

# Global Burden of RHD (and other GAS diseases)

David A. Watkins, MD, MPH

University of Washington

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| Disease  | Number of existing cases | Number of new cases each year | Number of deaths each year |
|--|--------------------------|-------------------------------|----------------------------|
| <b>Severe GAS diseases</b>   |                          |                               |                            |
| Rheumatic heart disease  | 15.6 million             | 282 000*                      | 233 000†                   |
| History of acute rheumatic fever without carditis, requiring secondary prophylaxis | 1.88 million             | 188 000*                      | ..                         |
| RHD-related infective endocarditis   | ..                       | 34 000                        | 8000                       |
| RHD-related stroke   | 642 000                  | 144 000                       | 108 000                    |
| Acute post-streptococcal glomerulonephritis  | ‡                        | 472 000                       | 5000                       |
| Invasive group A streptococcal diseases  | ..                       | 663 000                       | 163 000                    |
| Total severe cases   | 18.1 million             | 1.78 million                  | 517 000                    |
| <b>Superficial GAS diseases</b>  |                          |                               |                            |
| Pyoderma   | 111 million              | ..                            | ..                         |
| Pharyngitis  | ..                       | 616 million                   | ..                         |

RHD=rheumatic heart disease. All estimates rounded off. Note that these estimates assume constancy of incidence and prevalence over time.

\*New rheumatic heart disease cases were calculated based on the proportion of incident acute rheumatic fever cases expected to develop rheumatic heart disease. The remainder of incident acute rheumatic fever cases are included in the "History of acute rheumatic fever without carditis" row. Therefore, the total number of new acute rheumatic fever cases each year is 282 000 + 188 000=470 000. †Includes acute rheumatic fever deaths. Rheumatic heart disease deaths are based on proportion of existing rheumatic heart disease cases expected to die each year. ‡No attempt has been made to quantify the prevalence of acute post-streptococcal glomerulonephritis-induced chronic renal impairment or end-stage renal failure

**Table 7: Minimum summary estimates of the global burden of group A streptococcal diseases**



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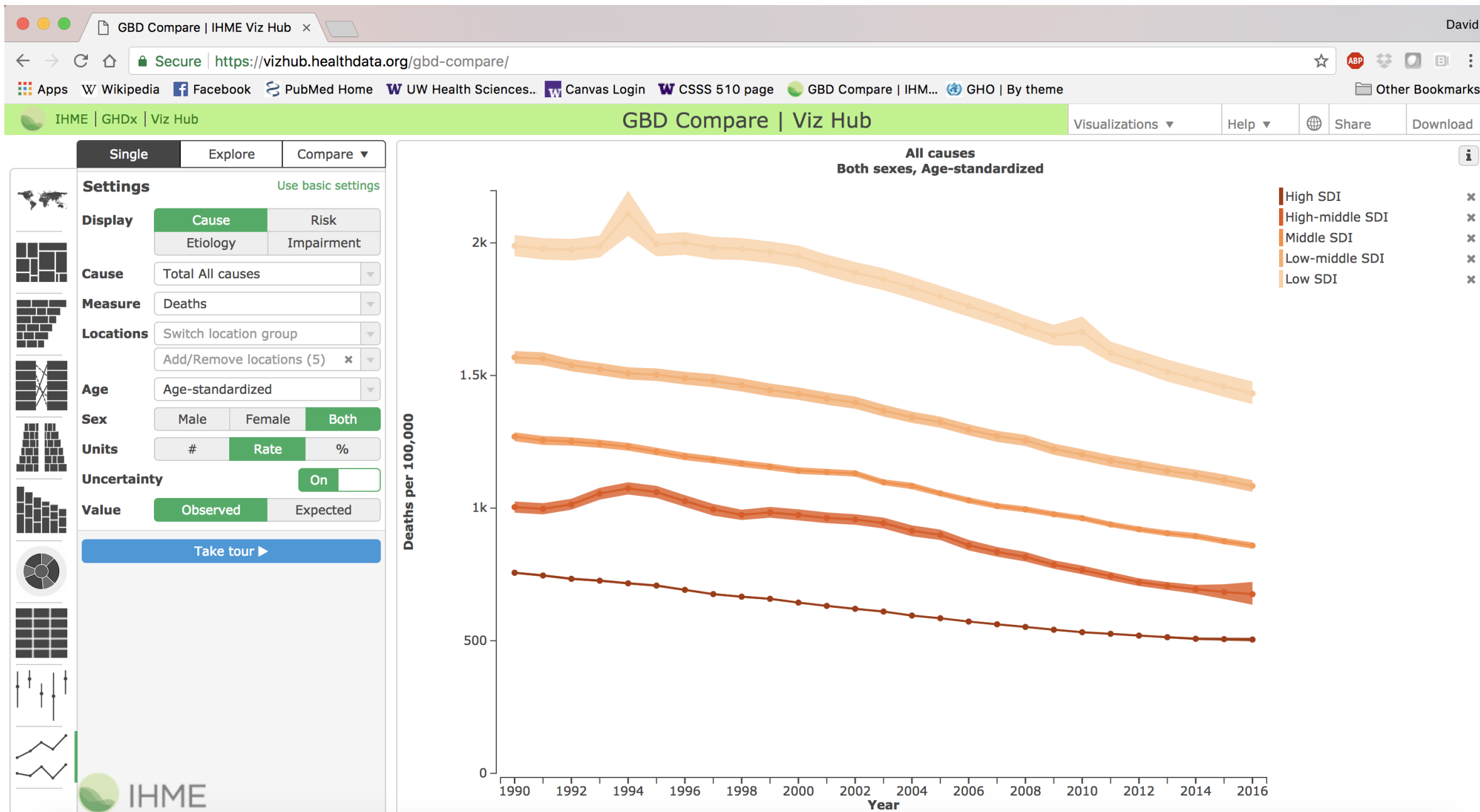
### IHME releases second annual report on the Sustainable Development Goal indicators

The Institute for Health Metrics and Evaluation (IHME) at the University of Washington is releasing new findings related to the Sustainable Development Goals in a scientific paper, a data visualization tool, and a report produced in collaboration with the Bill & Melinda Gates Foundation.



# The GBD approach

- Systematic effort to gather/use all available data on >300 causes of death or disability
- Produce estimates of fatal and non-fatal outcomes, summarized by disability-adjusted life-years (DALYs), with uncertainty
- Disaggregated by age, sex, country, and year (1990 - present)
- Computational advances and huge increases in amount of data vs. prior WHO-GBD studies
- Annually revised and updated (next release in May 2020)



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## Global, Regional, and National Burden of Rheumatic Heart Disease, 1990–2015

