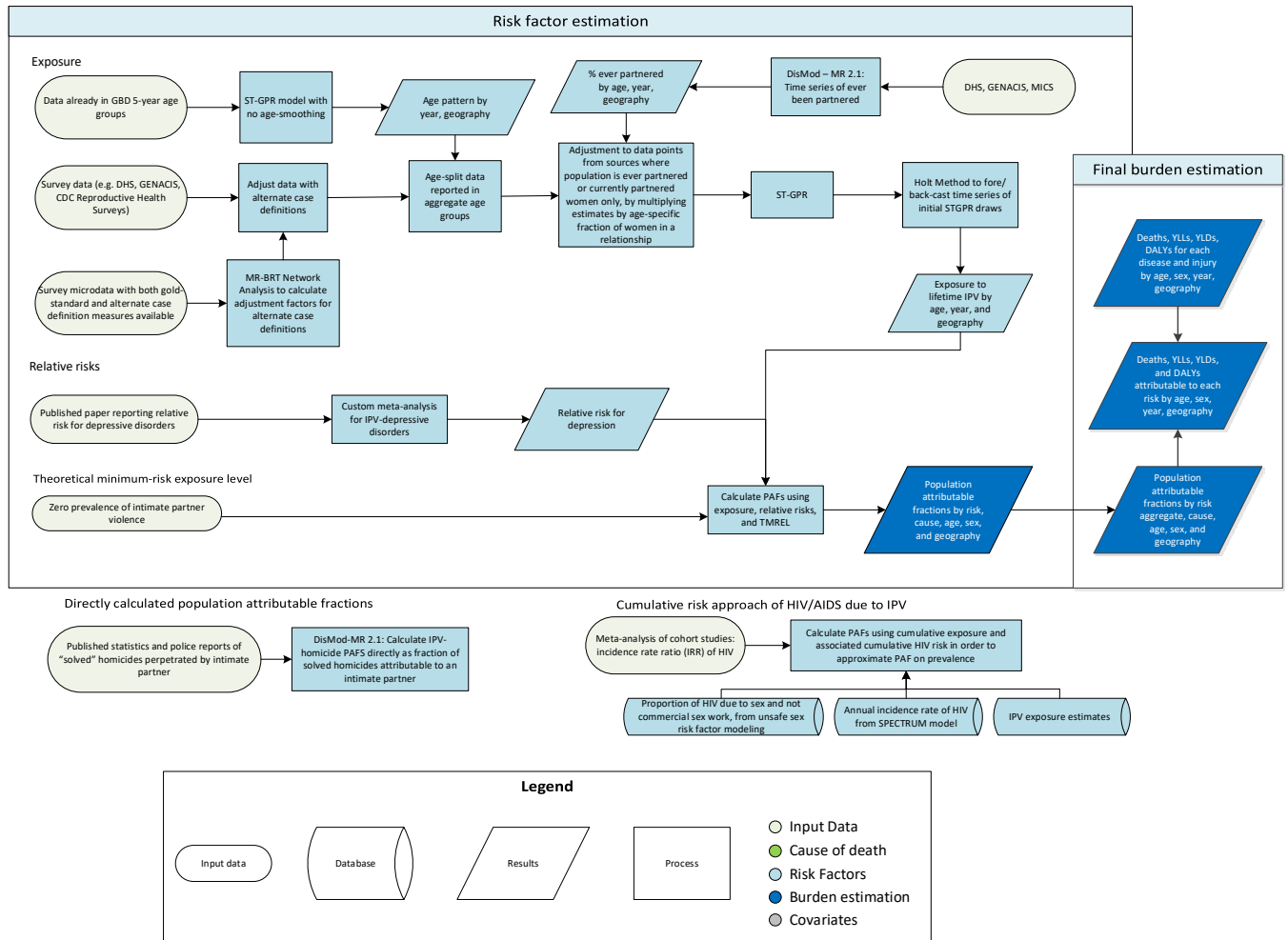


Intimate partner violence

Flowchart



Input data and methodological summary

Definition

Exposure

The case definition for intimate partner violence (IPV) is ever having experienced one or more acts of physical and/or sexual violence by a current or former intimate partner since the age of 15 years. IPV is estimated in females only because evidence of risk-outcomes for males does not meet our inclusion criteria.

- Physical violence is defined as “being slapped or having something thrown at you that could hurt you, being pushed or shoved, being hit with a fist or something else that could hurt, being kicked, dragged, or beaten up, being choked or burnt on purpose, and/or being threatened with or actually having a gun, knife, or other weapon used on you.”

