The Global Burden of Viral Hepatitis

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Declaration of Interest

I receive no funding of any kind from any pharmaceutical or other for-profit health-care-related company

Global prevalence of HBV and HCV

Schweizer 2015

HBsAg prevalence est.

3.61% (3.61-3.61%) –

248 million people living with HBV

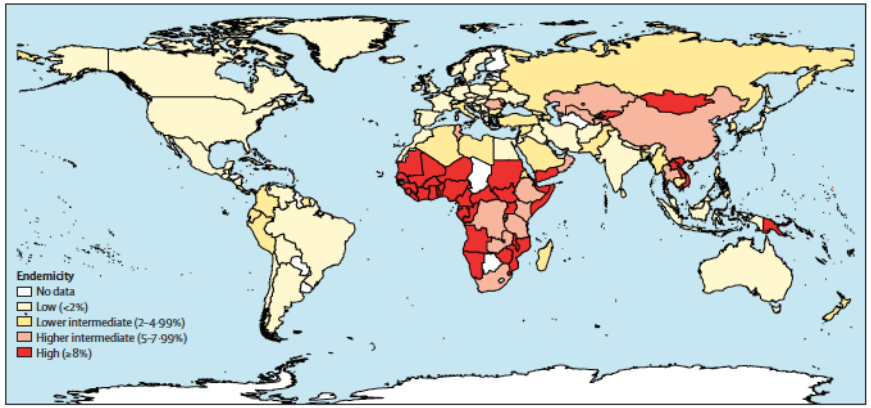
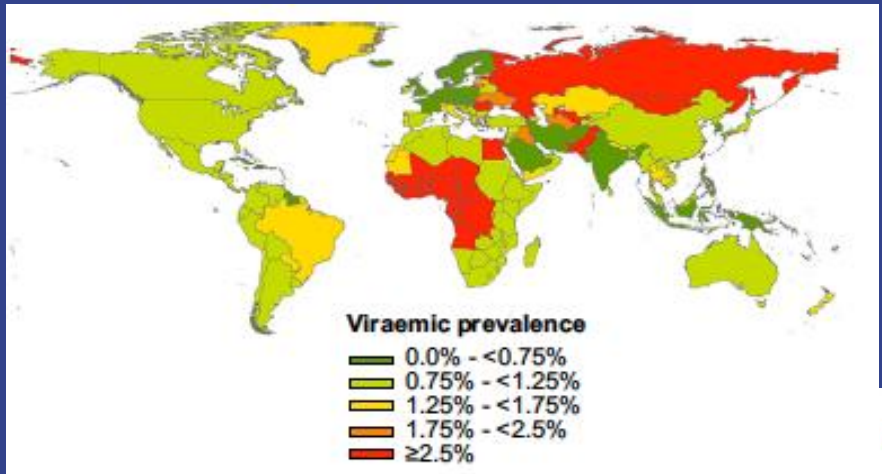


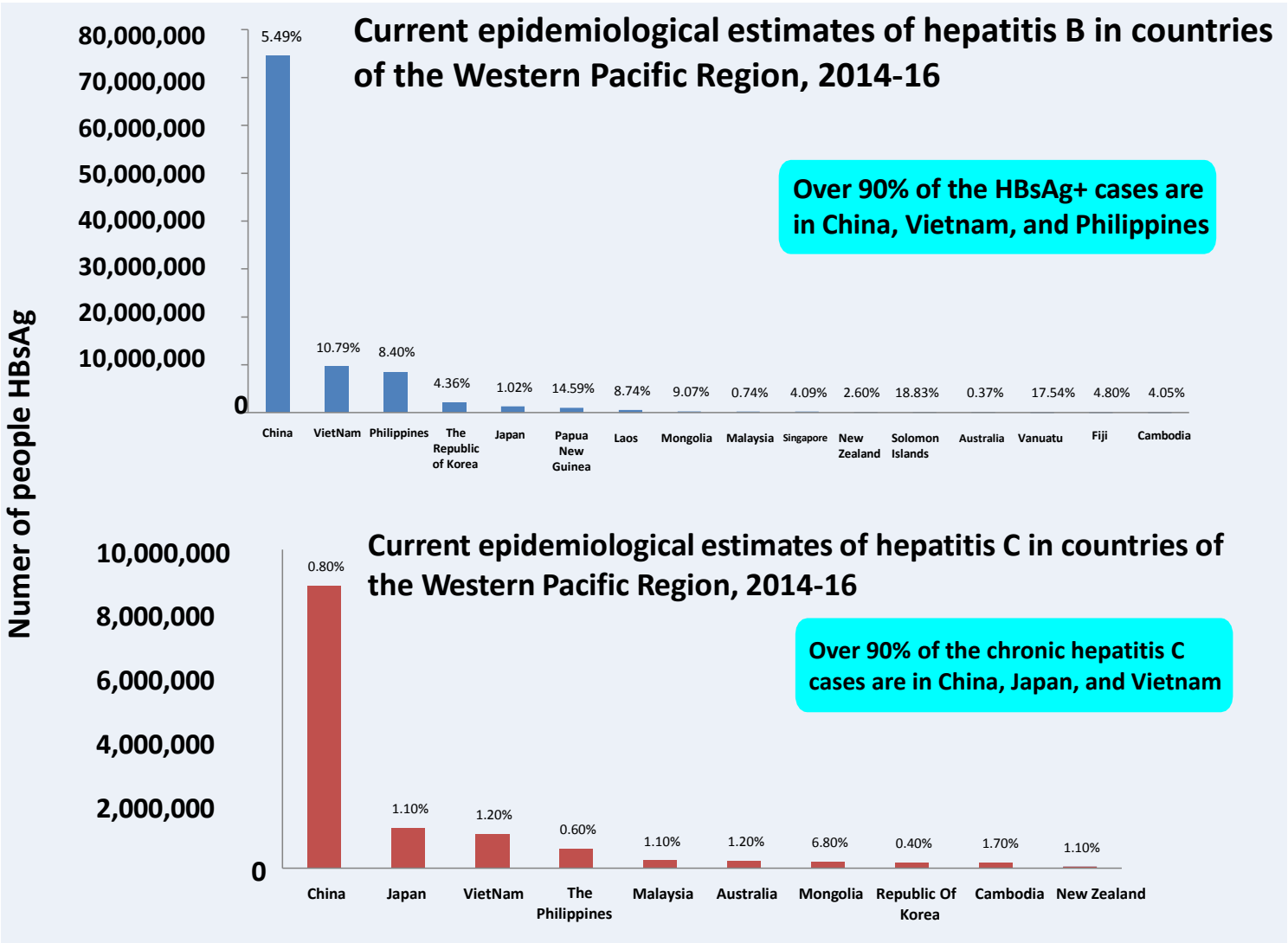
Figure 2: Global HBsAg endemicity (1957–2013)