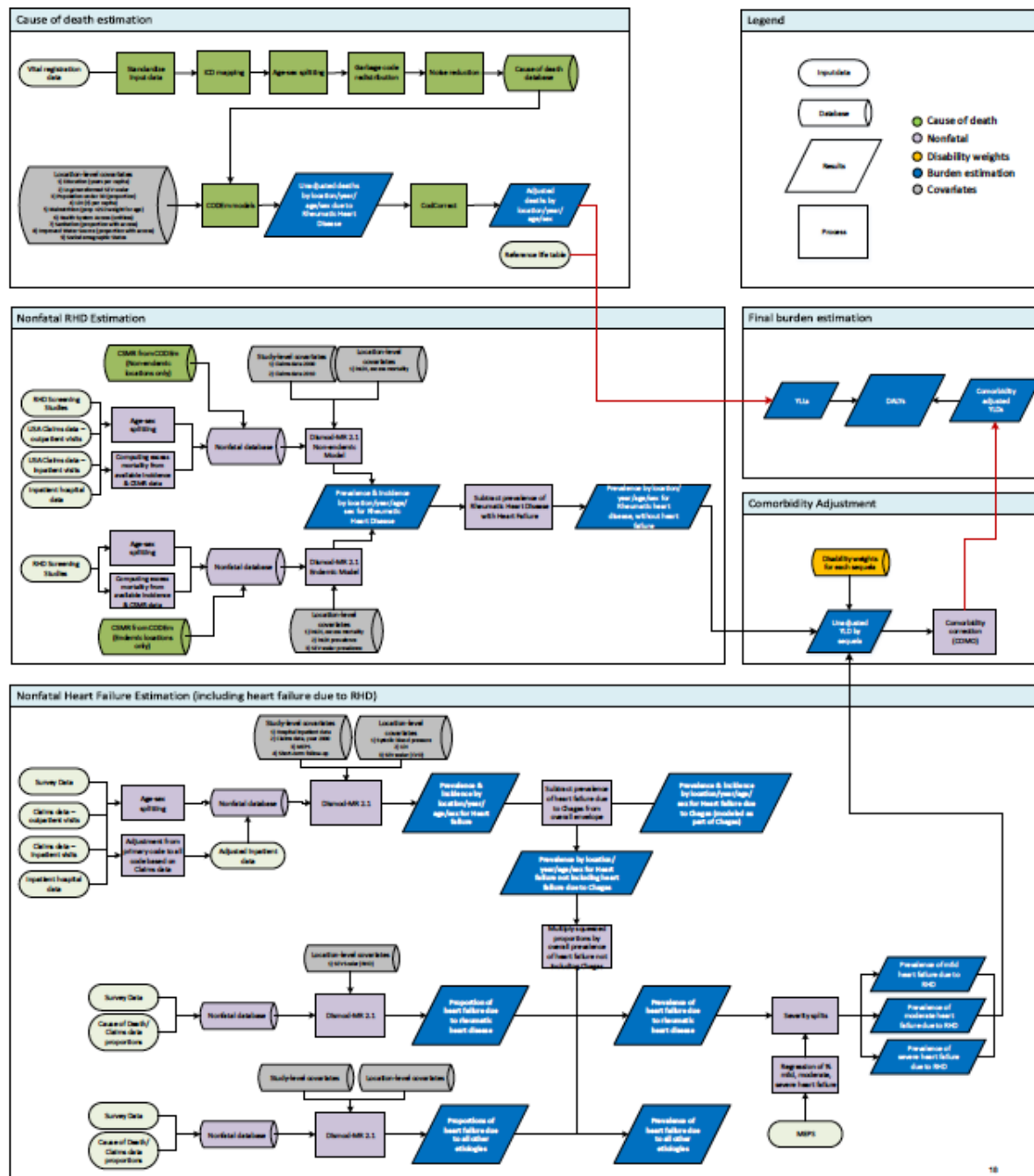
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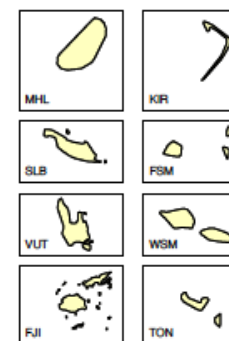
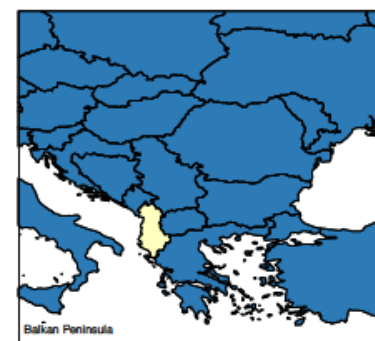
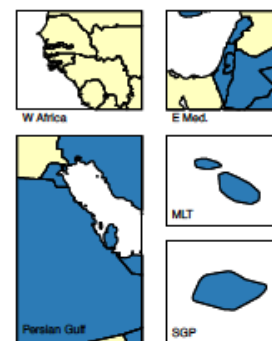
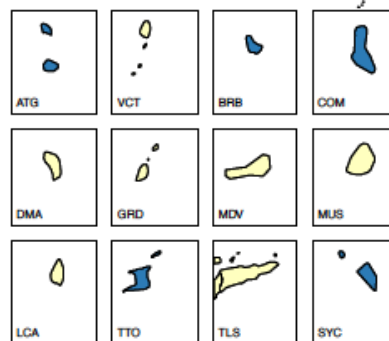
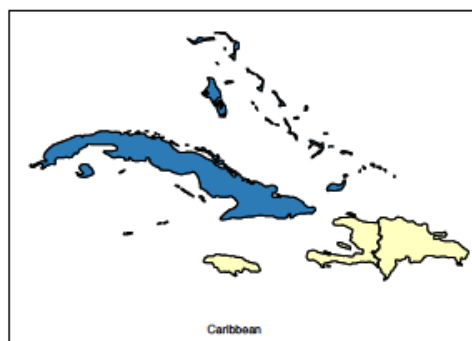
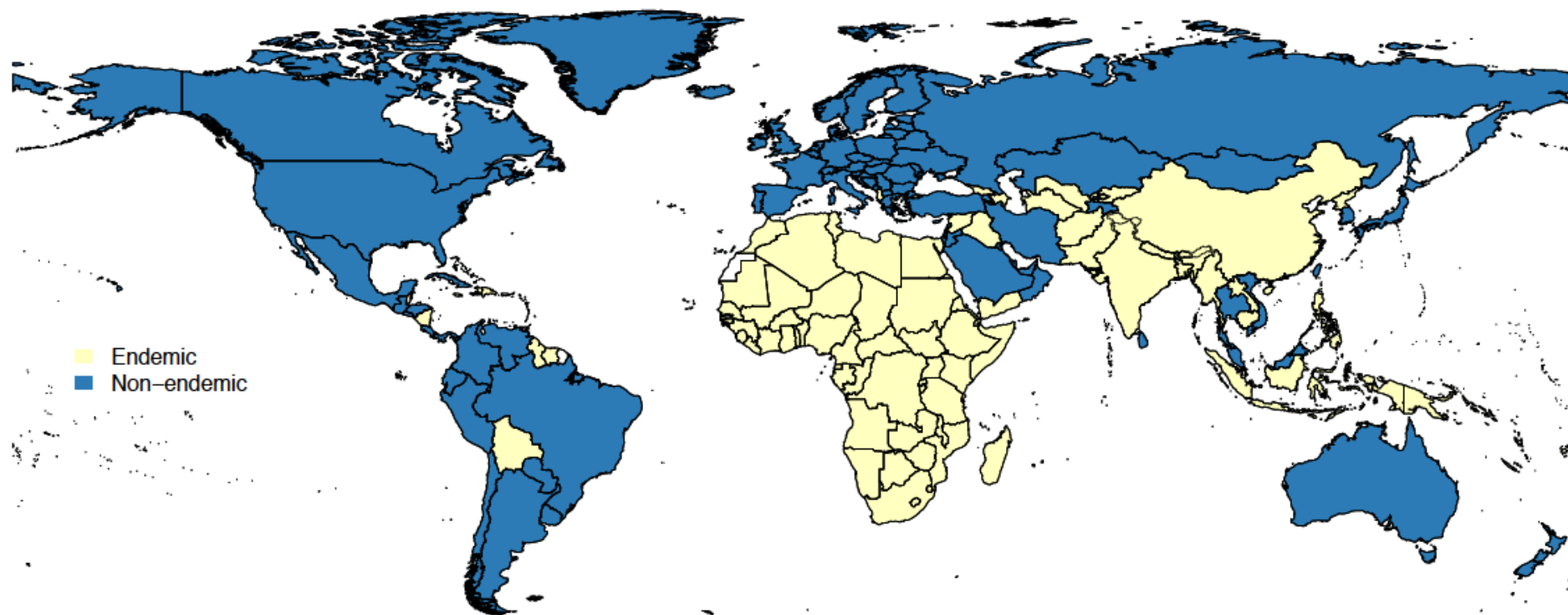
