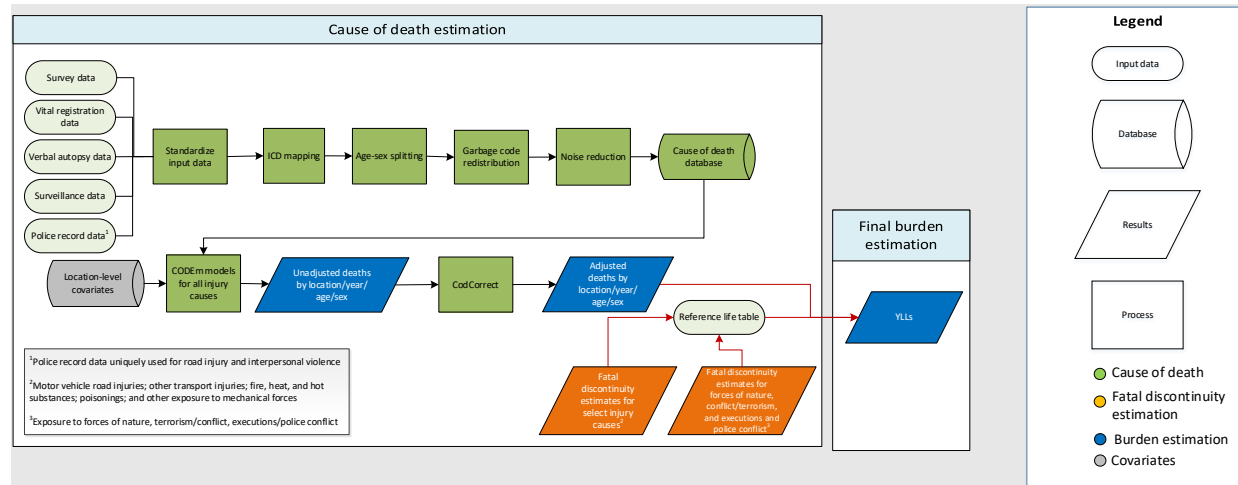


Injuries



Overview

Injuries are a Level 1 condition within the GBD hierarchy. We made estimates for 36 injuries which are grouped into three categories: transport injuries, unintentional injuries, and self-harm and interpersonal violence. The table below lists each of the injuries for which we make estimates.

Table 1: Name of 36 injuries where GBD makes fatal estimates

Transport injuries	Unintentional injuries	Self-harm and interpersonal violence
Transport injuries	Falls	Self-harm
Road injuries	Drowning	Self-harm by firearm
Pedestrian road injuries	Fire, heat, and hot substances	Self-harm by other specified means
Cyclist road injuries	Poisonings	Interpersonal violence
Motorcyclist road injuries	Poisoning by carbon monoxide	Physical violence by firearm
Motor vehicle road injuries	Poisoning by other means	Physical violence by sharp object
Other road injuries	Exposure to mechanical forces	Physical violence by other means
Other transport injuries	Unintentional firearm injuries	Conflict and terrorism
	Other exposure to mechanical forces	Executions and police conflict
	Adverse effects of medical treatment	
	Animal contact	
	Venomous animal contact	
	Non-venomous animal contact	
	Foreign body	
	Pulmonary aspiration and foreign body in airway	
	Foreign body in other body part	
	Environmental exposure to heat and cold	
	Exposure to forces of nature	
	Other unintentional injuries	

Input data

We estimated injury mortality using data from vital registration, verbal autopsy, mortality surveillance, censuses, surveys, and police record data. Police and crime reports were data sources uniquely used for the estimation of deaths from transport and road traffic injuries, and interpersonal violence. The police data were collected from published studies, national agencies, and institutional surveys such as the United Nations Crime Trends Survey and the WHO Global Status Report on Road Safety Survey. Police records were not used for countries with vital registration data unless the recorded number of road injury and interpersonal violence deaths from police records exceeded deaths in the vital registration data.

Infrequently, datapoints were marked as outliers. Outlier criteria excluded datapoints that (1) were implausibly high or low relative to global or regional patterns based on subject-matter or in-country experts, (2) substantially conflicted with established age or temporal patterns, or (3) significantly conflicted with higher-quality data sources conducted from the same locations or locations with similar characteristics (ie, Socio-demographic Index).

Modelling strategy

Overview

In GBD 2020, the standard CODEm modelling approach was applied to estimate deaths due to all causes of injury, excluding fatal discontinuities (see “Fatal discontinuities” section below). Refer to the table at the end of this section for a complete list of the cause-of-injury categories, modelling strategies, and covariate changes from GBD 2020.

GBD injury codes and categories

The International Classification of Diseases (ICD) was used to classify injuries. In GBD, injury incidence and death are defined as ICD-9 codes E000–E999 and ICD-10 chapters V to Y. There is one exception: deaths and cases of alcohol poisoning and drug overdoses are classified under drug and alcohol use disorders and modelled outside of the injury framework. Injury causes were organised into 28 mutually exclusive and collectively exhaustive external cause-of-injury categories.

Preparation of data

The preparation of cause-of-death data includes age splitting, age-sex splitting, smoothing, and outlier detection. These steps are described in detail by Naghavi et al and Lozano et al.^{1,2,3} We also found that some deaths are assigned an ICD code that links to a condition that does not lead to death (eg, senility), are overly vague and could be attributed to more than one cause of death (ie, “Exposure to unspecified factor” [X59 in ICD-10 and E887 in ICD-9]), and all undetermined intent codes (Y10-Y34 in ICD-10 and E980-E988 in ICD-9), or is an intermediate cause of death (ie, septicemia or peritonitis) or as an ill-defined and unknown cause of mortality (R99). We consider these codes as “garbage codes” and redistribute them based on methods described in GBD 1990.⁴ Approximately 1% of total deaths in countries with vital registration data are assigned to these garbage code categories.

In countries with non-detail ICD code data, cause-of-injury categories were proportionally split into sublevel cause-of-injury categories. The sublevel cause-of-injury causes were created in the CoDCorrect process. For GBD iterations of 2015, 2016, 2017, 2019, and 2020, the proportions were based on post-mortem investigation of injury deaths as described in the paper by Matzopoulos et al. 2015.⁵

We added police data for road injuries and interpersonal violence in countries with sparse or absent cause of death data even though we know from countries with near-complete vital registration data that police records tend to underestimate the true level of deaths. However, we applied police data estimates in instances where reported deaths were higher than vital registration numbers. In these select instances, we were advised by in-country experts that the police data were more complete than vital registration data.

Due to nationwide protests by the Black Lives Matter movement in the USA in 2020 and increased national attention on the epidemic of police violence against Black Americans, input data on police conflict and executions for the USA were reviewed for completeness. We determined that the USA National Vital Statistics System (NVSS) systematically under-reports deaths due to police violence by about 50% every year. In order to quantify this bias, we ran a network meta-regression on NVSS data with direct comparisons by state and year to Mapping Police Violence (MPV),⁷ an alternate open-source database that catalogs deaths due to police violence, and indirect comparisons to an additional source, Fatal Encounters (FE).⁸ We believe that they more accurately capture deaths due to police violence because of they use open-source methodologies to identify police violence deaths, rather than relying on death certificates.^{9,10,11} The regression included a fixed effect on state to capture different under-reporting rates across states but assumed that under-reporting rates are constant across age, sex, and year. Additionally, since MPV does not attempt to capture police killed by civilians and neither MPV nor FE attempts to capture executions, death counts from the FBI's Law Enforcement Officers Killed and Assaulted database and the Death Penalty Information Center (DPIC) were added to these data sources in order to conform them to the GBD definition of executions and police conflict.^{12,13} During data processing, we added police conflict deaths in USA NVSS by pulling deaths from a selection of redistribution packages and GBD causes that are likely to contain the miscoded deaths. We took away deaths from interpersonal violence and related garbage packages first, then from GBD causes falls and exposure to mechanical forces and garbage packages exposure to unspecified factor (X59) and ill-defined. These groups of causes were selected based on literature review that found homicide as the main source of miscoded police conflict deaths.^{9,14,15} Record linkage between NVSS and open-source databases has shown that interpersonal violence is the most common underlying cause of death listed on death certificates for mis-assigned police violence deaths.⁶

Injuries estimated as fatal discontinuities

Fatal discontinuity events, defined as spikes in a time series of deaths that are unexpected and introduce a "shock" of deaths that is not predictable through modelling, were estimated for ten injury causes that are also modelled in CODEm. These causes included "Other transport injuries", "Fire, heat, and hot substances", "Poisoning by other means", "Other exposure to mechanical forces", "Non-venomous animal contact", "Environmental heat and cold exposure", "Physical violence by firearm", "Physical violence by sharp object", "Physical violence by other means", and "Executions and police conflict". Final fatal discontinuity estimations for these causes were merged with CODEm results post-CoDCorrect to produce final cause of death results.

"Exposure to forces of nature," and "Conflict and terrorism" are injuries that were modelled outside of the CODEm process only using fatal discontinuity estimation. Details on the fatal discontinuity estimation process can be found in its own section of this appendix.