- Sexual violence is defined as “being physically forced to have intercourse when you did not want to, having sexual intercourse because you were afraid of what your partner might do, and/or being forced to do something that you found humiliating or degrading” (the definition of humiliating and degrading may vary across studies depending on the regional and cultural setting).
- Intimate partner is defined as “a partner to whom you are married or with whom you cohabit.” In countries where people date, dating partners will also be considered (a partner with whom you have an intimate [sexual] relationship with but are not married to or cohabiting).

Input data

Exposure

For GBD 2020, we incorporated new exposure data sources identified through the GHDx and shared with us by collaborators. We made no updates to the systematic review conducted in 2019 for the fraction of homicides against women attributable to an intimate partner.

We included all sources that provided population-representative data on the proportion of women who have ever experienced physical or sexual violence by a current or former intimate partner. We also accepted sources reporting on the following alternate case definitions and non-reference populations:

1. Women who have ever experienced any physical IPV
2. Women who have ever experienced any sexual IPV
3. Women who have ever experienced severe physical IPV
4. Women who have experienced IPV in the past year
5. Women who have ever had an intimate partner who have experienced IPV
6. Women who currently have an intimate partner who have experienced IPV
7. Women who have experienced intimate partner violence by a spouse
8. Women who have experienced intimate partner violence by a current spouse

Table 1: Data inputs for exposure for intimate partner violence.

	Countries with data	New sources	Total sources
Exposure	142	115	712

Relative risk

We did not conduct a new systematic review for IPV relative risks in GBD 2020.

Table 2: Data inputs for relative risks for intimate partner violence.