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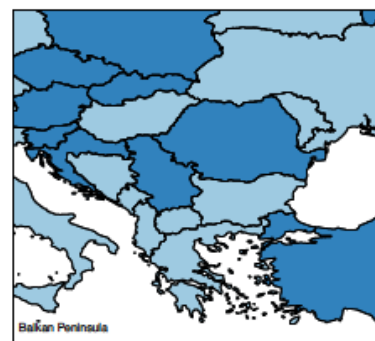
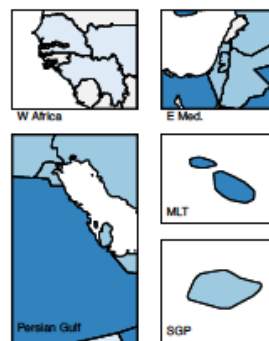
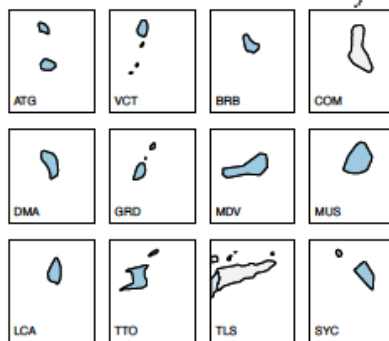
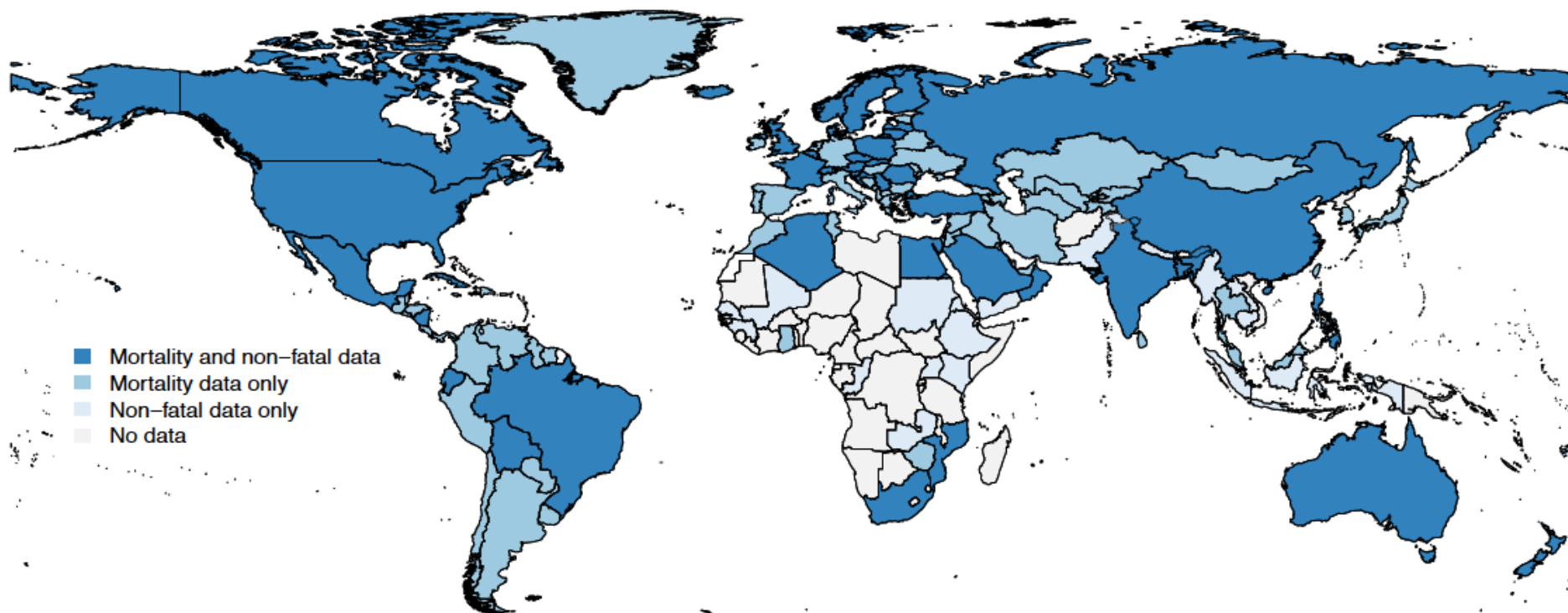
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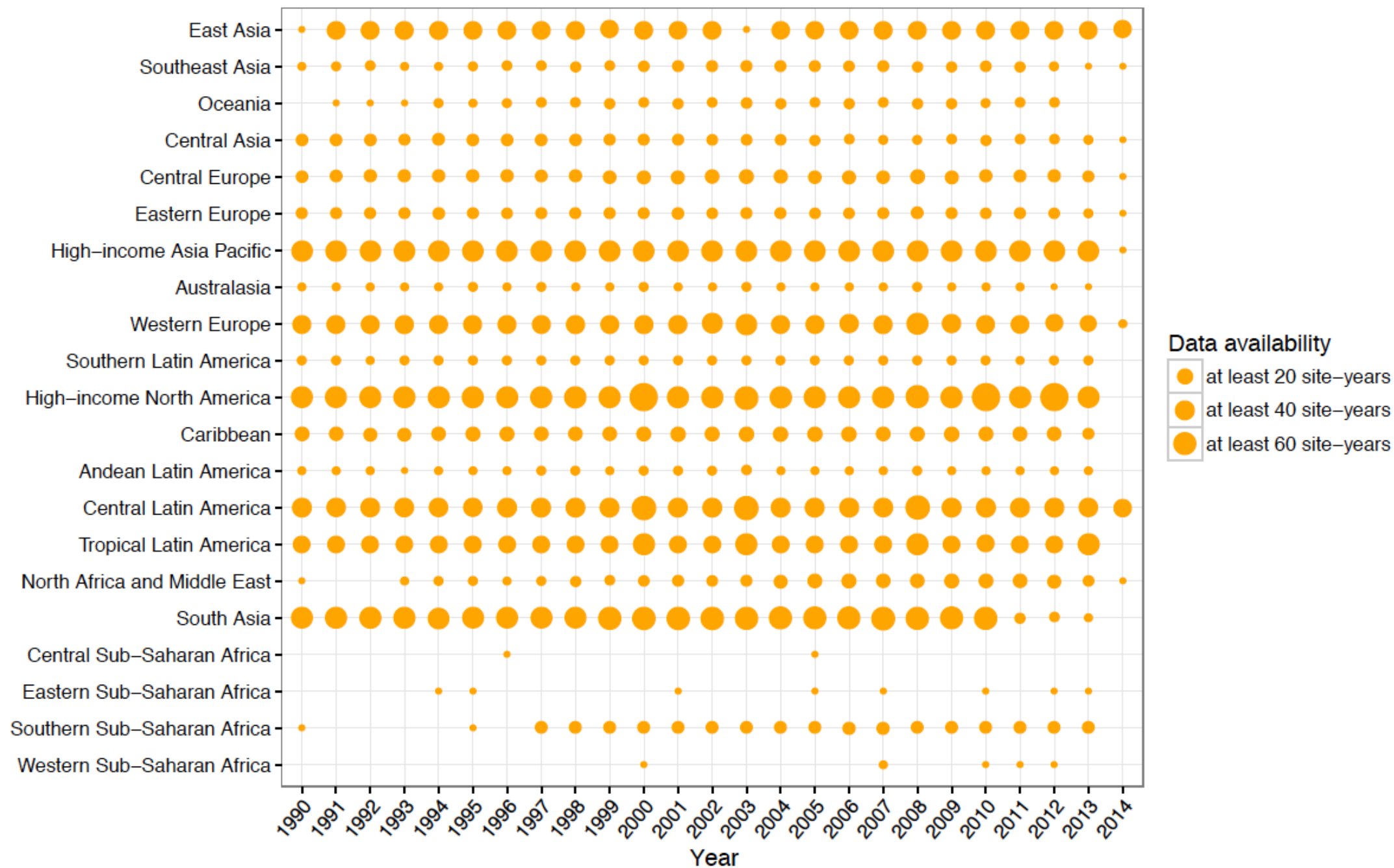