Vehicles - 2 wheels fraction (proportion)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Vehicles - 2+4 wheels (per capita)	1	1	1	1	1	1	1	1	1	NA	NA	NA	NA	1	1	
Vehicles - 4 wheels (per capita)	NA	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Education (years per capita)	2	-1	2 ^b	-1	2	-1	2	-1	2	-1	2	-1	2	-1	2	-1
Healthcare Access and Quality Index	2	-1	2	-1	2	-1	2	-1	2	-1	2	-1	2	-1	2	-1
LDI (I\$ per capita)	2	-1	2 ^b	-1	2	-1	2	-1	2	-1	2	-1	2	-1	2	-1
Population 15 to 30 (proportion)	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1
Population density (300-500 ppl/sqkm, proportion)	2	1	2	1	2	1	2	1	2	1	2	1	NA	NA	2	1
Population density (500-1000 ppl/sqkm, proportion)	2	1	2	1	2	1	2	1	2	1	2	1	NA	NA	2	1
Population-weighted mean temperature	2	1	2	1	2 ^c	1	2	1	2	1	2	1	2	1	2	1
Socio-demographic Index	2	-1	2 ^b	-1	2	-1	2	-1	2	-1	2	-1	3 ^e	-1	2	-1
Rainfall quintile 5 (proportion)	3	1	3 ^d	1	3	1	3	1	3	1	3	1	3	1	3	1
Log-transformed SEV scalar: Road Inj	NA	NA	1	1	NA	NA	NA	NA	NA	NA	1	1	NA	NA	1	1
Log-transformed SEV scalar: Pedest	NA	NA	NA	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Log-transformed SEV scalar: Cyclist	NA	NA	NA	NA	NA	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA
Log-transformed SEV scalar: Mot Cyc	NA	NA	NA	NA	NA	NA	NA	NA	1	1	NA	NA	NA	NA	NA	NA
Log-transformed SEV scalar: Mot Veh	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	NA	NA	NA	NA
Log-transformed SEV scalar: Oth Road	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	NA	NA
Log-transformed SEV scalar: Oth Trans	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1

a: Used at Level 1 in female models, Level 2 in males

b: Used at Level 3 in global models, Level 2 in data-rich models

c: Used at Level 1 in male data-rich model. Level 2 in other three models.

d: Not used in male global model

e: Used at Level 2 in male global model, Level 3 for the other three models

Covariate level is grouped by strong biological link (1), strong evidence of a relationship (2), or weak relationship (3). The direction indicates whether the covariate and cause of death change in the same direction (1) or opposite (-1).

Figure 2a: Transport injuries covariate influence plot



Figure 2b: Road injuries covariate influence plot



UNINTENTIONAL INJURIES

Table 3: Covariate changes from GBD 2019 to GBD 2020

ID	Cause	Modelling strategy	Covariate changes from GBD 2019
2	Unintentional injuries	Not modelled at parent cause level	
2.1	Falls	CODEm	
2.2	Drowning	CODEm	
2.3	Fire, heat, and hot substances	CODEm and fatal discontinuity estimation	
2.4	Poisonings	CODEm	
2.4.1	Poisoning by carbon monoxide	CODEm	Added: Litres of alcohol consumed per capita
2.4.2	Poisoning by other means	CODEm and fatal discontinuity estimation	Added: Litres of alcohol consumed per capita
2.5	Exposure to mechanical forces	CODEm	
2.5.1	Unintentional firearm injuries	CODEm	
2.5.2	Other exposure to mechanical forces	CODEm and fatal discontinuity estimation	
2.6	Adverse effects of medical treatment	CODEm	Dropped: Litres of alcohol consumed per capita
2.7	Animal contact	CODEm	
2.7.1	Venomous animal contact	CODEm	<p>Changed from Level 1 to Level 2: Litres of alcohol consumed per capita; Absolute value of average latitude; Population-weighted mean temperature; Rainfall population-weighted (mm/yr); Proportion of population involved in agricultural activities; Urbanicity; Sahel Region of Africa (binary) for female models and male data-rich model</p> <p>Dropped: Litres of alcohol consumed per capita for all models; Sahel Region of Africa (binary) for male global model</p>

2.7.2	Non-venomous animal contact	CODEm and fatal discontinuity estimation	<p>Changed to Level 3 for female models and male data-rich models: Elevation Over 1500m (proportion); Elevation Under 100m (proportion; Population density (over 1000 ppl/sqkm, proportion); Population density (under 150 ppl/sqkm, proportion)</p> <p>Changed to Level 1 for male global models: Population density (over 1000 ppl/sqkm, proportion); Population density (under 150 ppl/sqkm, proportion)</p>
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2.8	Foreign body	CODEm
2.8.1	Pulmonary aspiration and foreign body in airway	CODEm
2.8.2	Foreign body in other body part	CODEm
2.9	Environmental exposure to heat and cold	CODEm and fatal discontinuity estimation
2.10	Exposure to forces of nature	Fatal discontinuity estimation
2.11	Other unintentional injuries	CODEm and fatal discontinuity estimation

Table 3.1: Unintentional injuries covariate levels and directions

Covariate	Falls		Drowning		Fire, heat, and hot substances	
	Level	Directions	Level	Directions	Level	Directions
Education (years per capita)	1	-1	3	-1	3	-1
Litres of alcohol consumed per capita	1	1	NA	NA	NA	NA
Log-transformed SEV scalar: Falls	1	1	NA	NA	NA	NA
Healthcare Access and Quality Index	2	-1	NA	NA	2	-1
Population-weighted mean temperature	2	-1	1	1	1	1

Elevation over 1500m (proportion)	3	1	NA	NA	NA	NA
LDI (I\$ per capita)	3	-1	3	-1	3	-1
Socio-demographic Index	3	-1	3	-1	3	-1
Coastal population within 10km (proportion)	NA	NA	1	1	NA	NA
Landlocked nation (binary)	NA	NA	1	-1	NA	NA
Log-transformed SEV scalar: Drown	NA	NA	1	1	NA	NA
Rainfall quintile 1 (proportion)	NA	NA	1	-1	NA	NA
Rainfall quintile 5 (proportion)	NA	NA	1	1	NA	NA
Elevation under 100m (proportion)	NA	NA	2	1	NA	NA
Log-transformed SEV scalar: Fire	NA	NA	NA	NA	1	1
Indoor air pollution (all cooking fuels)	NA	NA	NA	NA	2	1
Population density (over 1000 ppl/sqkm, proportion)	NA	NA	NA	NA	2	1
Tobacco (cigarettes per capita)	NA	NA	NA	NA	2	1

Covariate level is grouped by strong biological link (1), strong evidence of a relationship (2), or weak relationship (3). The direction indicates whether the covariate and cause of death change in the same direction (1) or opposite (-1).

Table 3.2: Poisonings covariate levels and directions

Covariate	Poisonings		Poisonings by carbon monoxide		Poisoning by other means	
	Level	Directions	Level	Directions	Level	Directions
Education (years per capita)	3	-1	3	-1	3	-1
Litres of alcohol consumed per capita	NA	NA	1	1	1	1
Healthcare Access and Quality Index	2	-1	3	-1	3	-1
Population-weighted mean temperature	1	1	2	-1	1	1
Elevation over 1500m (proportion)	NA	NA	NA	NA	NA	NA
LDI (I\$ per capita)	3	-1	3	-1	3	-1
Socio-demographic Index	3	-1	3	-1	3	-1

Population density (over 1000 ppl/sqkm, proportion)	2	-1	NA	NA	NA	NA
Log-transformed SEV scalar: Poison	1	1	NA	NA	NA	NA
Opium cultivation (binary)	1	1	NA	NA	NA	NA
Population density (under 150 ppl/sqkm, proportion)	2	1	NA	NA	NA	NA
Log-transformed SEV scalar: Inj pois CO	NA	NA	1	1	NA	NA
Log-transformed SEV scalar: Inj pois oth	NA	NA	NA	NA	1	1

Covariate level is grouped by strong biological link (1), strong evidence of a relationship (2), or weak relationship (3). The direction indicates whether the covariate and cause of death change in the same direction (1) or opposite (-1).

Table 3.3: Mechanical forces covariate levels and directions

Covariate	Exposure to mechanical forces		Firearm injuries		Other exposure to mechanical forces	
	Level	Directions	Level	Directions	Level	Directions
Education (years per capita)	3	-1	3	-1	3	-1
Healthcare Access and Quality Index	2	-1	2	-1	2	-1
Population-weighted mean temperature	1	1	1	1	1	1
LDI (I\$ per capita)	3	-1	3	-1	3	-1
Socio-demographic Index	3	-1	3	-1	3	-1
Population density (over 1000 ppl/sqkm, proportion)	2	-1	3	-1	2	-1
Population density (under 150 ppl/sqkm, proportion)	2	1	2	-1	2	1
Log-transformed SEV scalar: Mech gun	NA	NA	1	1	NA	NA
Log-transformed SEV scalar: Oth mech	NA	NA	NA	NA	1	1

Covariate level is grouped by strong biological link (1), strong evidence of a relationship (2), or weak relationship (3). The direction indicates whether the covariate and cause of death change in the same direction (1) or opposite (-1).

Table 3.4: Animal contact covariate levels and directions

Covariate	Animal contact		Venomous animal contact		Non-venomous animal contact	
	Level	Directions	Level	Directions	Level	Directions

Education (years per capita)	3	-1	3	-1	3	-1
Litres of alcohol consumed per capita	1	1	NA	NA	1	1
Healthcare Access and Quality Index	2	-1	2	1	2 ^l	-1
Population-weighted mean temperature	1	1	2	1	1	1
Elevation over 1500m (proportion)	3	-1	3	-1	3 ^g	-1
LDI (I\$ per capita)	3	-1	3	-1	3	-1
Socio-demographic Index	3	-1	3	-1	3	-1
Elevation under 100m (proportion)	3	1	3	-1	3 ^g	1
Population density (over 1000 ppl/sqkm, proportion)	3	-1	3	-1	3 ^g	-1
Population density (under 150 ppl/sqkm, proportion)	3	1	3	1	3 ^g	1
Log-transformed SEV scalar: Animal	1	1	NA	NA	NA	NA
Population 15 to 30 (proportion)	2	1	NA	NA	NA	NA
Log-transformed SEV scalar: Venom	NA	NA	1	1	NA	NA
Mean number of venomous snake species	NA	NA	1	1	NA	NA
Proportion of population vulnerable to snake species	NA	NA	1	1	NA	NA
Absolute value of average latitude	NA	NA	2	-1	NA	NA
Rainfall population-weighted (mm/yr)	NA	NA	2	1	NA	NA
Proportion of population involved in agricultural activities	NA	NA	2	1	NA	NA
Sahel region of Africa (binary)	NA	NA	2 ^d	1	NA	NA
Urbanicity	NA	NA	2	-1	NA	NA
Log-transformed SEV scalar: Non ven	NA	NA	NA	NA	1	1

d: Not used in male global model

g: Used at Level 1 in male global model, Level 3 for the other three models

l: Used at Level 3 in male global model

Covariate level is grouped by strong biological link (1), strong evidence of a relationship (2), or weak relationship (3). The direction indicates whether the covariate and cause of death change in the same direction (1) or opposite (-1).