	Countries with data	New sources	Total sources
Relative risks	7	0	9

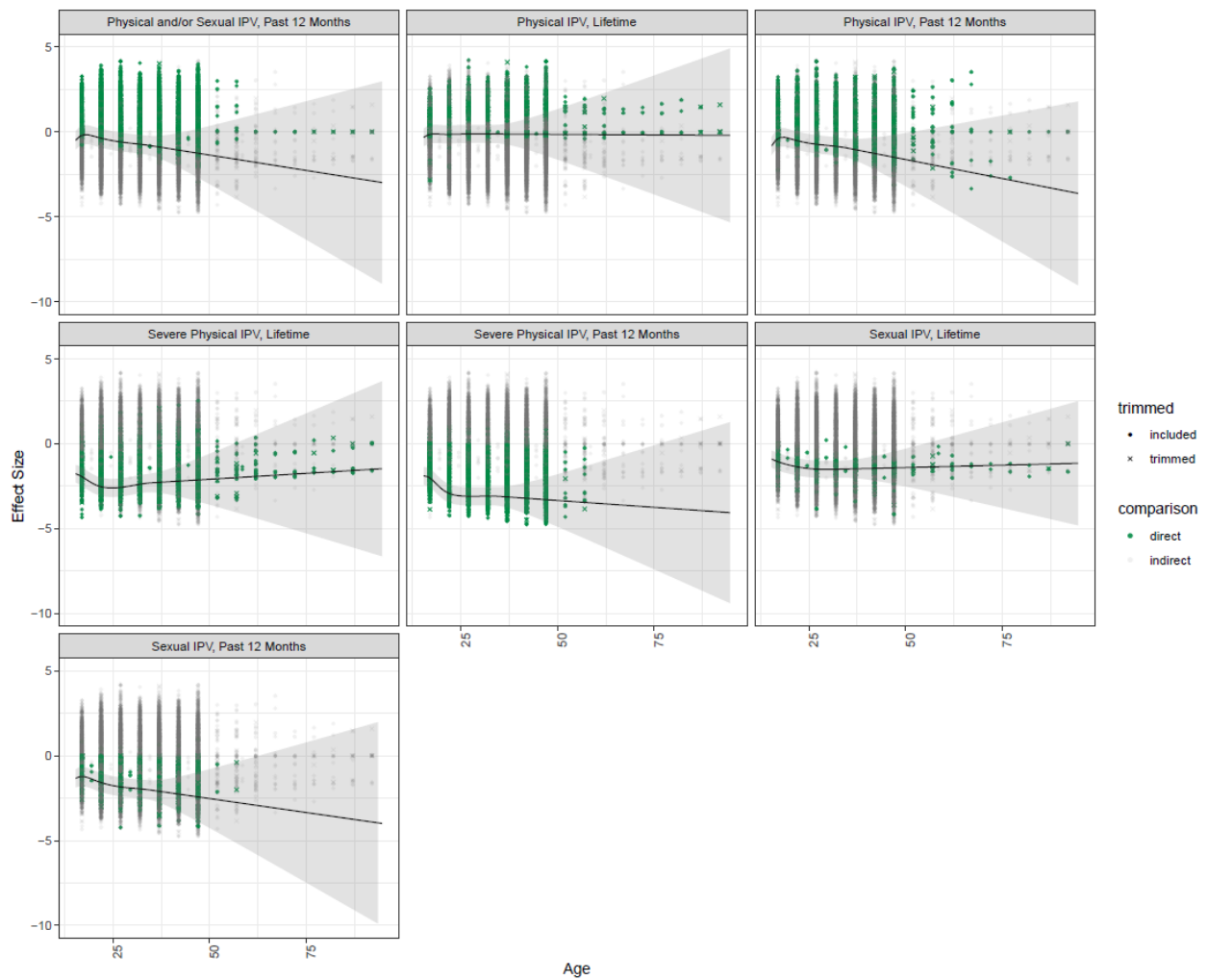
Data processing

Crosswalking

For data that reported IPV using alternate case definitions (ie, just physical, just sexual, past-year IPV), we ran a logit-difference meta-regression with the MR-BRT tool to estimate correction factors. MR-BRT is described in detail in a separate section of this appendix. Only within-study comparisons were used to

inform the meta-regression, and data from subnational locations were not used unless they were the only data available from that location (ie, in order to avoid biasing crosswalk calculations towards locations with estimates available from multiple subnational units). In comparing alternate definitions against gold-standard, it was observed that the difference between 12-month recall and lifetime recall definitions differed by abuse type (ie, the difference in 12-month and lifetime recall was larger for physical violence only definitions when compared to sexual violence only definitions). In addition, the difference between definitions varied by age of respondent (ie, the difference between 12-month and lifetime recall widens as participants get older). For these reasons, a network meta-analysis was created with a spline on age and mutually exclusive definitions (eg, recall and abuse type alternate definition adjustment factors are interactive, not additive). The model was fit using 10% trimming and priors assuming that past 12-month prevalence would be less than lifetime prevalence of the same definition type and component definition prevalence would be less than aggregate within the same recall period (ie, severe only IPV over the lifetime would be less than physical and/or sexual over the lifetime).

Figure 1. MR-BRT network meta-analysis predictions by definition type, age



Age-splitting

We split data reported in broader age groups than the GBD five-year age groups by adapting the method reported in Ng et al. to split aggregate data using a reference age pattern. We divided the data into two sets: 1) a training dataset, containing data that already fell into GBD five-year age groups, and 2) a split dataset, which contained data reported in aggregate age groups broader than GBD five-year bins. We then used spatiotemporal Gaussian process regression (ST-GPR) to estimate geography-time-specific age patterns using the training dataset. The ST-GPR model used an age-weight parameter value that minimised the effect of any age smoothing within the model. This parameter choice allowed the estimated age pattern to be driven by data rather than enforced by smoothing parameters of the model. Due to data sparsity within the training dataset, estimated geography-age patterns were aggregated to the GBD region level. The age pattern from the GBD region with the most training datapoints (south Asia) was used to adjust data reported in aggregated age groups.

Ever-partnered sample adjustment

To correct for studies reporting IPV prevalence out of only ever- or currently partnered women, we multiplied estimates from these studies by the age-specific fraction of women who had ever been partnered. We generated ever-partnered estimates using MICS and DHS data in a single parameter DisMod-MR 2.1 model to reflect the most recent data on proportion of women who have ever been partnered.

For studies restricting the perpetrator to spouses or current spouses, due to insufficient data comparing our reference and alternate populations in specific age-location-years, we refrained from calculating under-informed correction factors.

Modelling strategy

We use three distinct approaches to estimate burden attributable to IPV, including 1) the traditional exposure and relative risk (RR) to population attributable fraction (PAF) method for depression; 2) the direct PAF approach for estimating the proportion of homicides that are perpetrated by an intimate partner; and 3) a cumulative risk approach for estimating the burden of HIV/AIDS attributable to IPV.