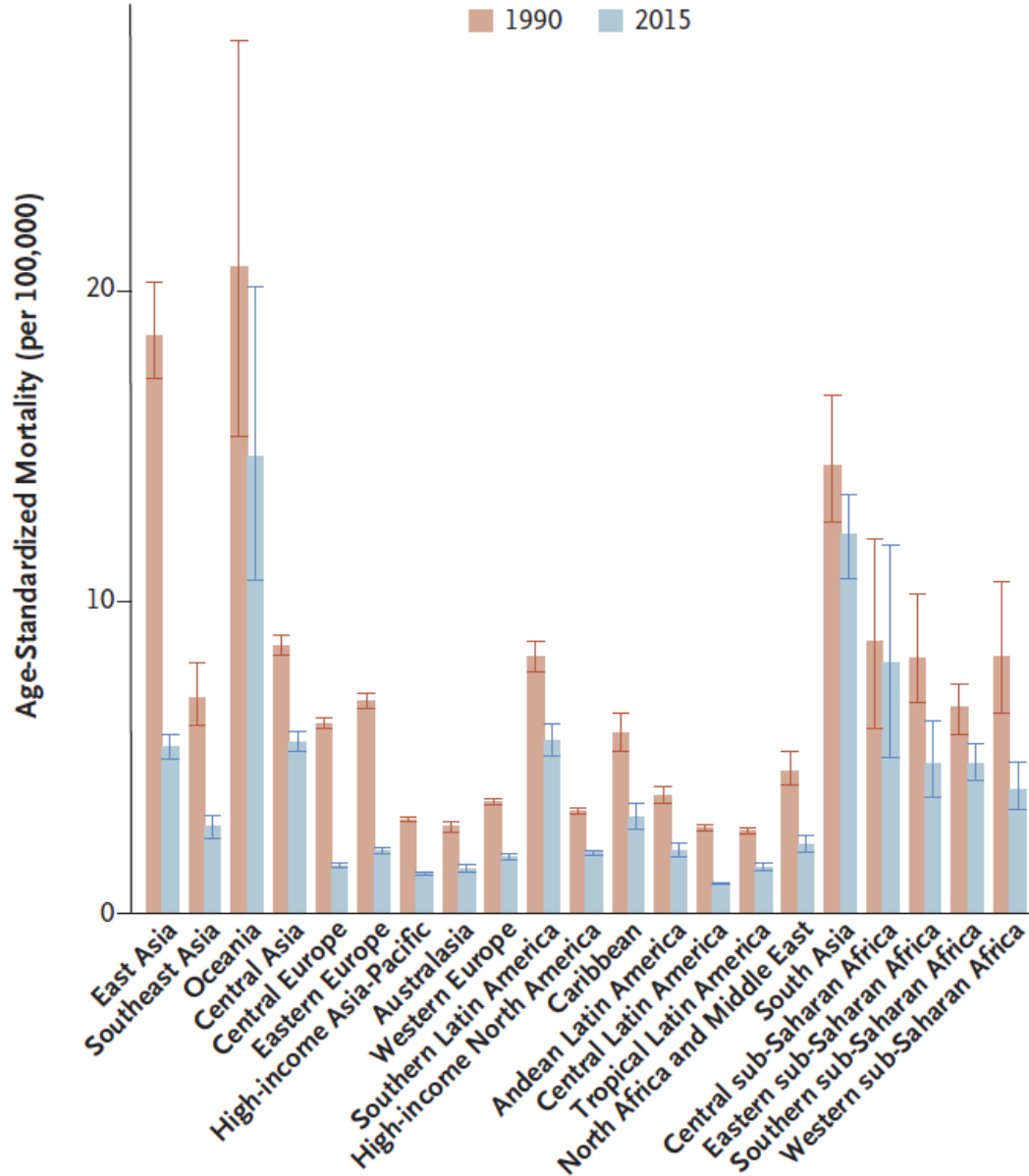




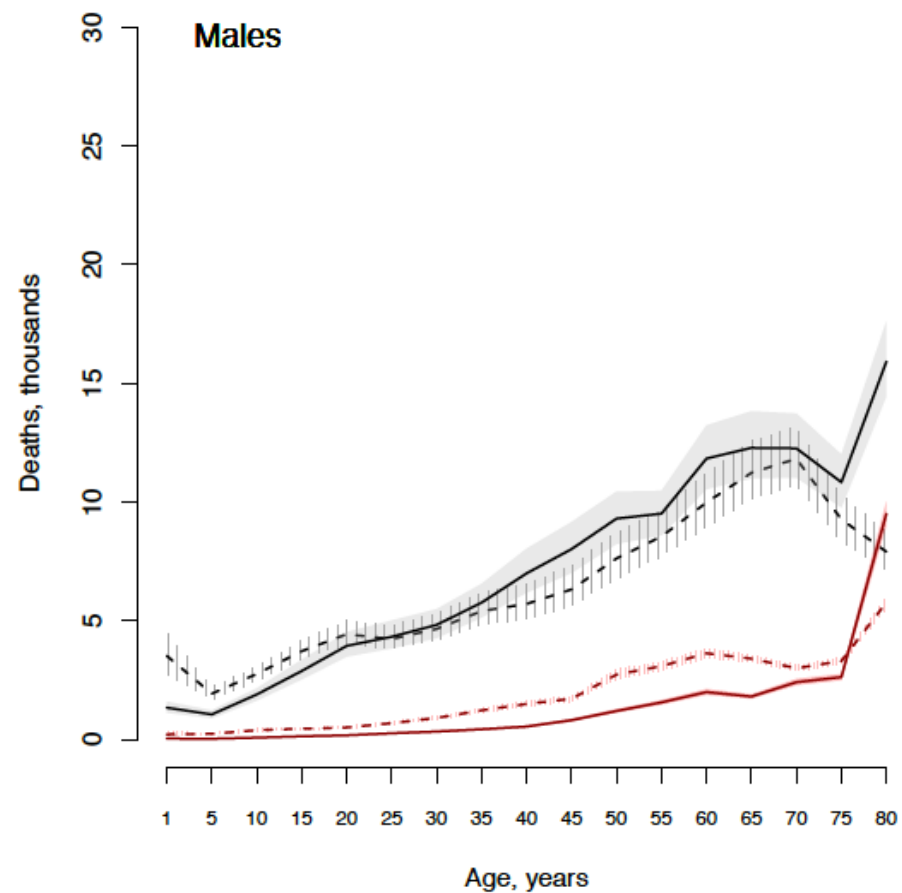
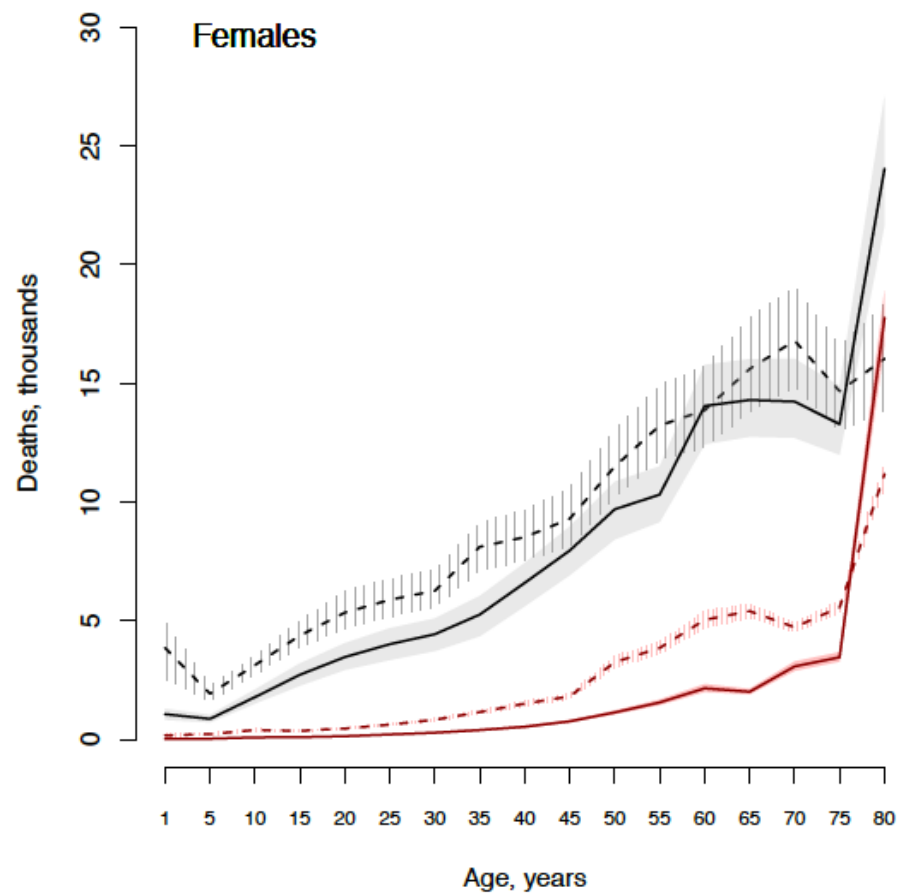