Table 3.5: Foreign body covariate levels and directions

Covariate	Foreign body		Pulmonary aspiration and foreign body in airway		Foreign body in other body part	
	Level	Directions	Level	Directions	Level	Directions
Education (years per capita)	1	1	1 ^j	-1	3	-1
Litres of alcohol consumed per capita	1	1	1	1	1	1
Healthcare Access and Quality Index	2	-1	2	-1	2	-1
Population-weighted mean temperature	1	1	1	1	1	1
LDI (I\$ per capita)	1	1	3	-1	3	-1
Socio-demographic Index	3	-1	3	-1	3	-1
Indoor air pollution (all cooking fuels)	1	1	NA	NA	NA	NA
Population over 65 (proportion)	1	1	NA	NA	NA	NA
Log-transformed SEV scalar: Foreign body asp	NA	NA	1	1	NA	NA
Alcohol binge drinker proportion, age-standardised	NA	NA	2 ^k	1	NA	NA
Mean BMI	NA	NA	2	1	NA	NA
Log-transformed SEV scalar: Other foreign body	NA	NA	NA	NA	1	1

j: Used at Level 3 in the female global model

k: Only used in the female global model

Covariate level is grouped by strong biological link (1), strong evidence of a relationship (2), or weak relationship (3). The direction indicates whether the covariate and cause of death change in the same direction (1) or opposite (-1).

Table 3.6: Other unintentional injuries covariates level and directions

Covariate	Adverse effects of medical treatment		Other unintentional injuries		Environmental exposure to heat and cold	
	Level	Directions	Level	Directions	Level	Directions
Education (years per capita)	1	-1	3	-1	3	-1
Healthcare Access and Quality Index	2	-1	1 ^d	1	2	-1
Population-weighted mean temperature	1	1	2	-1	3	1

LDI (I\$ per capita)	3	1	1 ^d	1	3	-1
Socio-demographic Index	3	-1	3	-1	3	-1
Population density (over 1000 ppl/sqkm, proportion)	NA	NA	3	-1	NA	NA
Population density (under 150 ppl/sqkm, proportion)	NA	NA	3	-1	NA	NA
Log-transformed SEV scalar: Oth unint	NA	NA	3	1	NA	NA
Vehicles - 2 wheels (per capita)	NA	NA	1	1	NA	NA
Vehicles - 4 wheels (per capita)	NA	NA	1	1	NA	NA
Elevation over 1500m (proportion)	NA	NA	1	1	3	1
90th percentile climatic temperature in the given country-year	NA	NA	NA	NA	3	1
Elevation 500 to 1500m (proportion)	NA	NA	NA	NA	3	1
Population density (150-300 ppl/sqkm, proportion)	NA	NA	NA	NA	3	-1
Rainfall (quintiles 4-5)	NA	NA	NA	NA	3	1
Sanitation (proportion with access)	NA	NA	NA	NA	3	-1

d: Not used in male global model

Covariate level is grouped by strong biological link (1), strong evidence of a relationship (2), or weak relationship (3). The direction indicates whether the covariate and cause of death change in the same direction (1) or opposite (-1).

