

Conventional MAIHDA — ACIC 2022 Track 1

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Table 1: Data frame (excerpt): level-2 stratum id, level-1 id, response and level-2 covariates

stratum_id	id.patient	Y	sex	V2_band	plan	V1_band	V4_band	y
161	1	378.8274	Sex: Male	Comorbidity: 0–1	Plan: B	Risk: Low (Q1)	Deprivation: High	1
161	1	634.0839	Sex: Male	Comorbidity: 0–1	Plan: B	Risk: Low (Q1)	Deprivation: High	2
161	1	654.8388	Sex: Male	Comorbidity: 0–1	Plan: B	Risk: Low (Q1)	Deprivation: High	3
161	1	664.2329	Sex: Male	Comorbidity: 0–1	Plan: B	Risk: Low (Q1)	Deprivation: High	4
181	2	302.2389	Sex: Male	Comorbidity: 4–5	Plan: B	Risk: High (Q3)	Deprivation: High	1
181	2	296.0461	Sex: Male	Comorbidity: 4–5	Plan: B	Risk: High (Q3)	Deprivation: High	2
181	2	308.6708	Sex: Male	Comorbidity: 4–5	Plan: B	Risk: High (Q3)	Deprivation: High	3
181	2	335.5608	Sex: Male	Comorbidity: 4–5	Plan: B	Risk: High (Q3)	Deprivation: High	4

Table 2: Observed stratum means — Top five

rank	stratum_id	sex	comorbidity	plan	risk	deprivation	size
284	187	Sex: Male	Comorbidity: 6–7	Plan: B	Risk: Medium (Q2)	Deprivation: High	436 19
285	258	Sex: Female	Comorbidity: 0–1	Plan: C	Risk: Low (Q1)	Deprivation: High	2229 19
286	259	Sex: Male	Comorbidity: 0–1	Plan: C	Risk: Medium (Q2)	Deprivation: High	637 19
287	185	Sex: Male	Comorbidity: 6–7	Plan: B	Risk: Low (Q1)	Deprivation: High	650 19
288	288	Sex: Female	Comorbidity: 6–7	Plan: C	Risk: Very High (Q4)	Deprivation: High	440 21