## A Mortality



- 320,000 deaths in 2015
- Most deaths occurred in East and South Asia (India, China, and Pakistan)
- Highest age-standardized mortality rates estimated for Oceania, South Asia, and Central Sub-Saharan Africa
- No detectable decline in mortality since 1990 in these 3 regions



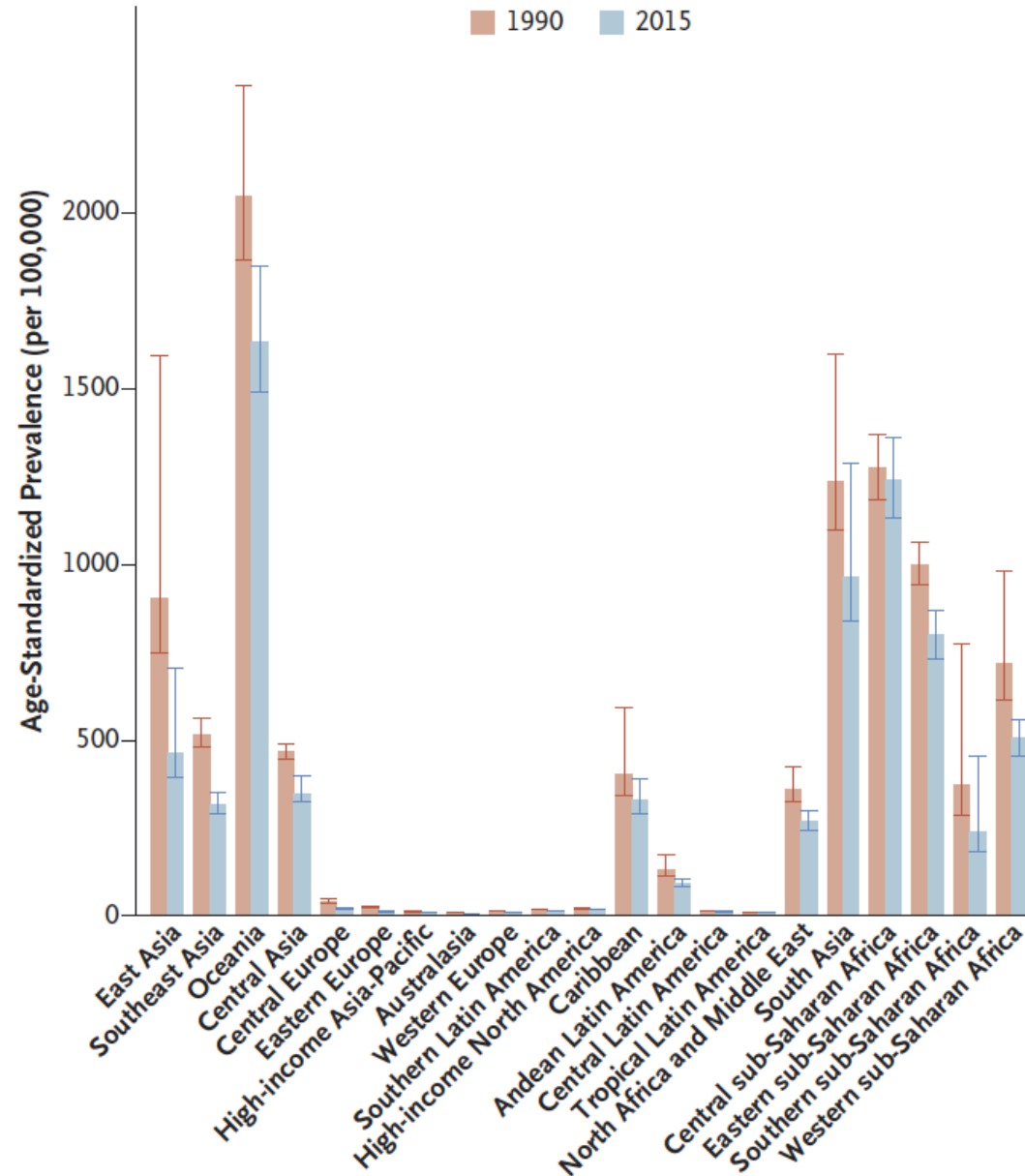
---- 1990

— 2015

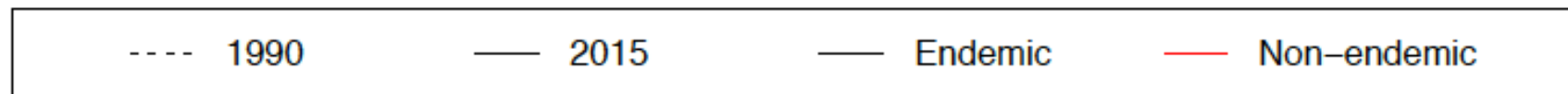