Figure 3a: Drowning covariate influence plot

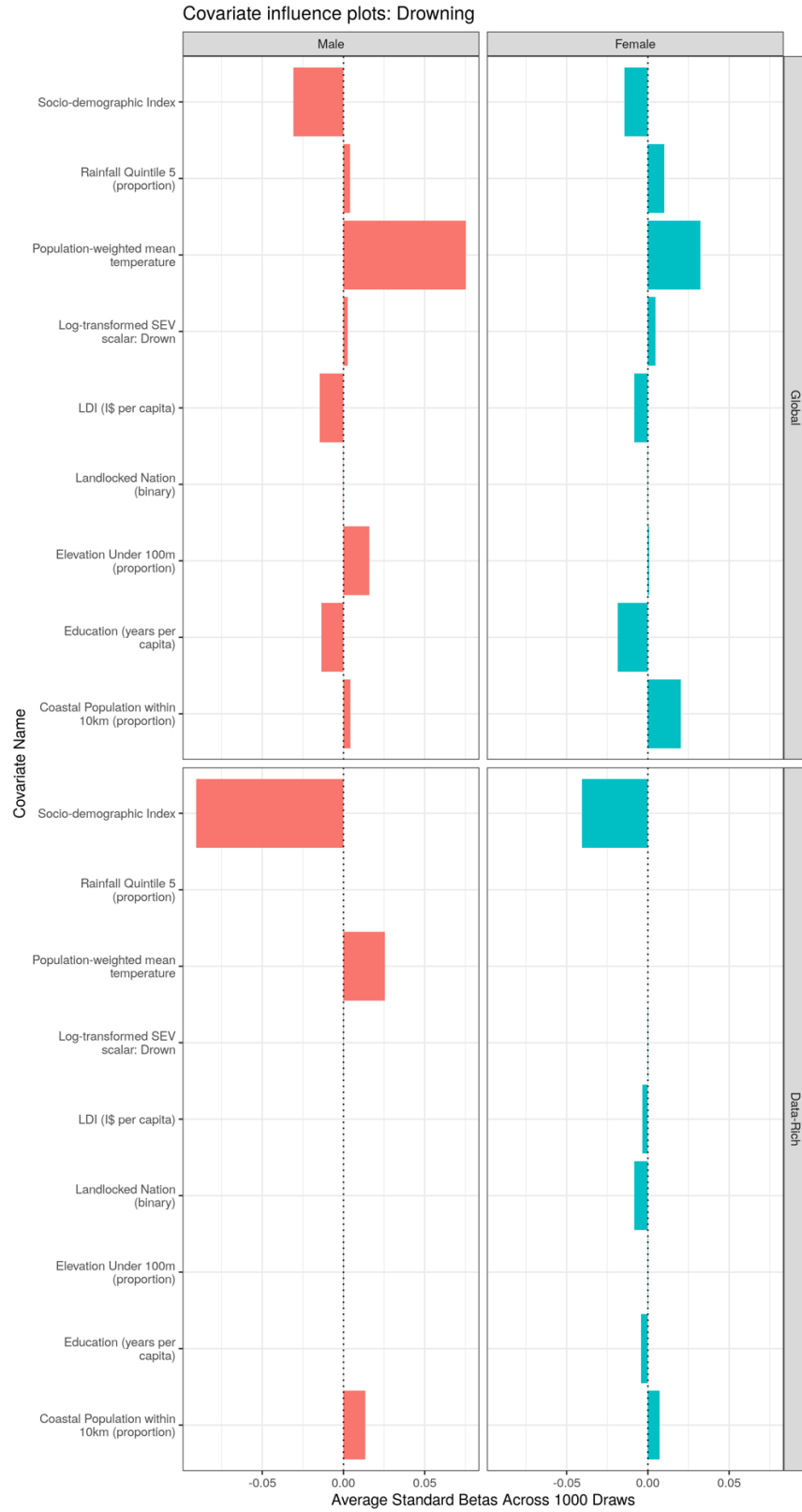


Figure 3b: Falls covariate influence plot

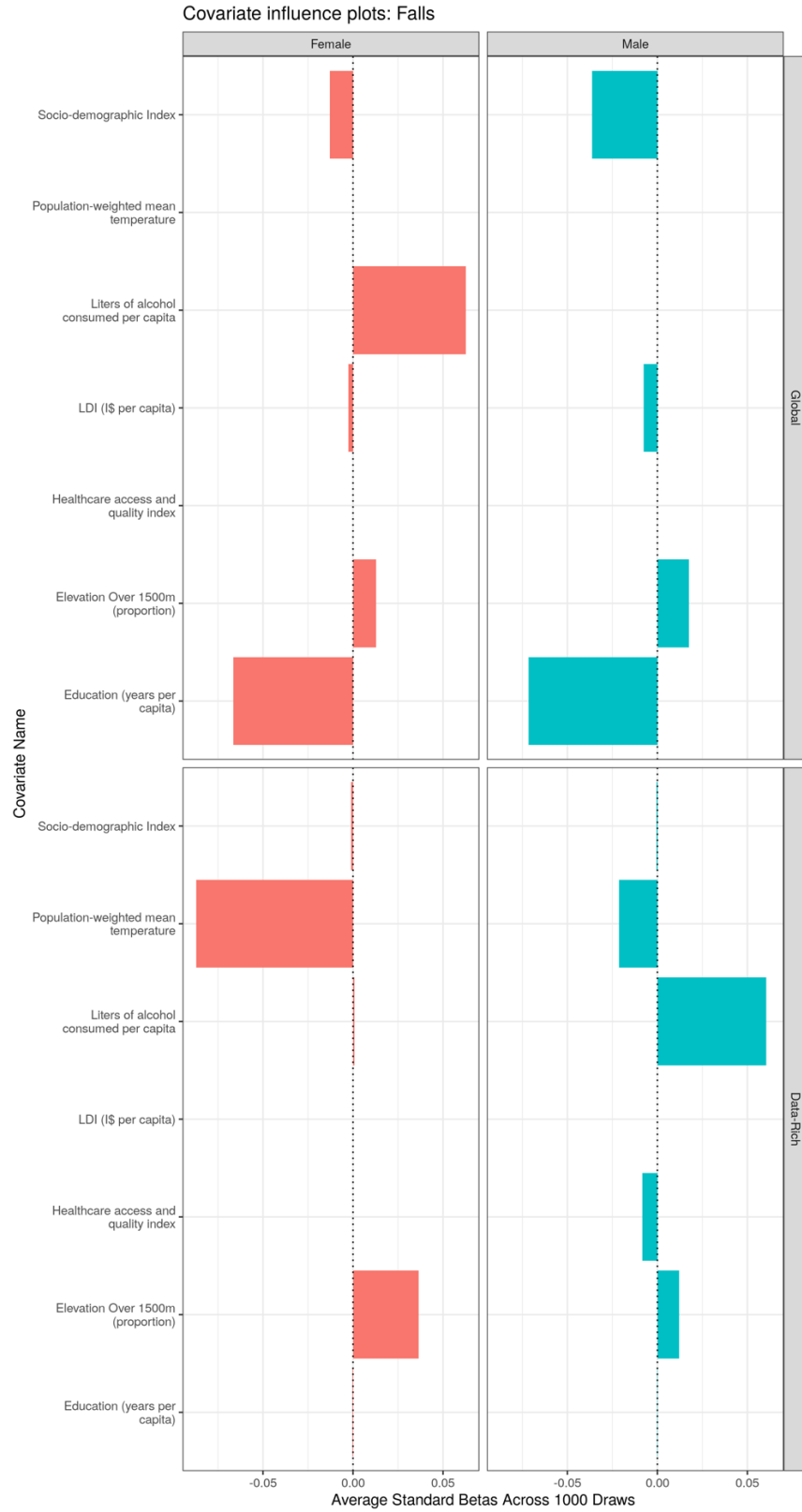


Figure 3c: Fire, heat, and hot substances covariate influence plot

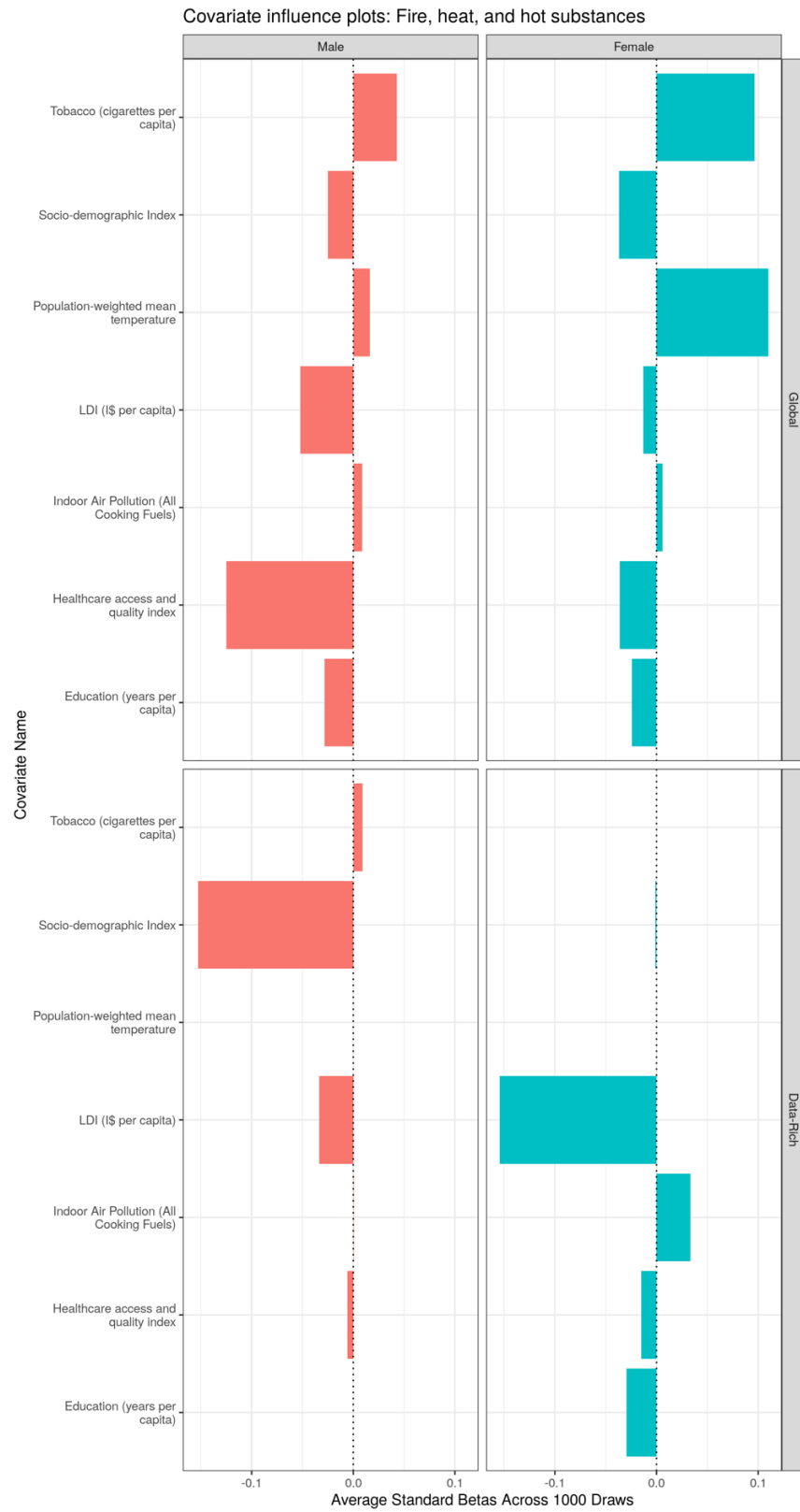


Figure 3d: Poisonings covariate influence plot

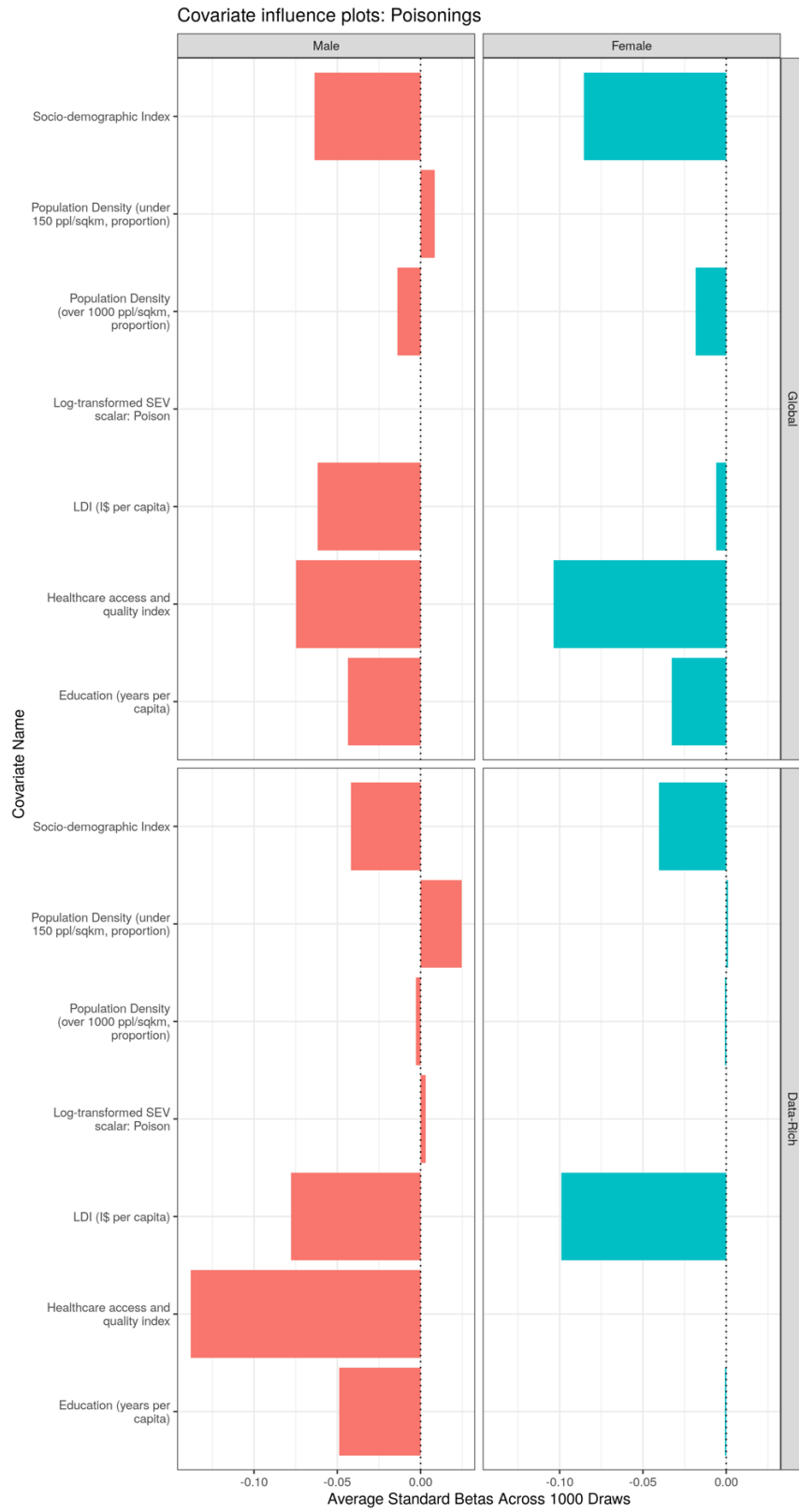


Figure 3e: Exposure to mechanical forces covariate influence plot

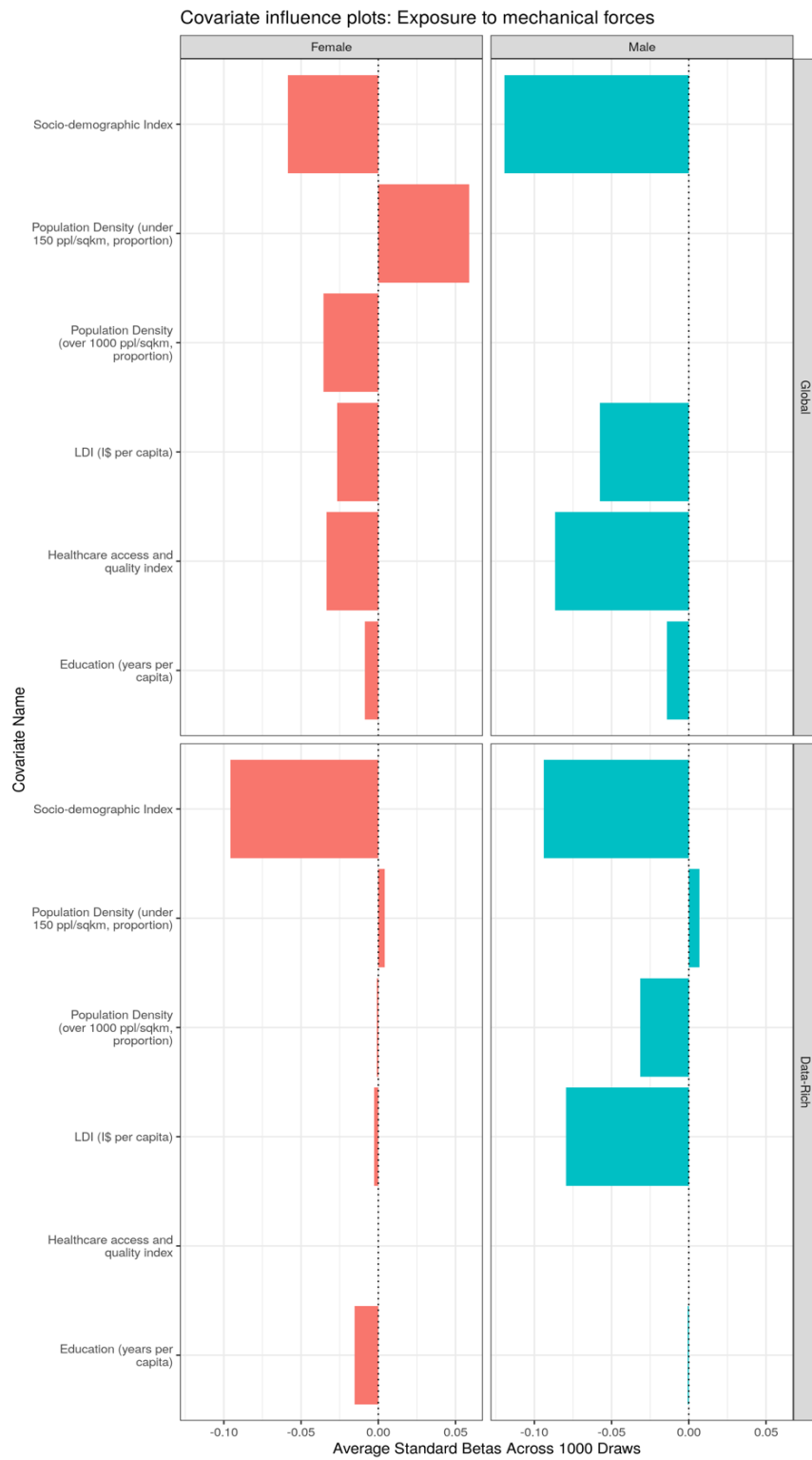


Figure 3f: Animal contact covariate influence plot

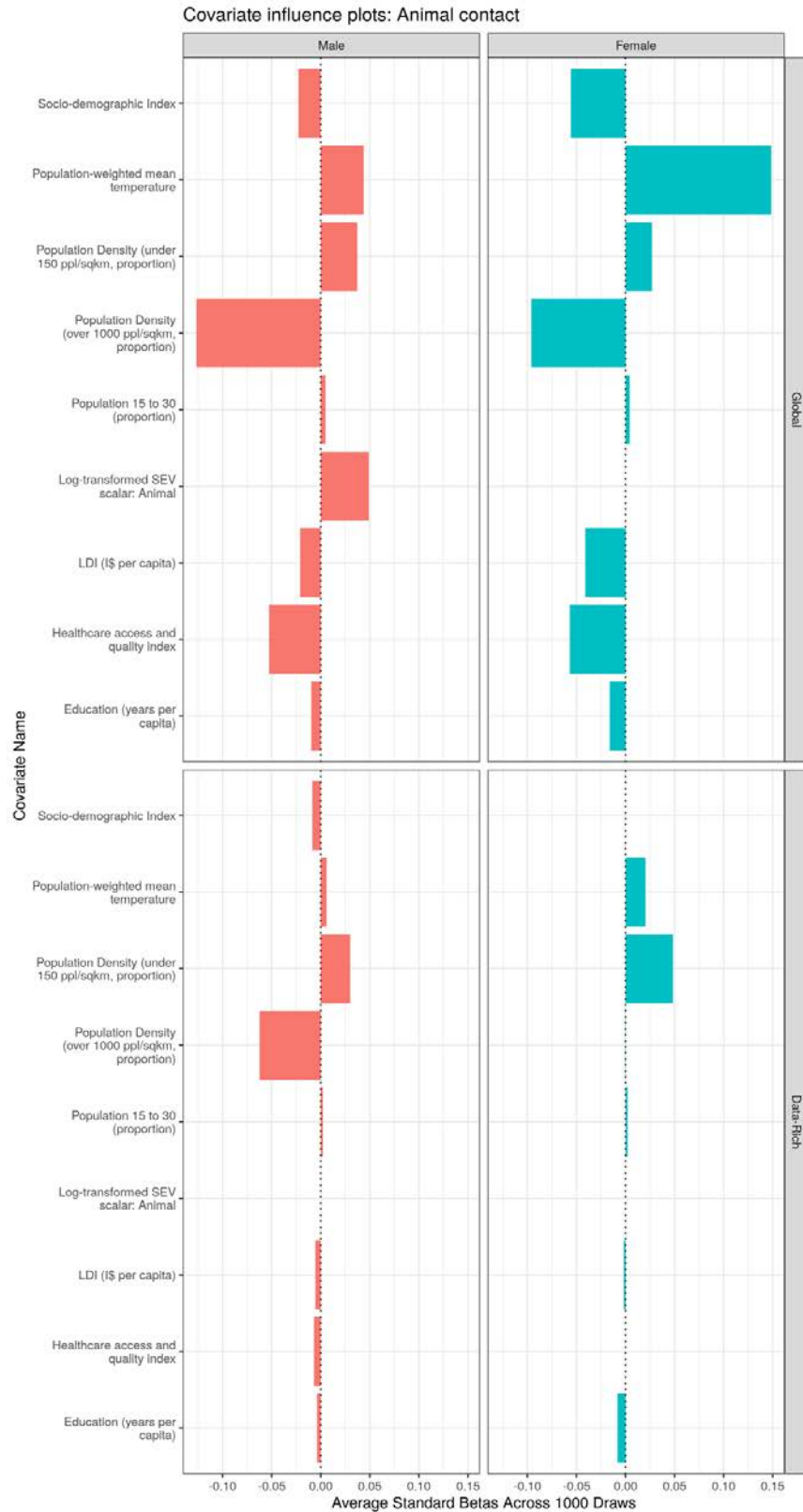


Figure 3g: Foreign body covariate influence plot

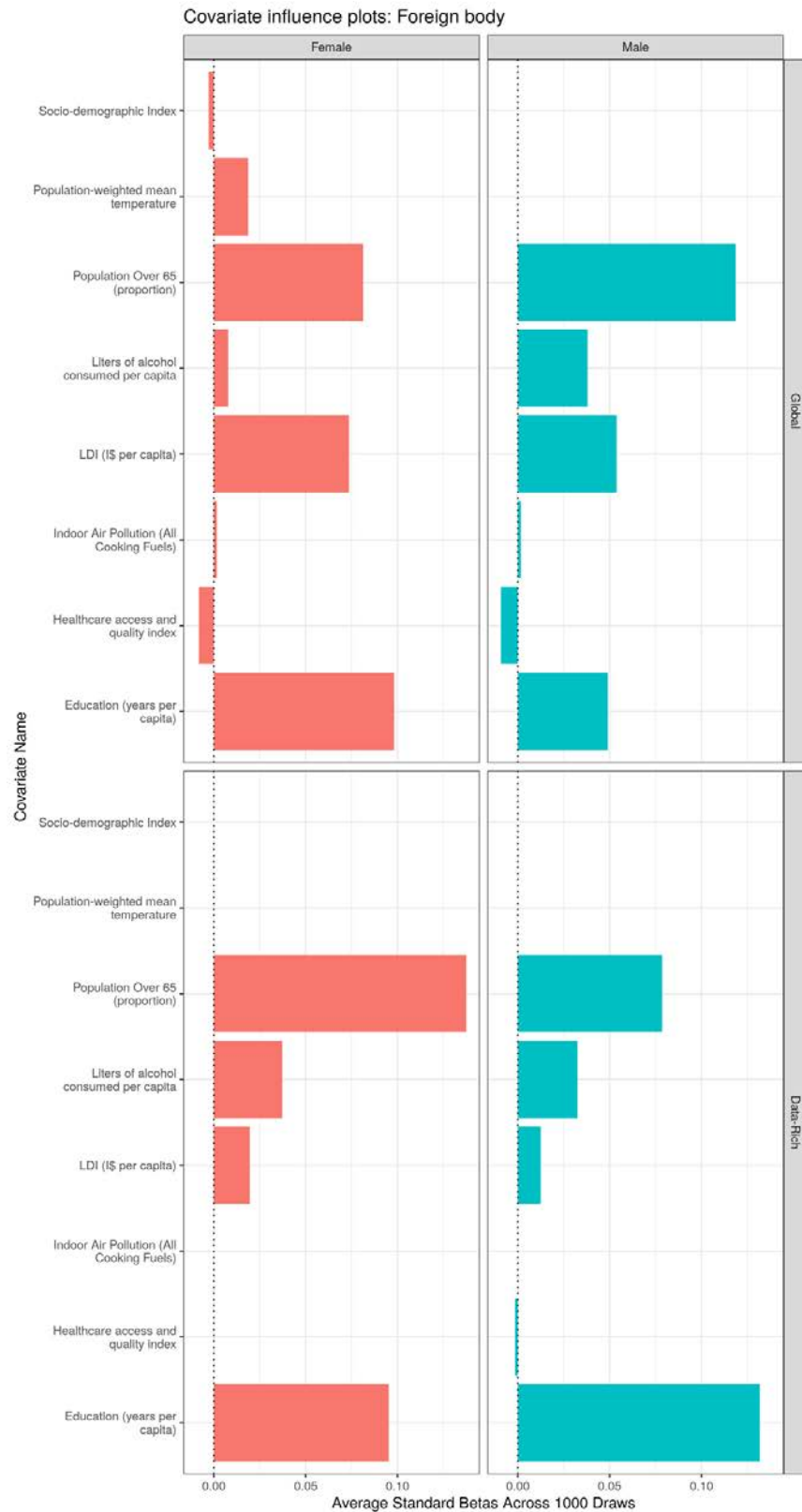


Figure 3h: Other unintentional injuries covariate influence plot

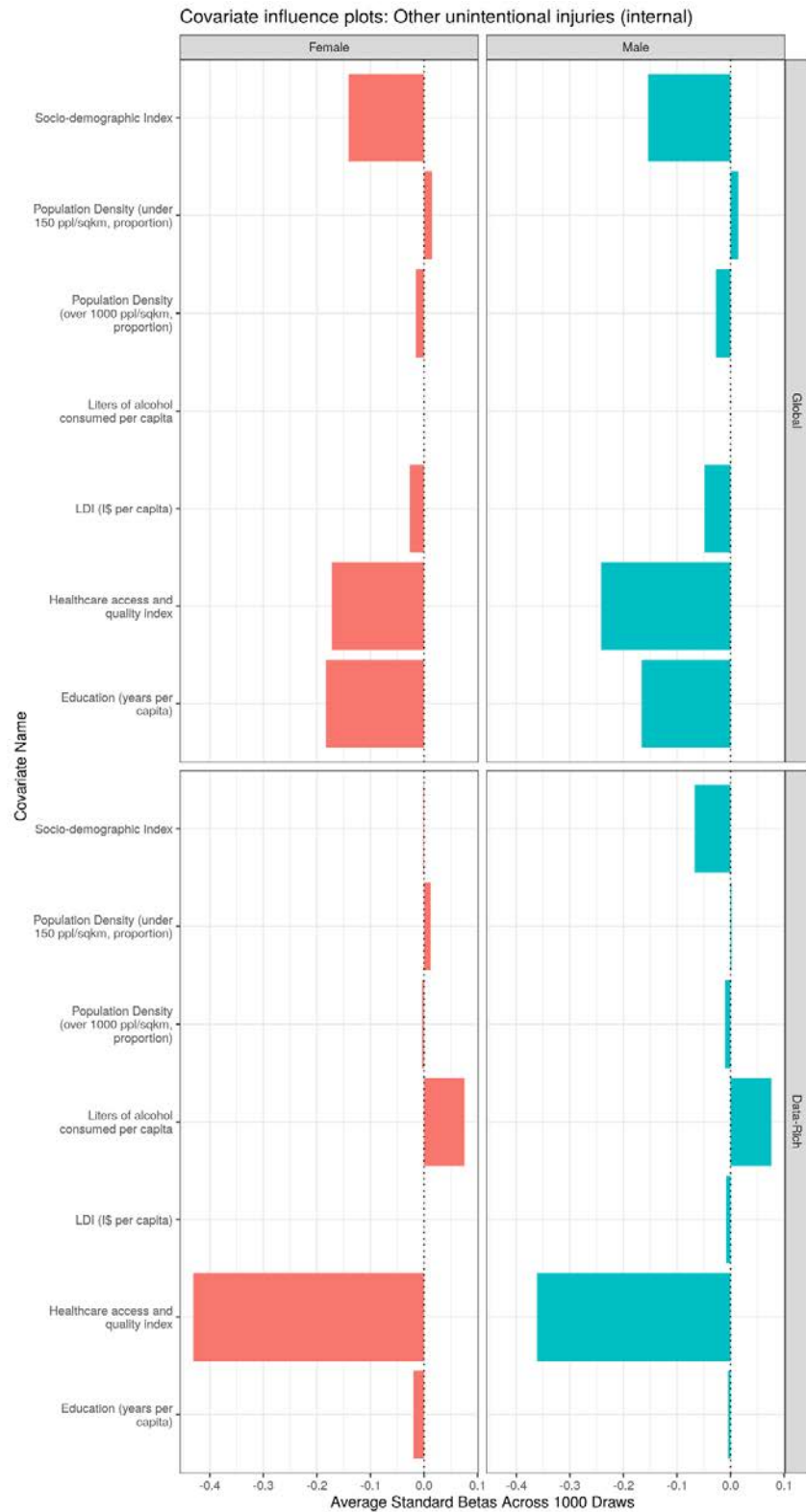
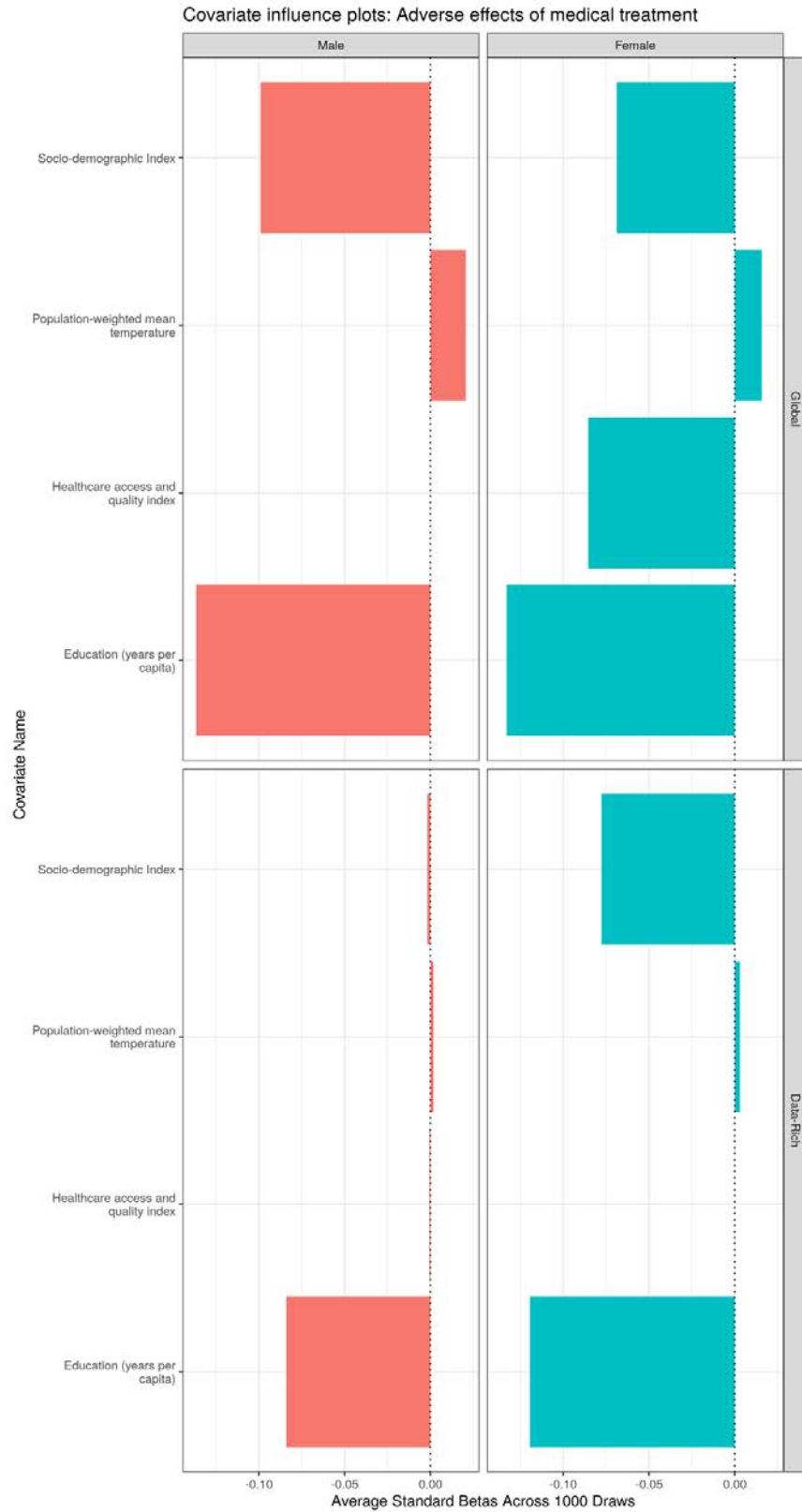


Figure 3i: Adverse effects of medical treatment covariate influence plot



SELF-HARM AND INTERPERSONAL VIOLENCE

Table 4: Covariate changes from GBD 2019 to GBD 2020