Gower 2014

HCV viraemic prevalence est. 1.1% (0.9-1.4%) –

80 million people living with HCV





Source: Gower et al 2014, Schweitzer et al 2015, CDA/WHO

Global Burden of Disease Study 2013

www.healthmetricsandevaluation.org/gbd

About GBD

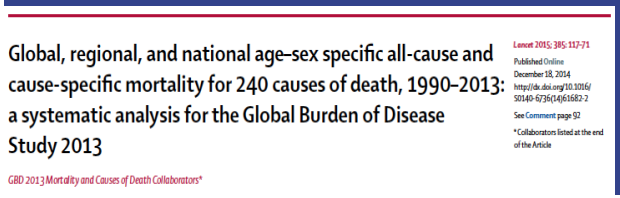
IHME
Institute for Health Metrics and Evaluation

- **HIV/AIDS: 1.3 million** deaths 2013, falling since 2005 (1.7m)
- **TB: 1.4 million** deaths in 2013 (1.3m in HIV -); falling since 1990, incidence and prevalence falling since 2000
- **Malaria: 855,000** deaths in 2013; falling since 2004

Global Fund to fight AIDS, TB and Malaria

- **Viral hepatitis: 1.45 million** deaths in 2013, steadily increasing (895,000 in 1990)

Murray 2014, GBD Collaborators 2015, Stanaway 2016



Global, regional, and national age–sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013

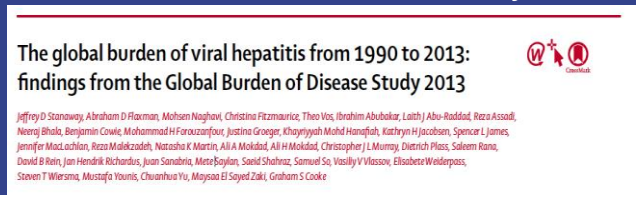
GBD 2013 Mortality and Causes of Death Collaborators*

Lancet 2015; 385: 117-71

Published Online December 18, 2014 http://dx.doi.org/10.1016/S0140-6736(14)61682-2

See Comment page 92

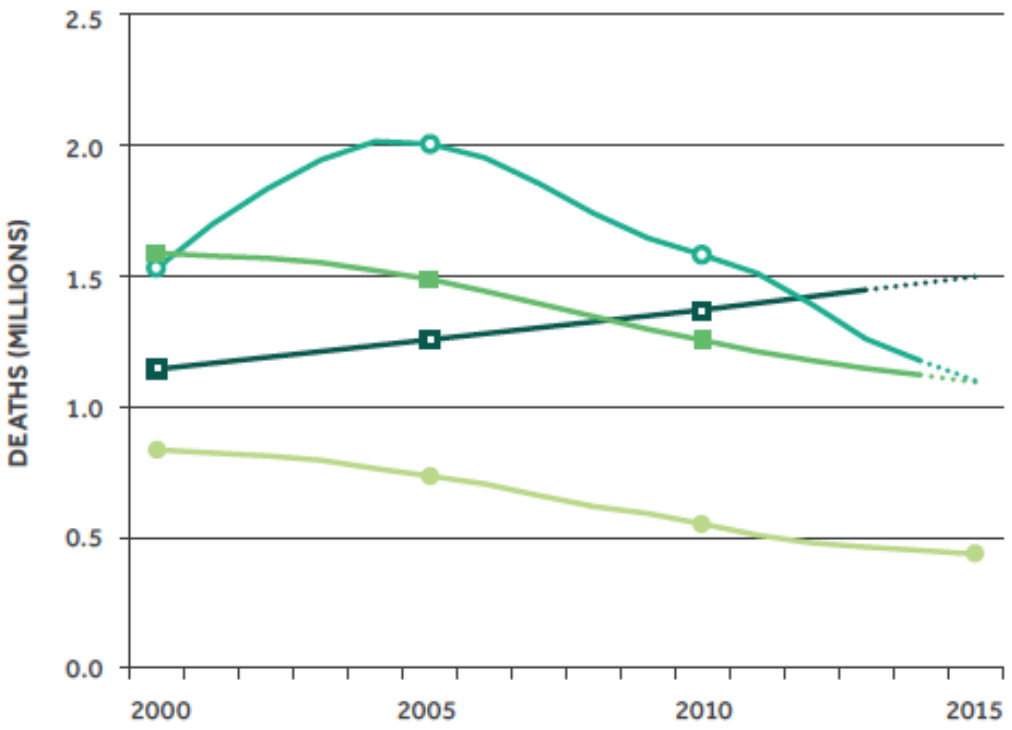
* Collaborators listed at the end of the Article