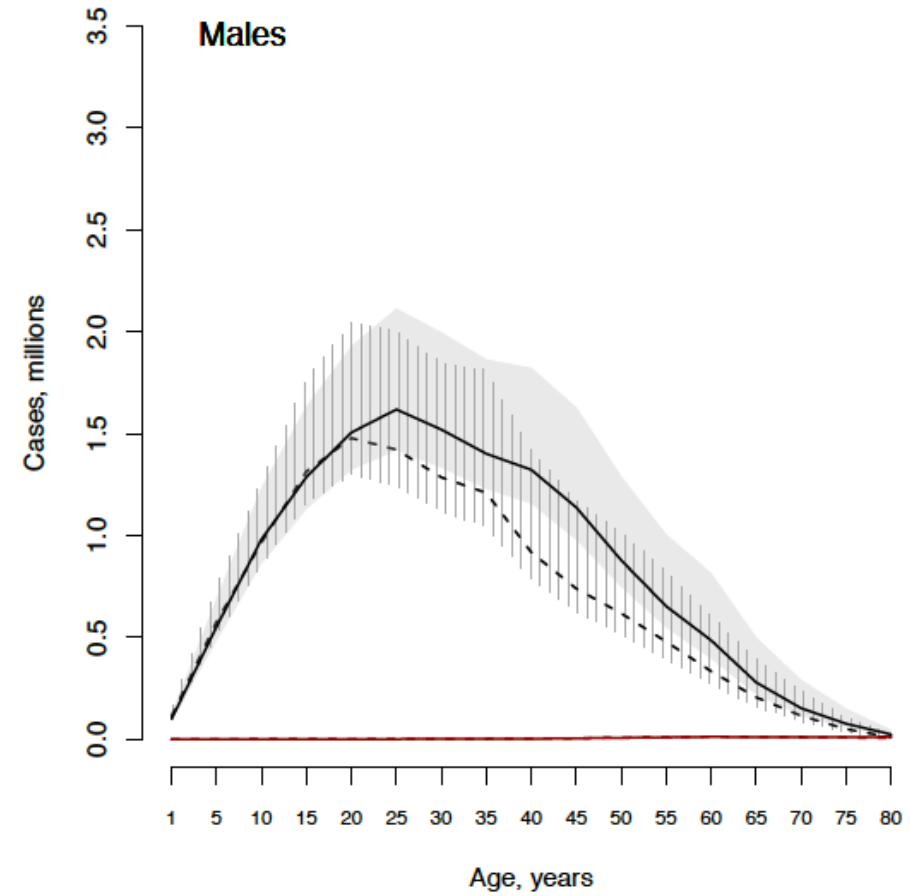
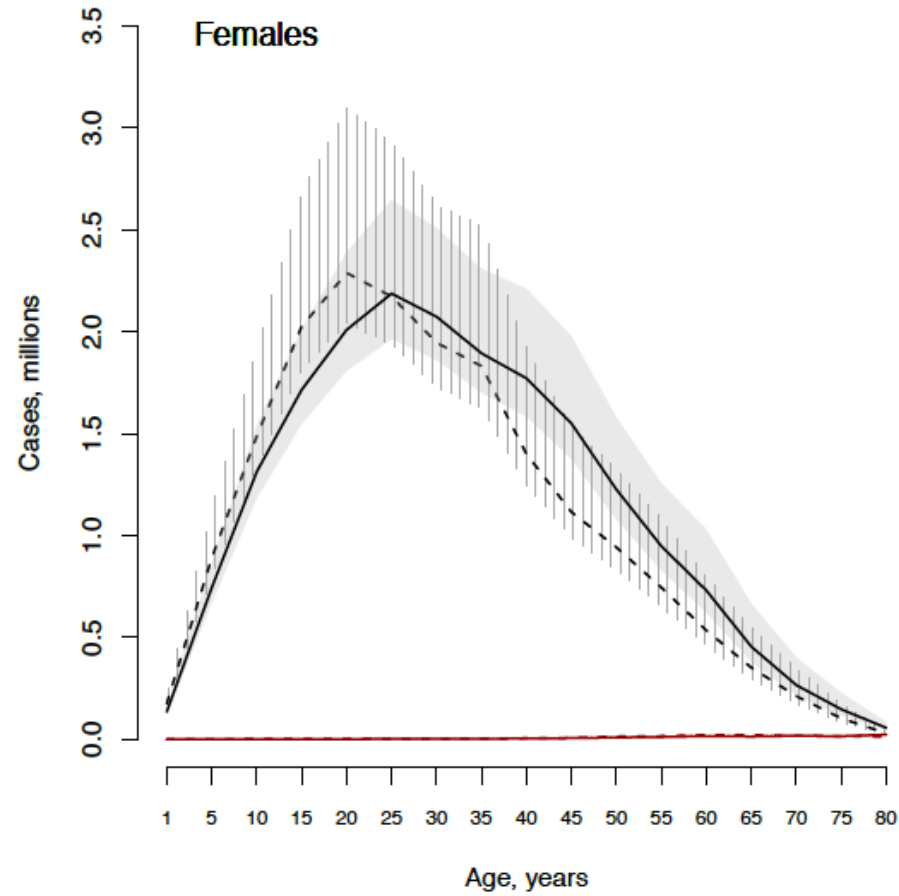
— Endemic

— Non-endemic

## B Prevalence



- 33 million cases in 2015 (cf. 16 million cases per Carapetis et al. 2005)
- Most cases in East and South Asia (again: India, China, and Pakistan)
- Highest age-standardized prevalence estimated for Oceania, South Asia, and Central Sub-Saharan Africa
- Similar prevalence in 1990 and 2015