ID	Cause	Modelling strategy	Covariate changes from GBD 2019
3	Self-harm and interpersonal violence	Not modelled at parent cause level	
3.1	Self-harm	CODEm	
3.1.1	Self-harm by firearm	CODEm	
3.1.2	Self-harm by other specified means	CODEm	
3.2	Interpersonal violence	CODEm	Dropped: Opium cultivation (binary)
3.2.1	Physical violence by firearm	CODEm and fatal discontinuity estimation	Dropped: Opium cultivation (binary)
3.2.2	Physical violence by sharp object	CODEm and fatal discontinuity estimation	Dropped: Opium cultivation (binary)
			Changed to Level 1 in female global model: Population-weighted mean temperature
			Changed to Level 2 in female data-rich model: Population-weighted mean temperature
3.2.3	Physical violence by other means	CODEm and fatal discontinuity estimation	Dropped: Opium cultivation (binary)
3.3	Conflict and terrorism	Fatal discontinuity estimation	
3.4	Executions and police conflict	CODEm and fatal discontinuity estimation	

Table 4.1. Self-harm covariate levels and directions

Covariate	Self-harm		Self-harm by firearm		Other specified means	
	Level	Direction	Level	Direction	Level	Direction
12-month non-partner sexual violence	1	1	1	1	1	1
Litres of alcohol consumed per capita	1	1	1	1	1	1
Log-transformed SEV scalar: Self-harm	1 ^h	1	1	1	1	1
Major depressive disorder	1	1	1	1	1	1
Muslim religion (proportion of population)	1 ⁱ	1	NA	NA	NA	NA
Population-weighted mean temperature	1	1	1	1	1	1
Healthcare Access and Quality Index	2	-1	2	-1	2	-1
Population density (150-300 ppl/sqkm, proportion)	2	1	2	1	2	1
Population density (300-500 ppl/sqkm, proportion)	2	-1	2	-1	2	-1
Population density (500-1000 ppl/sqkm, proportion)	2	-1	2	-1	2	-1
Population density (over 1000 ppl/sqkm, proportion)	2	-1	2	-1	2	-1
Population density (under 150 ppl/sqkm, proportion)	2	1	2	1	2	1
Education (years per capita)	3	-1	3	-1	3	-1
LDI (I\$ per capita)	3	-1	3	-1	3	-1
Socio-demographic Index	3	-1	3	-1	3	-1

h: Only used in female models

i: Used at Level 2 in male global model, used at Level 1 in male data-rich model. Not used in female model.