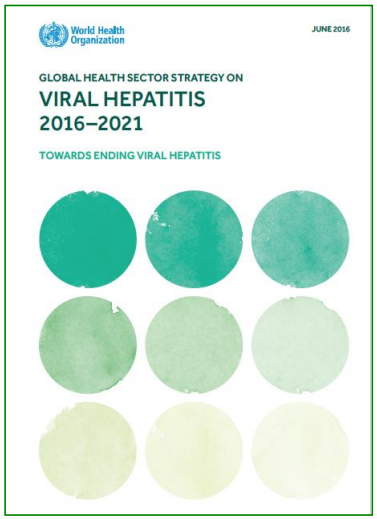


The global burden of viral hepatitis from 1990 to 2013: findings from the Global Burden of Disease Study 2013

Jeffrey D Stanaway, Abraham D Flaxman, Mohsen Naghavi, Christina Fitzmaurice, Theo Vos, Ibrahim Abubakar, Laith J Abu-Raddad, Reza Assadi, Neeraj Bhala, Benjamin Cowie, Mohammad H Forouzanfour, Justina Groeger, Khayriyyah Mohd Hanafiah, Kathryn H Jacobsen, Spencer L James, Jennifer MacLachlan, Reza Malekzadeh, Natasha K Martin, Ali A Mokdad, Ali H Mokdad, Christopher J L Murray, Dietrich Plass, Saleem Rana, David B Rein, Jan Hendrik Richardus, Juan Sanabria, Mete Saylan, Saeid Shahraz, Samuel So, Vasiliy V Vlassov, Elisabete Weiderpass, Steven T Wiersma, Mustafa Younis, Chuanhua Yu, Maysaa El Sayed Zaki, Graham S Cooke

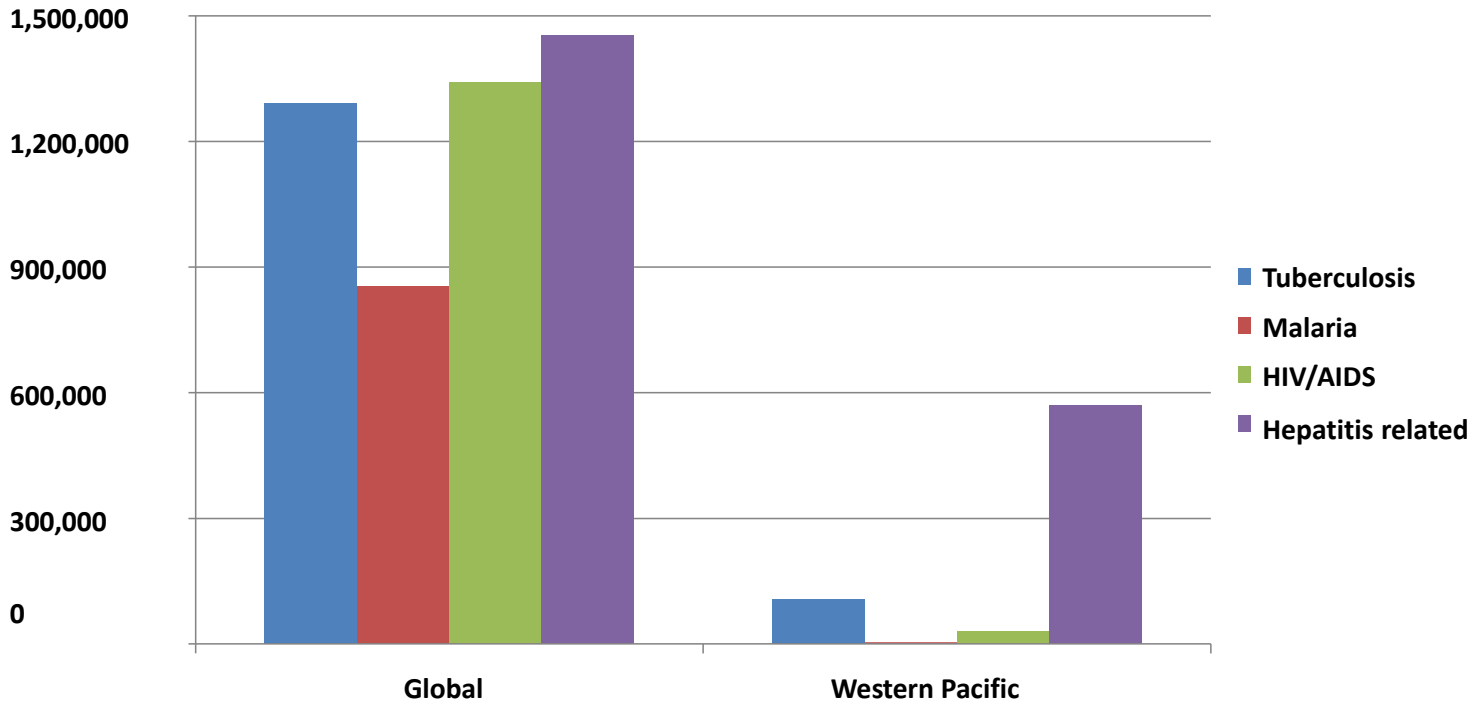
Figure 2. Estimated global number of deaths due to viral hepatitis, HIV, malaria and TB, 2000–2015