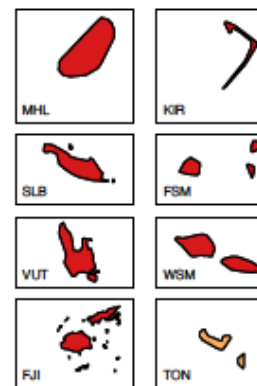
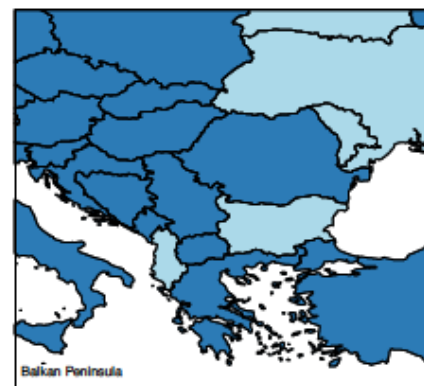
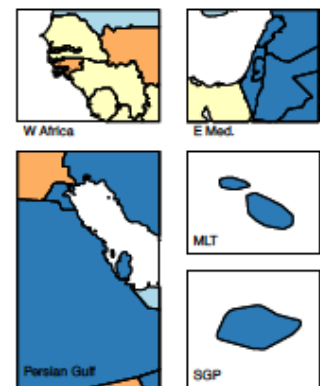
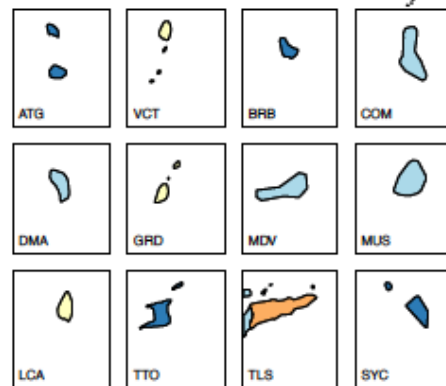
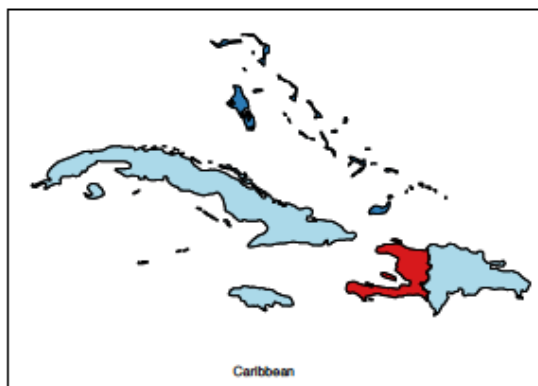
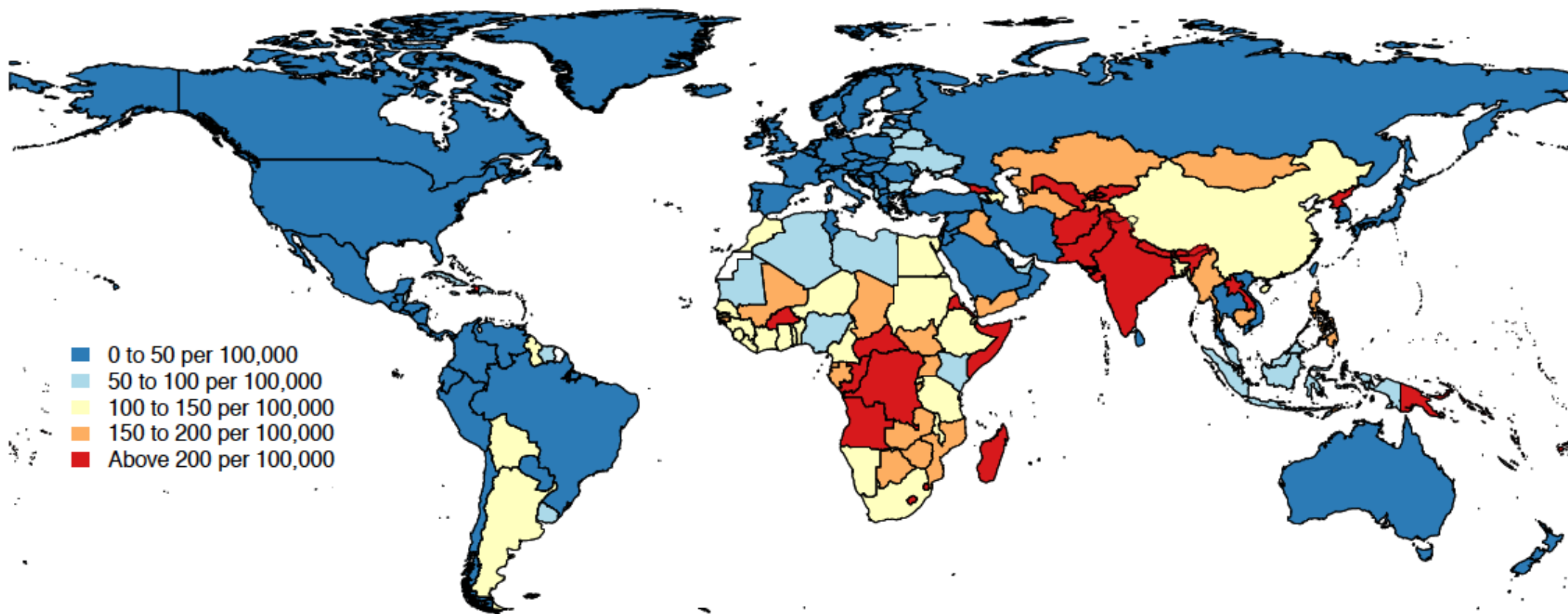
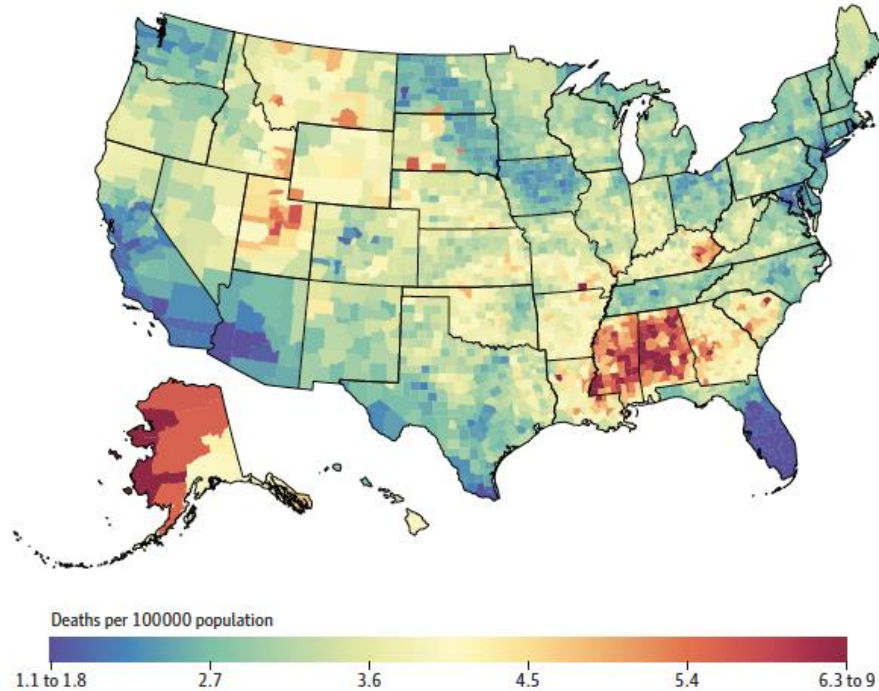


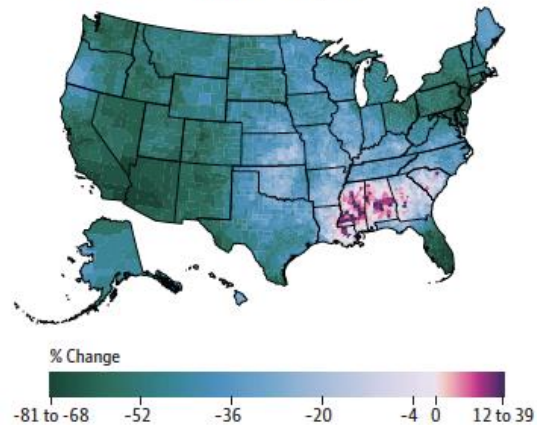


Figure 7. US County-Level Mortality From Rheumatic Heart Disease

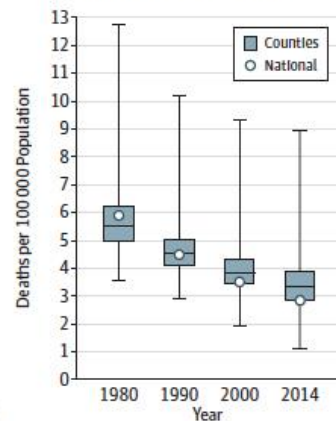
A Age-standardized mortality rate from rheumatic heart disease, both sexes, 2014



B Percent change in age-standardized mortality rate from rheumatic heart disease between 1980 and 2014, both sexes



