1800)	290 (100-2600)	16 400 (5900-86000)
HBV	40	210	65 000 (2400-240000)
HIV	5	6	1000 (200-5000)
HBV without PEP	400	2100	
AF in HCW for HCV and HBV	8 and 1%	25 and 8%	39 and 37%

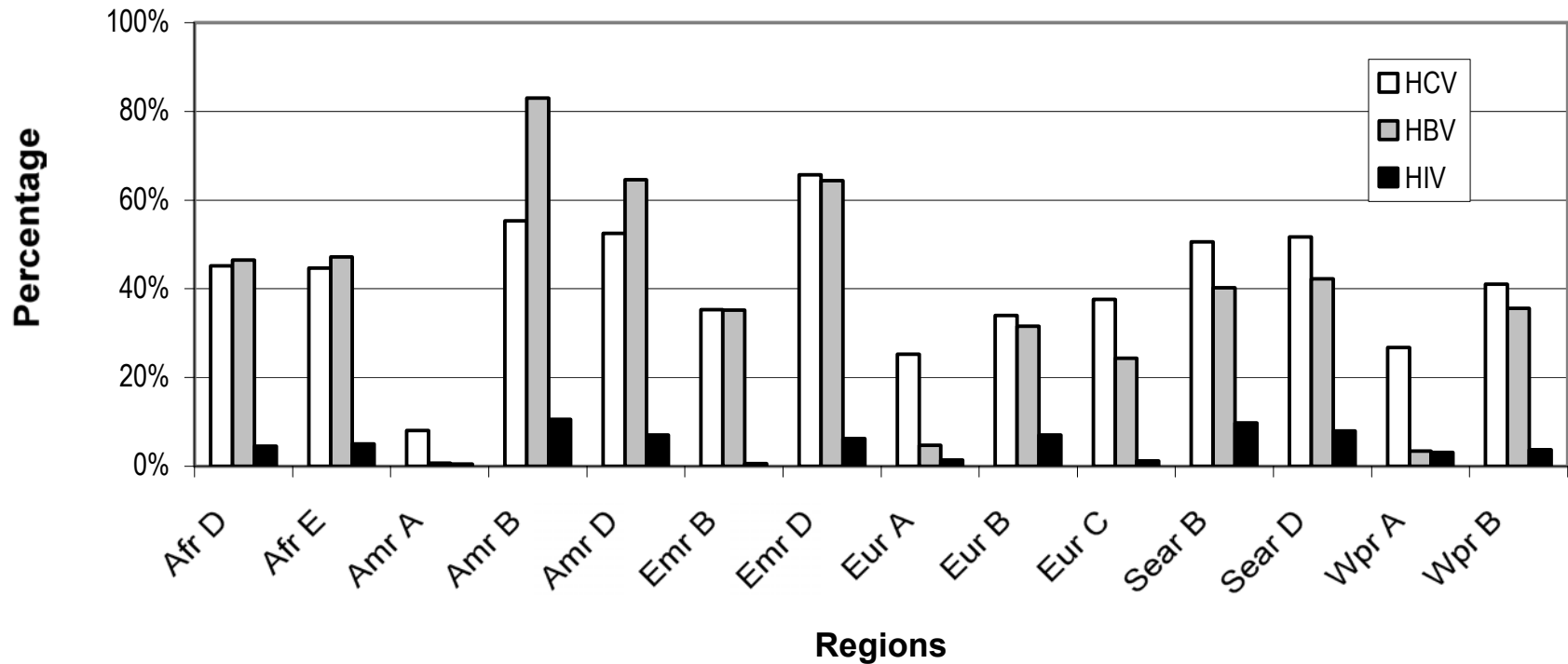


Results, for the year 2000

	Amr A	Eur A	Global
Deaths, HCV	6 (4-27)	4 (1-23)	145 (53-766)
Deaths, HBV	0 (0-1)	1 (0-3)	261 (86-923)
Deaths, HIV	3 (1-14)	4 (1-18)	736 (129-3578)



Results – attributable fractions in HCW



Conclusions

- Globally, relatively small burden, however:
- Important burden in the specific occupational groups of concern
- All of this burden is preventable
- Over a couple of years, a very large proportion of health-care workers gets exposed
- This burden concerns those who provide health-care for others and thus affects the health-care system in regions where this problem is important