Source: Global Burden of Disease and WHO/UNAIDS estimates, see http://ihmeuw.org/3pms, http://ihmeuw.org/3pmt (accessed 2 April 2016).

Comparison of Global and Western Pacific Mortality by Major Communicable Diseases, 2013*



*GBD 2013 Mortality and Causes of Death Collaborators. Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2015 Jan 10;385(9963):117-71.

Global Burden of Cancer 2013

Special Communication

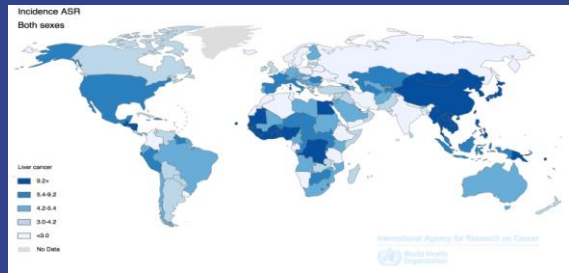
The Global Burden of Cancer 2013

Global Burden of Disease Cancer Collaboration

JAMA Oncol. 2015;1(4):505-527. doi:10.1001/jamaoncol.2015.0735

Published online May 28, 2015. Corrected on July 20, 2015.

- Liver cancer 3rd most common cause of cancer deaths globally; 2nd highest years of life lost
- Estimated 10% of all human cancer deaths were due to liver cancer
- Poor access to effective treatments in both developing and developed countries
  - ASIR (/100,000) 14.7 developing, 7.4 developed
  - ASDR (/100,000) 15.6 developing, 7.3 developed



Leading causes of mortality and trends, 1990 - 2013

The global burden of viral hepatitis from 1990 to 2013: findings from the Global Burden of Disease Study 2013

Jeffrey D Stanaway, Abraham D Flaxman, Mohsen Naghavi, Christina Fitzmaurice, Theo Vos, Ibrahim Abubakar, Laith J Abu-Raddad, Reza Assadi, Neeraj Bhala, Benjamin Cowie, Mohammad H Forouzanfour, Justina Groeger, Khayriyyah Mohd Hanafiah, Kathryn H Jacobsen, Spencer L James, Jennifer MacLachlan, Reza Malekzadeh, Natasha K Martin, Ali A Mokdad, Ali H Mokdad, Christopher J L Murray, Dietrich Plass, Saleem Rana, David B Rein, Jan Hendrik Richardus, Juan Sanabria, Mete Saylan, Saeid Shahraz, Samuel So, Vasilly V Vlassov, Ellsabete Weiderpass, Steven T Wiersma, Mustafa Younis, Chuanhua Yu, Maysaa El Sayed Zaki, Graham S Cooke

Summary

Background With recent improvements in vaccines and treatments against viral hepatitis, an improved understanding of the burden of viral hepatitis is needed to inform global intervention strategies. We used data from the Global Burden of Disease (GBD) Study to estimate morbidity and mortality for acute viral hepatitis, and for cirrhosis and liver cancer caused by viral hepatitis, by age, sex, and country from 1990 to 2013.

Methods We estimated mortality using natural history models for acute hepatitis infections and GBD's cause-of-death ensemble model for cirrhosis and liver cancer. We used meta-regression to estimate total cirrhosis and total liver cancer prevalence, as well as the proportion of cirrhosis and liver cancer attributable to each cause. We then estimated cause-specific prevalence as the product of the total prevalence and the proportion attributable to a specific cause. Disability-adjusted life-years (DALYs) were calculated as the sum of years of life lost (YLLs) and years lived with disability (YLDs).