C Age-standardized mortality rate from rheumatic heart disease over time

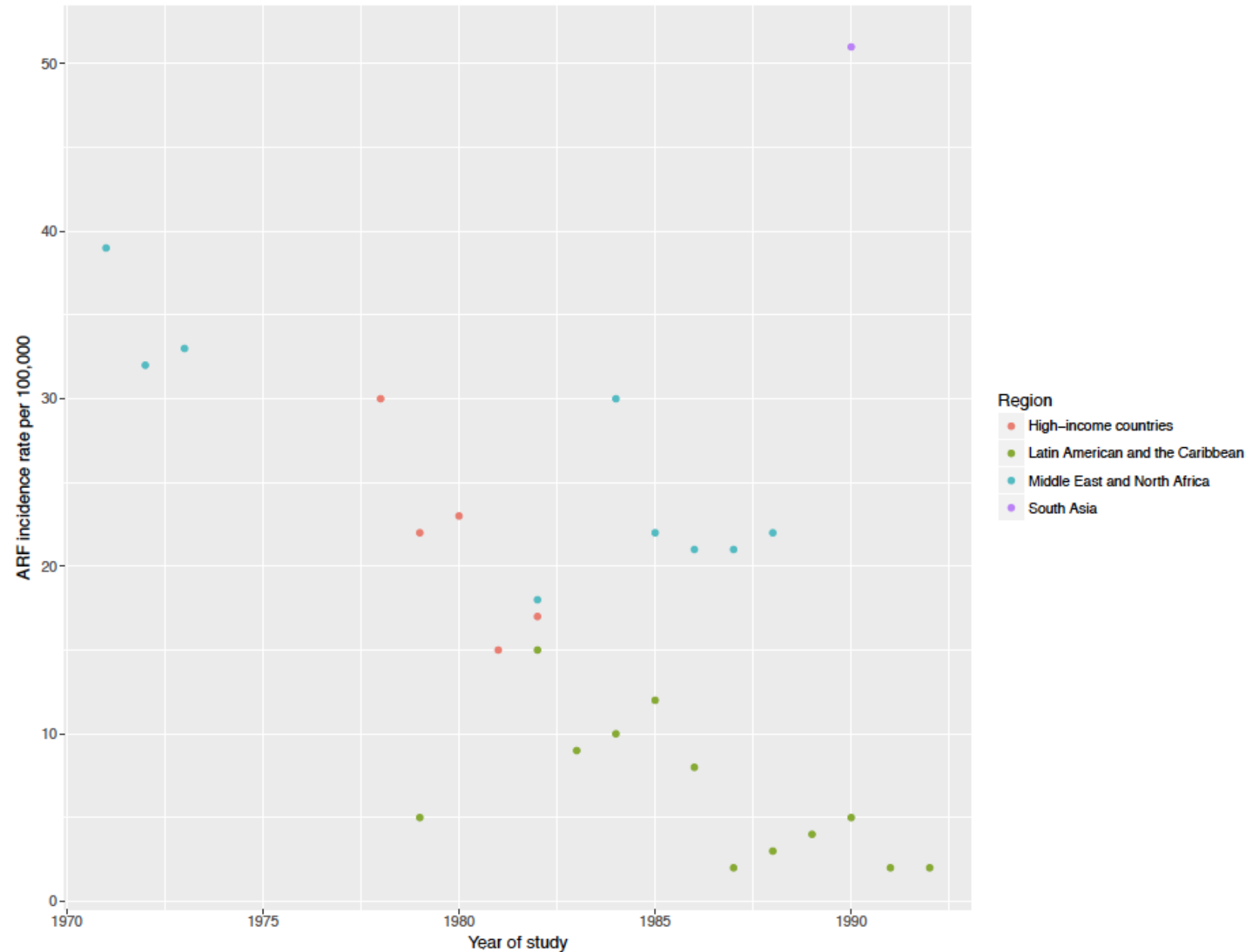


## The residual burden of RHD in wealthy countries

- Highest death rates in the most-deprived areas of the USA (immigrant, Indigenous, etc.)
- Concerning trends (increases!) masked by overall progress on CVD and RHD in less-vulnerable groups
- Patterns similar in other countries, including Australia and New Zealand
- Subnational estimates produced for growing number of countries with each GBD update

- Much less known about GAS and ARF epidemiology
- 2008 systematic review: mostly older studies; inconsistent methods, reporting
- Clear time trend for each region studied; absolute rates vary by region

Adapted from:  
Tibazarwa, Heart 2008



|   | Country or territory        | Population at risk (age) | Annual incidence (per 100 000) | Comments   |
|---|-----------------------------|--------------------------|--------------------------------|--|
| Steer et al (2009) <sup>8</sup>   | Fiji                        | 5–14 years               | 15.2                           | Prospective surveillance of hospital admissions for acute rheumatic fever in a tertiary care hospital; annual incidence rates suggest a decline from the annual rate of 144 per 100 000 estimated in 1965–66 |
| Vinker et al (2010) <sup>15</sup>   | Israel                      | 5–14 years               | 7.5                            | Retrospective survey of community clinics and hospital records   |
| Breda et al (2012) <sup>4</sup>   | Italy                       | 2.5–17 years             | 4.1                            | Retrospective community-based survey of practitioners and health records   |
| Milne et al (2012) <sup>14</sup>  | New Zealand                 | 5–14 years               | 17.2                           | Data obtained from National Medical Statistics; annual incidence rates varied widely by ethnicity—Maori people 40.2 per 100 000, Pacific islanders 81.2 per 100 000, and others 2.1 per 100 000              |
| Lawrence et al (2013) <sup>13</sup>   | Australia                   | 5–14 years               | 19.4                           | Data obtained from the Northern Territory, Australia, acute rheumatic fever and rheumatic heart disease register; annual incidence was recorded in Aboriginal children                                       |
| Kumar et al (2014) <sup>7</sup>   | India                       | 5–14 years               | 8.7                            | Prospective, active surveillance of a single district of 1.1 million individuals over 8 years  |
| Beaudoin et al (2015) <sup>10</sup>   | American Samoa              | <18 years                | 150                            | Retrospective review of hospital records at the only hospital in the country   |
| Fauchier et al (2015) <sup>12</sup>   | French South Pacific Island | 5–19 years               | 112                            | Retrospective review of medical records  |
| Corsenac et al (2016) <sup>11</sup>   | New Caledonia               | 9–10 years               | 131                            | Retrospective review of the acute rheumatic fever and rheumatic heart disease register (we calculated the crude rate from data in the paper)   |
| Kočevár et al (2017) <sup>3</sup>   | Slovenia                    | 3–14 years               | 1.25                           | Retrospective review of hospital records at a single tertiary referral hospital  |
| This table presents the most recent data on acute rheumatic fever incidence reported in the literature. Data published before 2010 have been reviewed previously. <sup>6,9</sup> Note that most data are from retrospective studies, and there was a single study from Asia and no studies from Africa. |                             |                          |                                |  |
| <b>Table 1: Incidence of acute rheumatic fever</b>  |                             |                          |                                |  |

Karthikeyan and Guilherme, Lancet 2018.

# Updated GAS mortality estimates

| Sequela                            | Carapetis (2005) | Updated (2016) * |               |              |
|------------------------------------|------------------|------------------|---------------|--------------|
|                                    |                  | base case        | high estimate | low estimate |
| Rheumatic heart disease            | 233,000          | 300,000          | 320,000       | 290,000      |
| RHD-related infective endocarditis | 8,000            | 8,600            | 12,000        | 6,200        |
| RHD-related stroke                 | 108,000 **       | 26,000           | 35,000        | 18,000       |
| Acute post-strep GN                | 5,000            | 5,500            | 3,800         | 7,100        |
| Invasive GAS                       | 163,000          | 99,000           | 150,000       | 55,000       |
| Total severe cases                 | 517,000          | 440,000          | 520,000       | 370,000      |

\* Sources: GBD 2016 cause-specific mortality data; assumptions from literature (e.g., REMEDY, case series, etc.)

\*\* Would be 17,000 – 65,000 deaths if contemporary case fatality estimates were used

**Bottom line: 400,000 to 500,000 deaths attributable to GAS globally; most from RHD and invasive disease**

# Improving estimates of GAS disease burden

1. Prospective, longitudinal data on **invasive GAS** epidemiology (sentinel sites)
2. Prospective data on incidence of ARF (**new Jones Criteria** and/or novel diagnostic tests)
3. Data on RHD **prevalence among adults** in low- and middle-income countries
4. Extent of **misclassification of RHD deaths** (probably varies by region and over time with quality of vital registration datasets)

# Thank you

[davidaw@uw.edu](mailto:davidaw@uw.edu)