Exposure

We used ST-GPR to model lifetime IPV prevalence. Input data were prepared by first adjusting data with alternate case definitions and then splitting data in aggregate age groups by applying modelled reference age patterns, as described above. Full details on the ST-GPR method are reported elsewhere in the appendix. Briefly, the mean function input to GPR is a complete time series of estimates generated from a mixed effects hierarchical linear model plus weighted residuals smoothed across time, space, and age. The linear model formula for IPV is:

$$\text{logit}(p_{g,a,t}) = \beta_0 + \sum_{k=1}^{18} \beta_k I_{A[a]} + \alpha_s + \alpha_r + \alpha_g + \epsilon_{g,a,t}$$

Where, $I_{A[a]}$ is a dummy variable indicating specific age group A that the prevalence point $p_{g,a,t}$ captures, and α_s , α_r , and α_g are super-region, region, and geography random intercepts, respectively. Random effects were used in model fitting but not in prediction.

Data sparsity within the IPV model caused poor model fits over time. Thus, we introduced Holt’s linear trend method (extended simple exponential smoothing) to forecast and back-cast draws from the initial ST-GPR model. Holt’s linear trend method allows forecasting of data with a linear trend using a weighted average of past observations, with weights decaying exponentially as observations get older (Hyndman et al. 2018). We applied this method to location-age-specific draws from our initial ST-GPR model, with the year range of the ST-GPR draws to be used as the initial time series defined based upon location-age data availability. For location-age combinations with available data spanning more than three years, draws were bounded from the minimum year to the maximum year of location-age-specific data. Otherwise, draws were bounded from the minimum year to the maximum year of super-region-age-specific data. To avoid over-forecasting for longer time periods (ie, in locations where only very old data were available), we used a damping parameter ($\phi=0.9$) to enforce a zero-slope linear trend over time. Finally, due to our adjustment to ST-GPR draws we needed to re-enforce consistency between subnational and national means, so we logit-raked subnational draws to fit national means for countries with subnational estimation.

Theoretical minimum-risk exposure level

The theoretical minimum-risk exposure level for IPV is zero.

Direct PAF for female homicides

The burden of homicides attributable to intimate partner violence was modelled as a direct PAF. Input data sources provided the direct measurement of proportion of homicide cases where an intimate partner was the perpetrator. A single-parameter proportion DisMod-MR 2.1 model was run on input data to estimate geography-age-specific estimates of the fraction of homicides perpetrated by an intimate partner, which were then used as PAFs for homicide outcomes.

Cumulative risk approach for PAF of HIV/AIDS due to IPV

The third and final modelling approach that we used to assess burden attributable to intimate partner violence was a cumulative risk approach to measure the burden of HIV/AIDS attributable to IPV. As we measure burden based on deaths and prevalence, we needed to quantify attributable fractions for prevalence and death rather than incidence. To get a PAF for prevalence, we needed to consider the history of exposure to IPV and the accumulated associated risk of incident HIV due to IPV, relative to the overall risk of HIV at the population level. The ratio of cumulative IPV-attributable HIV incidence to total HIV incidence was an approximation of the relevant PAF for HIV prevalence, and we assumed this PAF can also be applied to mortality.

$$\frac{\text{Cumulative HIV incidence due to IPV}}{\text{Cumulative HIV incidence overall}} = \frac{1 - \prod_{a=0}^{a=n} (1 - PAF_{ay} * I_{ay})}{1 - \prod_{a=0}^{a=n} (1 - I_{ay})}$$

where:

I = annual incidence rate of HIV

a = age (15-95)

y = year (1990-2020)

$$PAF_{HIV\ incidence} = \frac{[Prevalence\ of\ IPV]_{ay} * (IRR-1)}{[Prevalence\ of\ IPV]_{ay} * (IRR-1) + 1}$$

Relative risk

Depression

No changes were introduced to the GBD 2019 depression result. From six studies (Ackard DM et al, J Pediatr. 2007, Chowdhary et al, J Obstet Gynaecol Can 2007, Loxton D et al, J Interpers Violence 2006, Suglia SF et al, J Urban Health 2011 & Ouellet-Morin et al, Depression and anxiety 2015, Han et al, Journal of Affective Disorders 2019), the relative risk of depression was calculated as 1.54 (95% UI 1.00–2.36) using MR-BRT 2019.

HIV incidence

No changes were introduced to the GBD 2019 HIV incidence result. From two cohort studies (Jewkes et al, Lancet 2010 & Kouyoumdjian et al, AIDS 2013) the relative risk of HIV incidence was calculated as 1.60 (95% UI 1.31–1.93) using a regression with MR-BRT 2019.

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