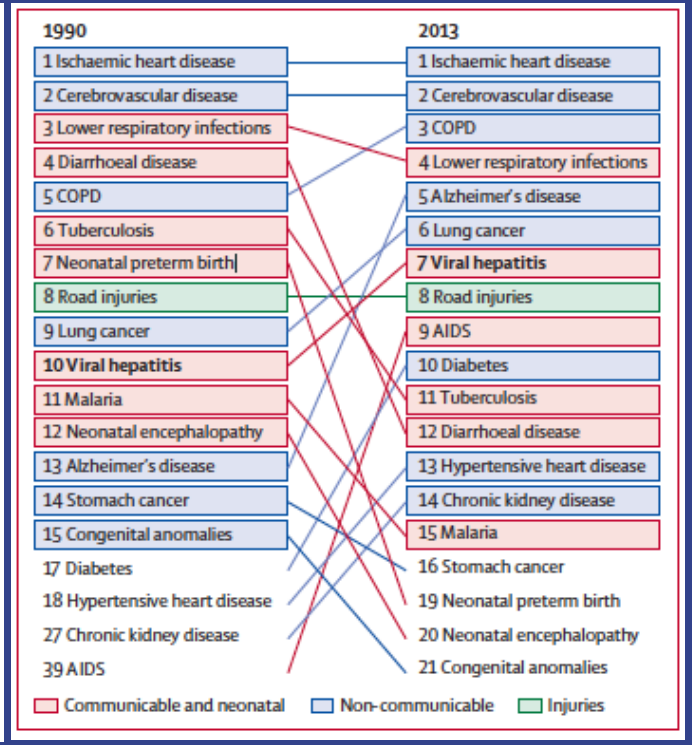
Findings Between 1990 and 2013, global viral hepatitis deaths increased from 0·89 million (95% uncertainty interval [UI] 0·86–0·94) to 1·45 million (1·38–1·54); YLLs from 31·0 million (29·6–32·6) to 41·6 million (39·1–44·7); YLDs from 0·65 million (0·45–0·89) to 0·87 million (0·61–1·18); and DALYs from 31·7 million (30·2–33·3) to 42·5 million (39·9–45·6). In 2013, viral hepatitis was the seventh (95% UI seventh to eighth) leading cause of death worldwide, compared with tenth (tenth to 12th) in 1990.

Interpretation Viral hepatitis is a leading cause of death and disability worldwide. Unlike most communicable diseases, the absolute burden and relative rank of viral hepatitis increased between 1990 and 2013. The enormous health loss attributable to viral hepatitis, and the availability of effective vaccines and treatments, suggests an important opportunity to improve public health.

Funding Bill & Melinda Gates Foundation.

Published Online July 6, 2016 http://dx.doi.org/10.1016/S0140-6736(16)30579-7

See Online/Comment http://dx.doi.org/10.1016/S0140-6736(16)31018-2



Stanaway et al 2016 Lancet

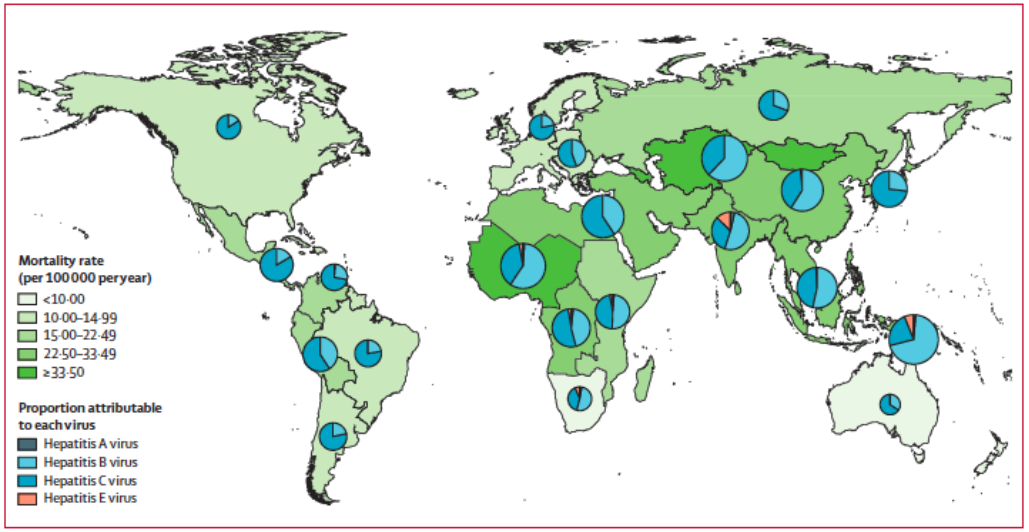


Figure 3: **Map of viral hepatitis-related, age-standardised mortality rate, by GBD region**
Overlaid pie charts indicate each virus type's contribution to the total hepatitis-related mortality; the size of the pie charts are proportional to the region's hepatitis-attributable mortality rate. GBD=Global Burden of Disease.