Covariate level is grouped by strong biological link (1), strong evidence of a relationship (2), or weak relationship (3). The direction indicates whether the covariate and cause of death change in the same direction (1) or opposite (-1).

Table 4.2: Interpersonal violence covariate level and directions

Covariate	Interpersonal violence		Execution and police conflict	
	Level	Direction	Level	Direction
Litres of alcohol consumed per capita	NA	NA	1	1
Log-transformed SEV scalar: Self harm	1	1	NA	NA
Healthcare Access and Quality Index	1	1	2	-1
Population density (150-300 ppl/sqkm, proportion)	2	-1	1	1
Population density (over 1000 ppl/sqkm, proportion)	NA	NA	2	1
Population density (under 150 ppl/sqkm, proportion)	2	1	NA	NA
Education (years per capita)	NA	NA	3	1
LDI (I\$ per capita)	3	-1	3	-1
Socio-demographic Index	3	-1	3	-1
Education relative inequality (Gini)	3	-1	1s	1
Log-transformed SEV scalar: Violence	1	1	NA	NA
Population 15 to 30 males (proportion)	1	1	1	1
Log-transformed SEV scalar: Viol gun	1	1	NA	NA

Covariate level is grouped by strong biological link (1), strong evidence of a relationship (2), or weak relationship (3). The direction indicates whether the covariate and cause of death change in the same direction (1) or opposite (-1).

Table 4.3: Physical violence covariate level and directions

Covariate	Physical violence by firearm		Physical violence by sharp object		Physical violence by other means	
	Level	Direction	Level	Direction	Level	Direction
Litres of alcohol consumed per capita	1	1	1	1	1	1
Population-weighted mean temperature	1	1	1 ^f	1	1	1
Healthcare Access and Quality Index	2	-1	2	-1	2	-1
Population density (over 1000 ppl/sqkm, proportion)	2	1	2	1	2	1

Education (years per capita)	3	-1	3	-1	3	-1
LDI (I\$ per capita)	3	-1	3	-1	3	-1
Socio-demographic Index	3	-1	3	-1	3	-1
Education relative inequality (Gini)	1	1	1	1	1	1
Population 15 to 30 males (proportion)	1	1	1	1	1	1
Log-transformed SEV scalar: Viol gun	1	1	NA	NA	NA	NA
Log-transformed SEV scalar: Viol knife	NA	NA	1	1	NA	NA
Log-transformed SEV scalar: Oth viol	NA	NA	NA	NA	1	1

f: Not used in female global model

Covariate level is grouped by strong biological link (1), strong evidence of a relationship (2), or weak relationship (3). The direction indicates whether the covariate and cause of death change in the same direction (1) or opposite (-1).