	Deaths, thousands	YLLs, thousands	YLDs, thousands	DALYs, thousands
High-income Asia Pacific	77·2 (66·8–94·1)	1403·0 (1189·1–1767·3)	25·0 (17·7–34·3)	1428·0 (1211·5–1795·5)
Central Asia	23·2 (21·4–25·7)	735·7 (674·8–818·3)	15·1 (10·6–20·5)	750·9 (689·9–832·5)
East Asia	459·7 (405·4–508·1)	12 402·1 (10 880·7–13 856·1)	254·9 (179·2–341·7)	12 657·0 (11 125·1–14 139·3)
South Asia	289·7 (253·4–341·5)	10 570·3 (9 171·0–12 773·4)	180·6 (124·4–247·7)	10 750·9 (9336·4–12 979·3)
Southeast Asia	134·4 (118·6–152·0)	3841·7 (3338·0–4438·8)	76·3 (53·5–103·6)	3918·0 (3416·4–4513·1)
Australasia	2·7 (2·2–3·2)	58·8 (49·3–67·4)	2·0 (1·4–2·8)	60·8 (51·2–69·7)
Caribbean	4·9 (4·5–5·6)	117·9 (105·7–133·9)	3·2 (2·2–4·4)	121·1 (108·8–136·7)
Central Europe	22·8 (20·7–24·4)	564·6 (510·9–605·5)	14·9 (10·5–20·2)	579·5 (523·4–622·2)
Eastern Europe	43·5 (39·0–49·6)	1331·6 (1182·1–1530·1)	27·4 (19·1–37·3)	1359·0 (1207·9–1556·9)
Western Europe	77·2 (69·4–84·1)	1529·9 (1380·9–1667·6)	40·3 (28·8–54·2)	1570·1 (1414·2–1715·0)
Andean Latin America	8·0 (6·9–9·2)	194·8 (164·9–226·5)	3·8 (2·6–5·3)	198·7 (168·1–230·4)
Central Latin America	32·9 (31·5–34·5)	825·6 (784·7–869·3)	19·0 (13·3–26·0)	844·6 (803·1–889·7)
Southern Latin America	8·8 (7·8–9·8)	203·5 (176·2–230·2)	4·4 (3·0–6·0)	207·8 (180·3–235·0)
Tropical Latin America	22·4 (18·5–26·8)	605·7 (500·7–733·5)	13·8 (9·4–18·9)	619·5 (514·7–744·4)
North Africa and Middle East	93·6 (86·2–101·8)	2403·7 (2198·1–2645·8)	56·4 (39·2–77·0)	2460·2 (2251·0–2700·9)
High-income North America	48·6 (40·4–57·9)	1201·5 (1001·5–1443·0)	26·4 (18·3–35·7)	1227·9 (1025·2–1468·5)
Oceania	2·9 (1·9–4·3)	112·0 (72·0–168·5)	1·4 (1·0–2·0)	113·4 (73·2–169·9)
Central sub-Saharan Africa	10·9 (9·2–12·8)	376·0 (310·9–449·5)	11·7 (7·9–16·0)	387·7 (320·4–460·3)
Eastern sub-Saharan Africa	31·0 (28·4–33·7)	1023·8 (920·6–1124·8)	39·2 (26·9–54·3)	1063·0 (958·1–1163·9)
Southern sub-Saharan Africa	4·8 (4·2–5·4)	145·7 (126·3–167·2)	6·9 (4·7–9·6)	152·6 (133·1–174·6)
Western sub-Saharan Africa	55·1 (48·5–62·1)	1932·5 (1680·4–2205·3)	51·1 (34·9–70·5)	1983·6 (1728·7–2250·5)

Data in parentheses are 95% uncertainty intervals. YLLs=years of life lost. YLDs=years living with disability. DALYs=disability-adjusted life-years.

Table 2: **Deaths, YLLs, YLDs, and DALYs attributable to viral hepatitis in 2013, by region**

The global burden of viral hepatitis from 1990 to 2013: findings from the Global Burden of Disease Study 2013

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Doherty Institute
A joint venture between the University of Melbourne and Melbourne Health

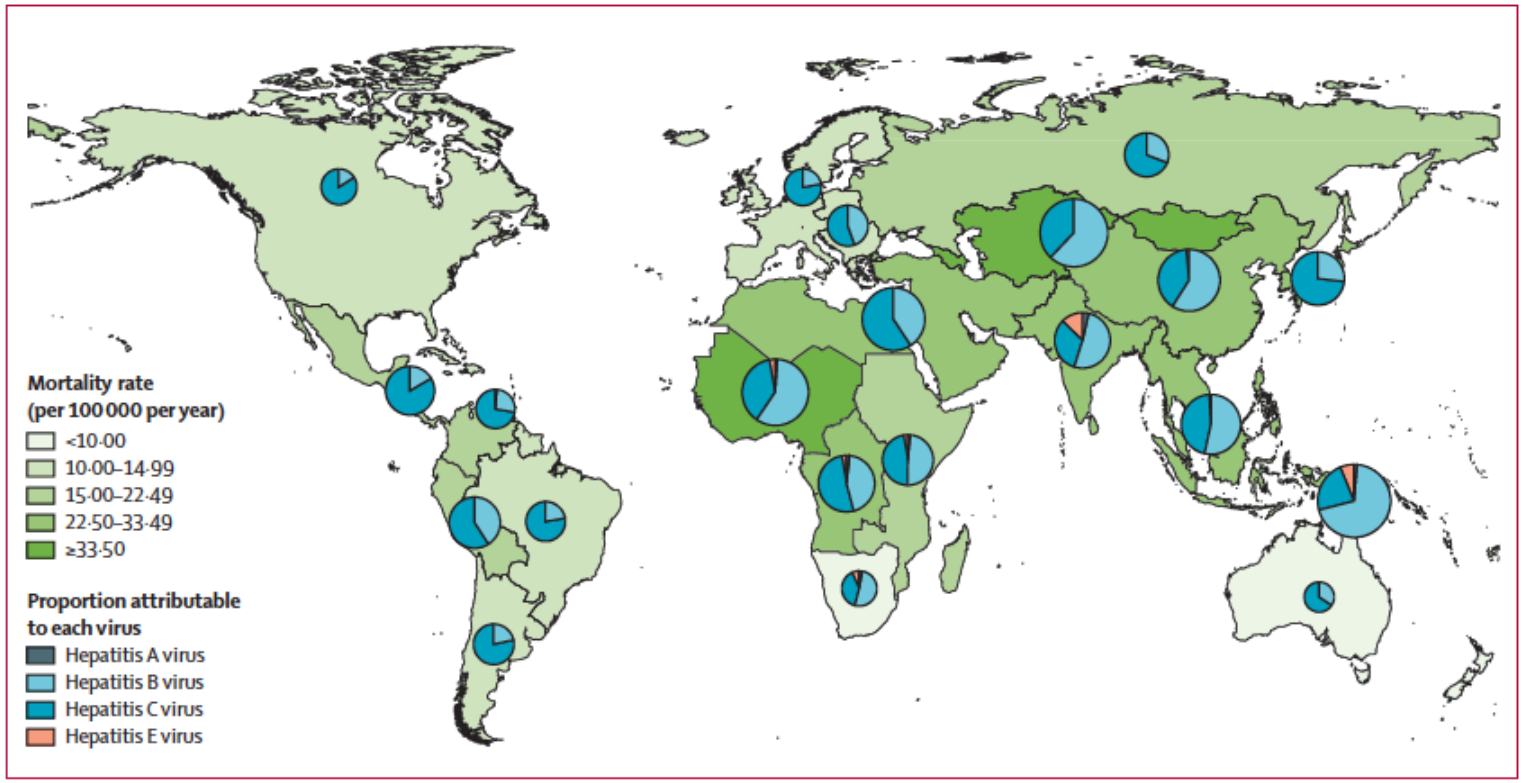

***Figure 3*: Map of viral hepatitis-related, age-standardised mortality rate, by GBD region**
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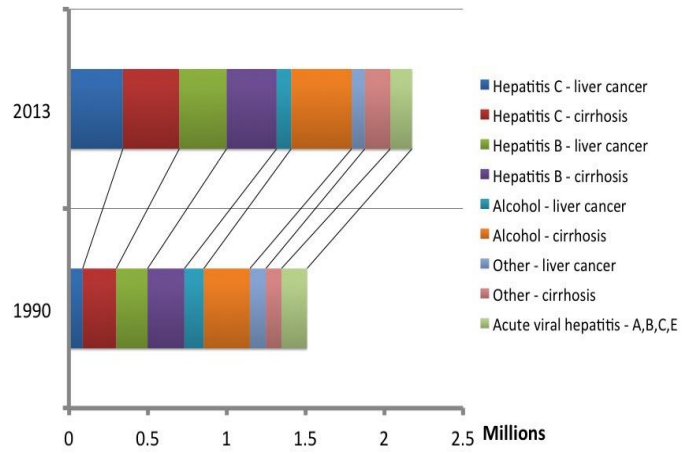
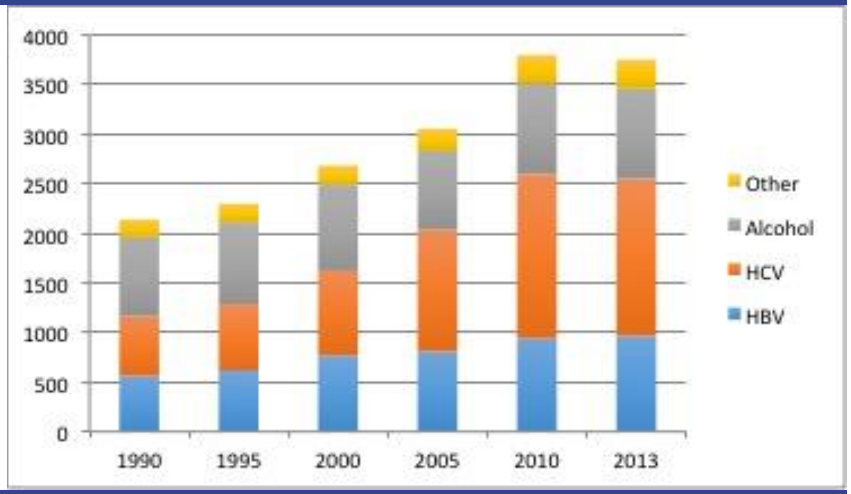
MORTALITY RATE (PER 100,000 PY)
<10
10 - 14.9
15 - 22.49
22.5 - 33.49
33.5 +
PROPORTION ATTRIBUTABLE TO EACH VIRUS
The area of each pie is proportional to the number of hepatitis-attributable deaths in that region: each wedge represents the proportion of those deaths attributable to a given virus
Hepatitis A
Hepatitis B
Hepatitis C
Hepatitis E

Shifting trends in the burden of liver disease

Global



Australia



Estimated BBV related mortality, Australia, 2013:

- HBV – 827 deaths
- HCV – 1,546 deaths
- HIV – 107 deaths

Cowie EASL 2015, GBD Collaborators 2015

Doherty Institute

Estimating the burden of disease attributable to injecting drug use as a risk factor for HIV, hepatitis C, and hepatitis B: findings from the Global Burden of Disease Study 2013