Figure 4a: Self-harm covariate influence plot

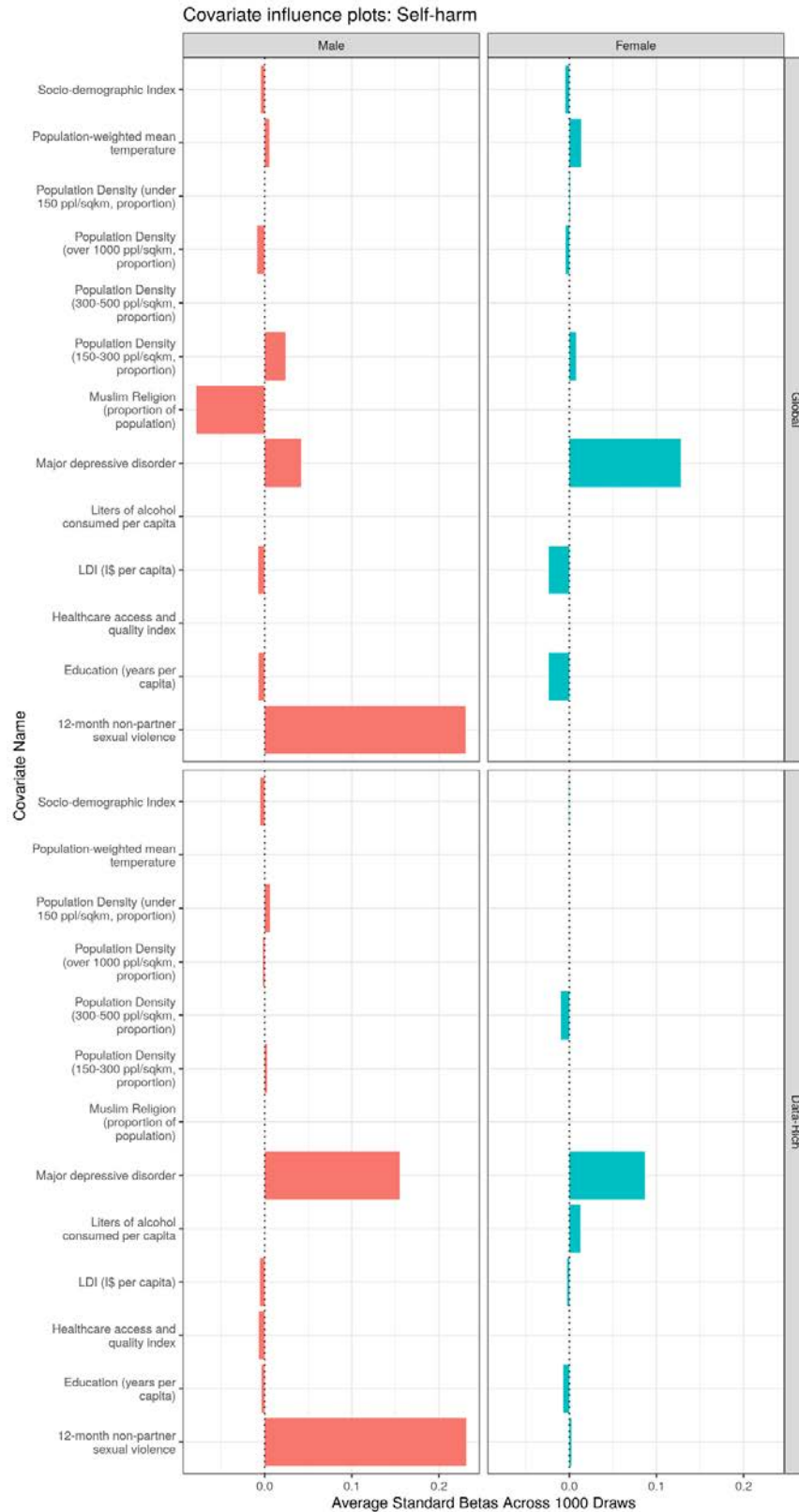


Figure 4b: Interpersonal violence covariate influence plot

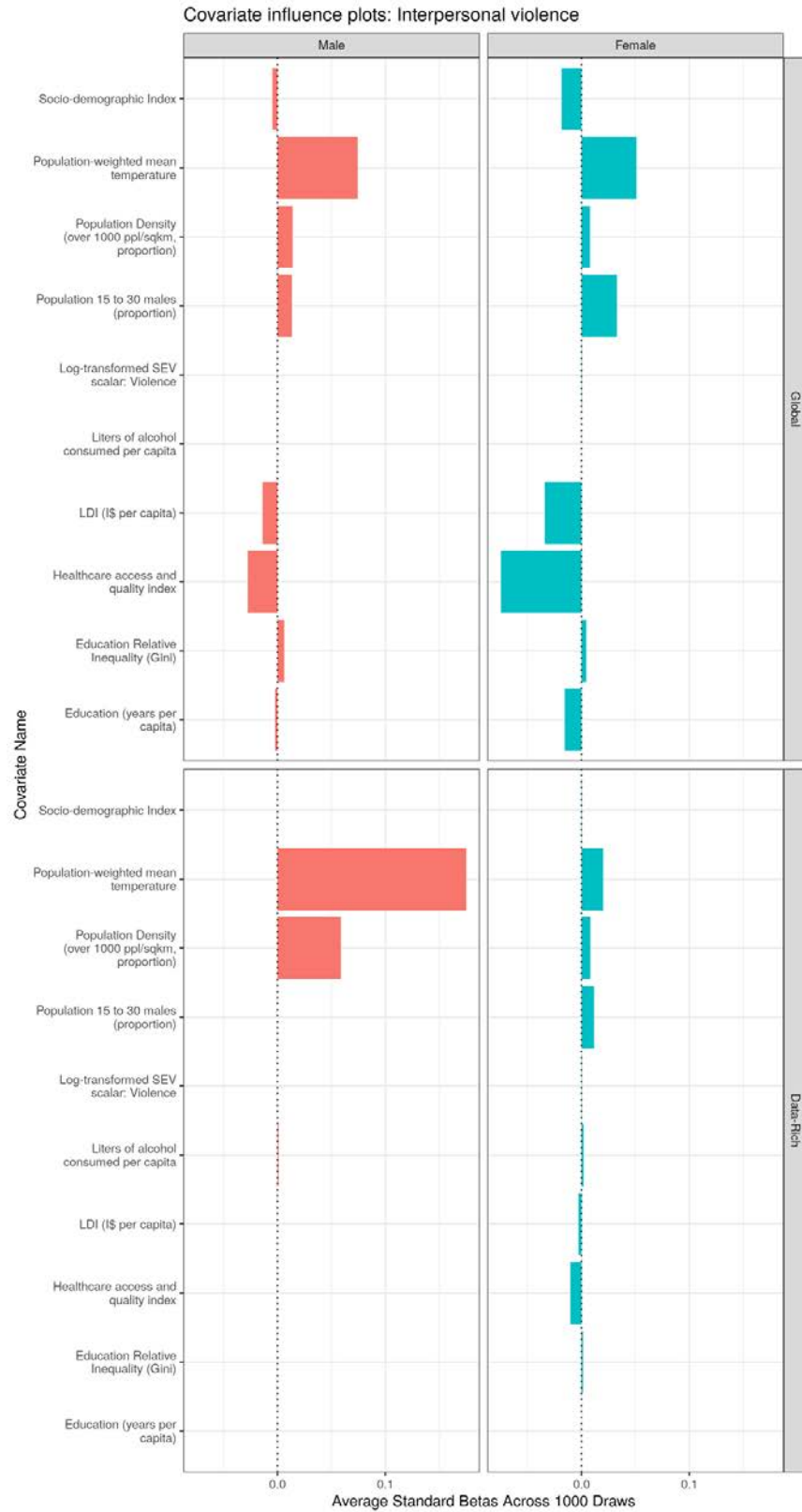


Figure 4c: Environmental heat and cold exposure covariate influence plot

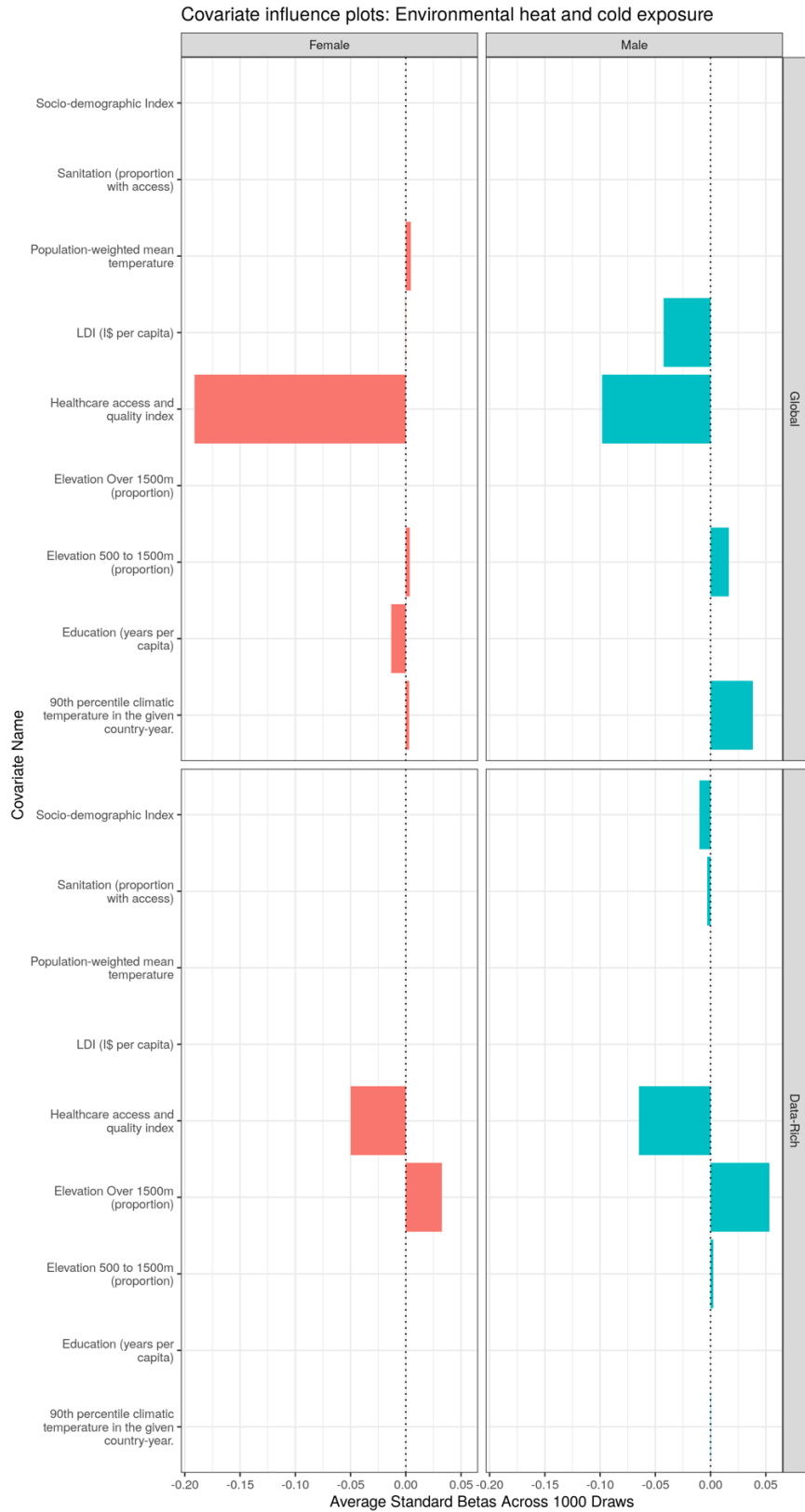
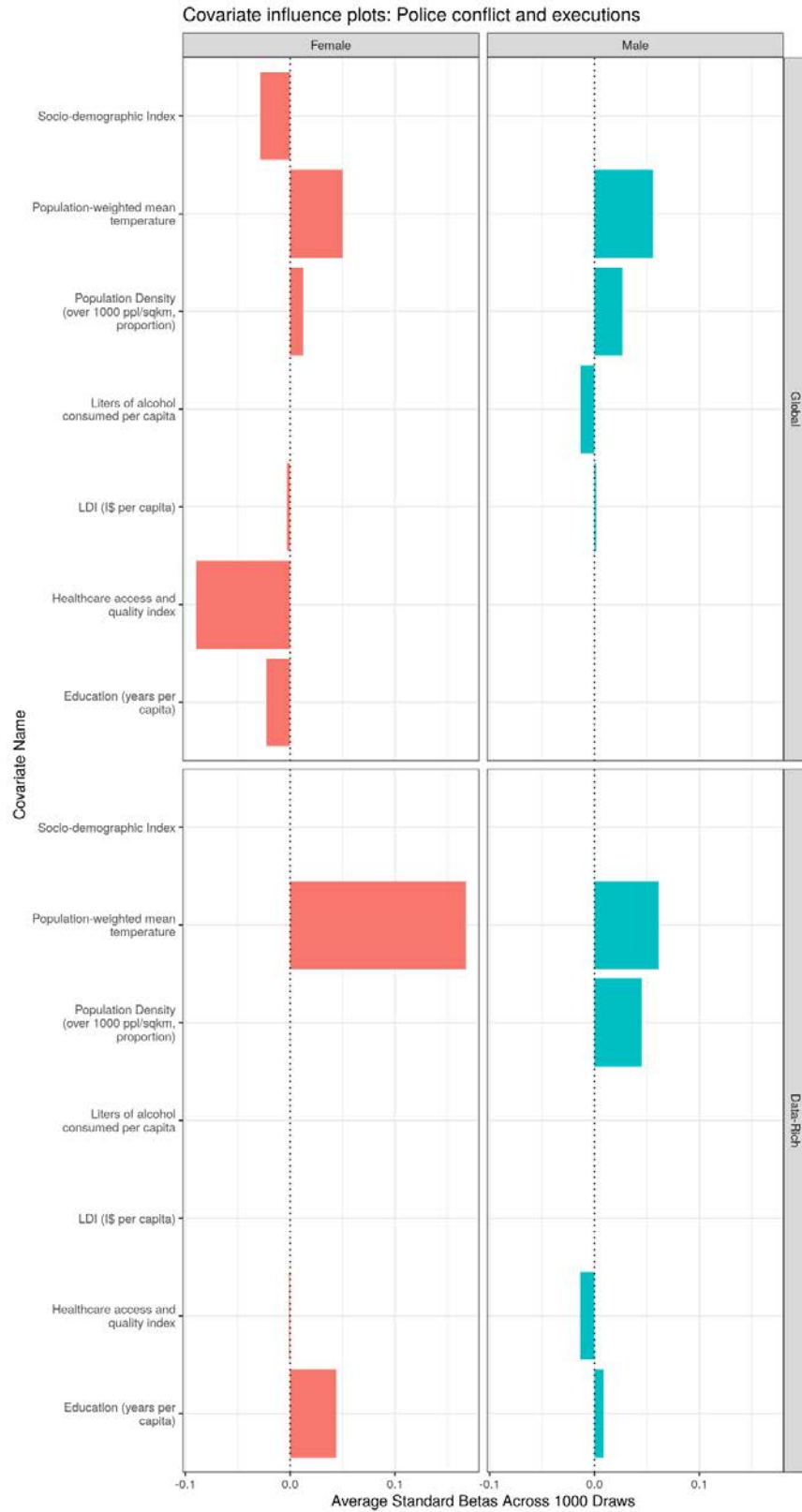


Figure 4d: Police conflict and executions covariate influence plot



Covariate levels and direction superscript

a: Used at Level 1 in female models, Level 2 in males.

b: Used at Level 3 in global models, Level 2 in data-rich models.

c: Used at Level 1 in male data-rich model. Level 2 in other three models.

d: Not used in male global model.

e: Used at Level 2 in male global model, Level 3 for the other three models.

f: Not used in female global model.

g: Used at Level 1 in male global model, Level 3 for the other three models.

h: Only used in female models.

i: Used at Level 2 in male global model, used at Level 1 in male data-rich model. Not used in female model.

j: Used at Level 3 in the female global model.

k: Only used in the female global model.

l: Used at Level 3 in male global model.

m: Not used in global models.

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