Louisa Degenhardt, Fiona Charlson, Jeff Stanaway, Sarah Larney, Lily T Alexander, Matthew Hickman, Benjamin Cowie, Wayne D Hall, John Strang, Harvey Whiteford, Theo Vos

- In 2013, an estimated 10.09 million DALYs attributable to previous exposure to HIV, HBV and HCV via IDU, 4-fold increase since 1990
- In 2013 IDU estimated to cause
  - 4% of DALYs due to HIV (highest in LMIC)
  - 1.1% of DALYs due to HBV
  - 39.1% of DALYs due to HCV (highest in HIC)
- IDU is a major contributor to the global burden of disease

Doherty Institute

HIV and related infections in prisoners 1

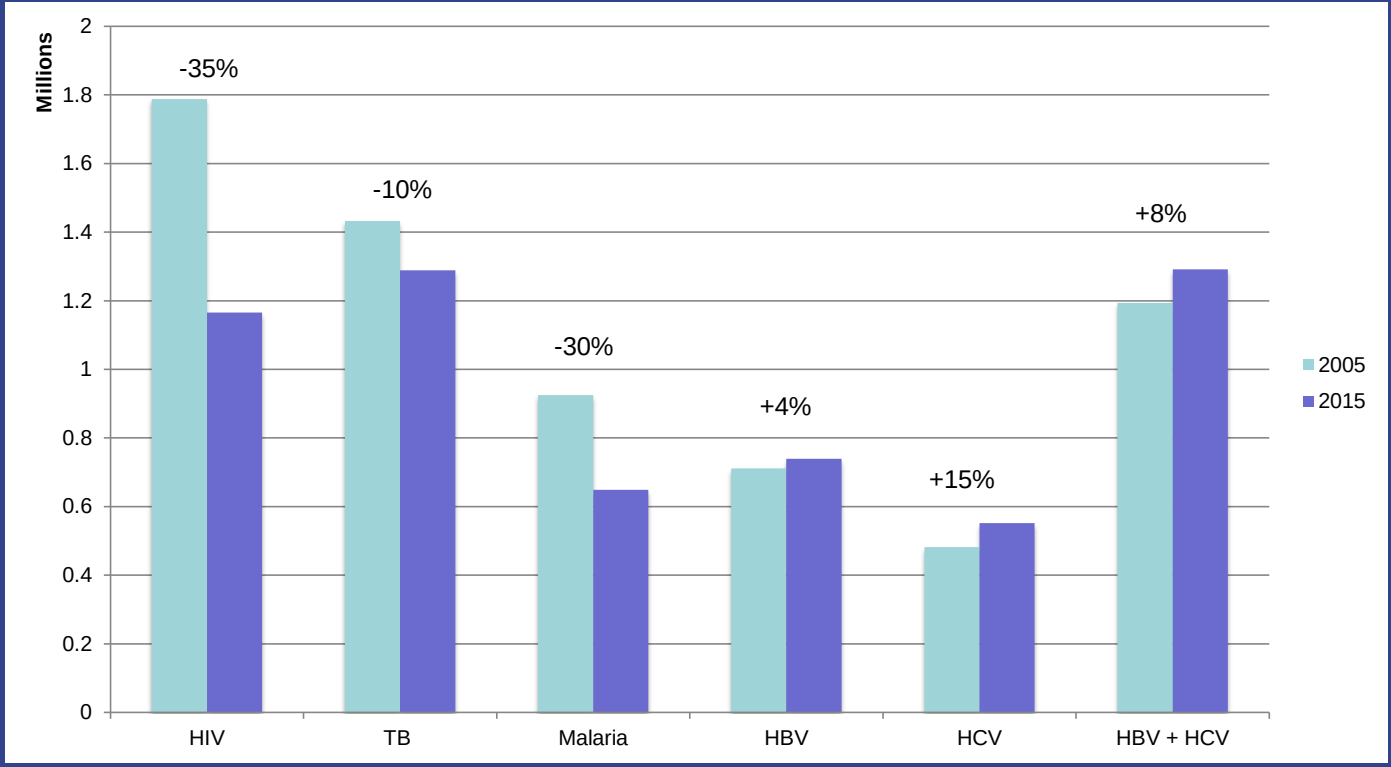
Global burden of HIV, viral hepatitis, and tuberculosis in prisoners and detainees

Kate Dolan, Andrea L Wirtz, Babak Moazen, Martial Ndeffo-mbah, Alison Galvani, Stuart A Kinner, Ryan Courtney, Martin McKee, Joseph J Amon, Lisa Maher, Margaret Hellard, Chris Beyrer, Fredrick L Altice

- In 2014, estimated 10.2 million people incarcerated at any time
  - 3.8% have HIV (389,000 people)
  - 15.1% have HCV (1.5 million people)
  - 4.8% have HBV (492,000 people)
  - 2.8% have active TB (286,000 people)
- Most effective way of controlling these infections is to reduce the incarceration of PWID

Doherty Institute

Preliminary results – GBD 2015
Annual deaths – all ages



GBD Causes of Death Collaborators 2016

Acknowledgements

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Melbourne Health Office for Research & Royal Melbourne Hospital Foundation
Peter Doherty Institute for Infection & Immunity

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