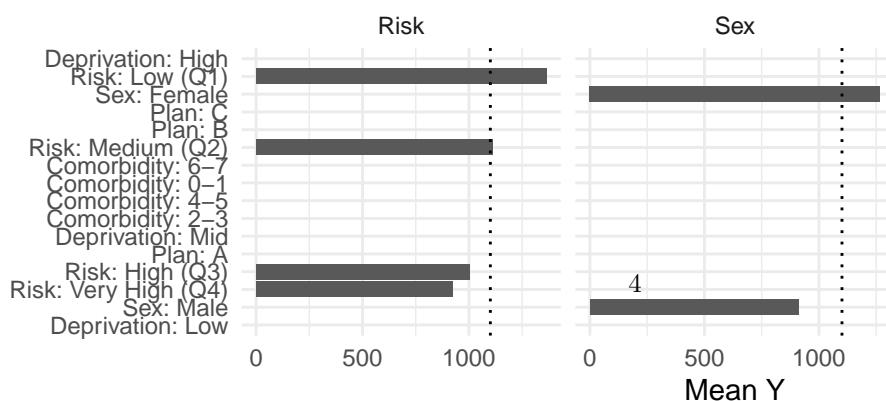
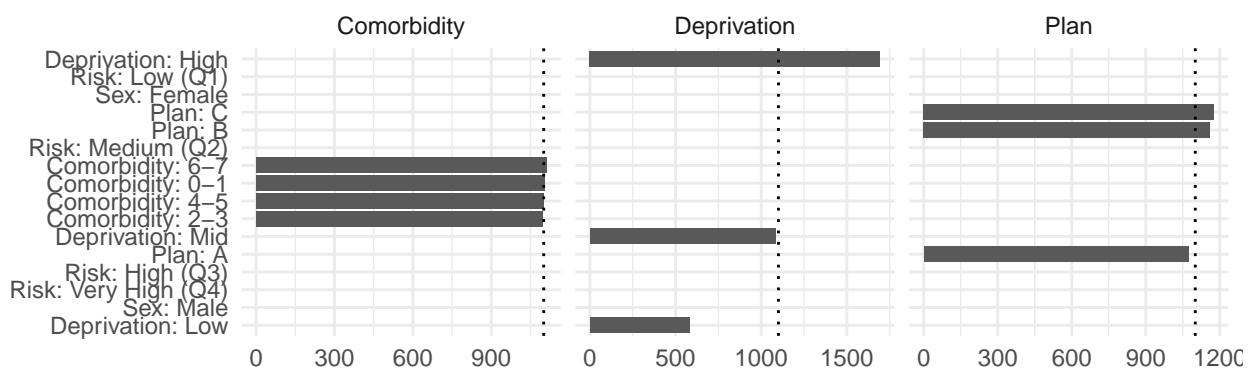
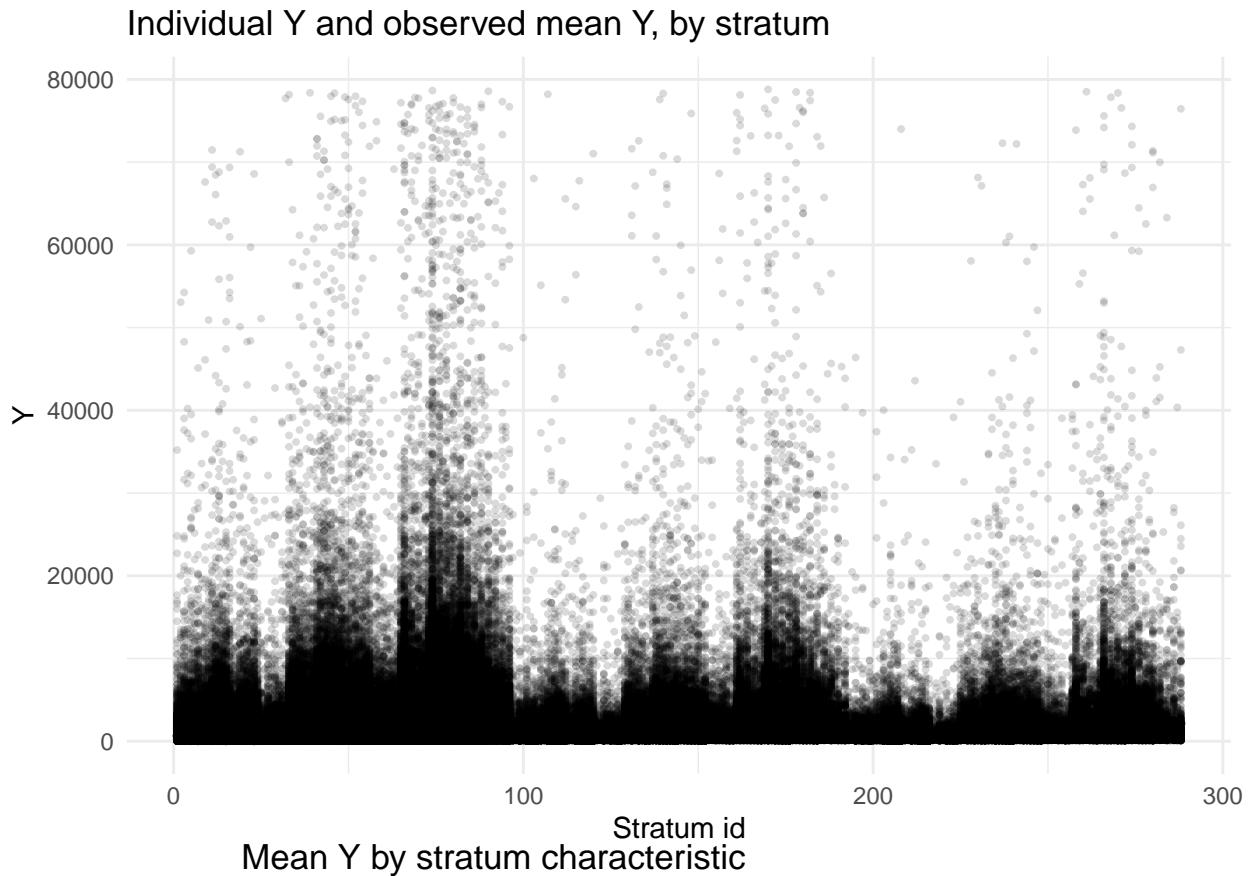
Table 3: Observed stratum means — Bottom five

rank	stratum_id	sex	comorbidity	plan	risk	deprivation	size
1	15	Sex: Male	Comorbidity: 2–3	Plan: A	Risk: Very High (Q4)	Deprivation: Low	30489 474.
2	23	Sex: Male	Comorbidity: 4–5	Plan: A	Risk: Very High (Q4)	Deprivation: Low	18774 476.
3	31	Sex: Male	Comorbidity: 6–7	Plan: A	Risk: Very High (Q4)	Deprivation: Low	5994 477.
4	7	Sex: Male	Comorbidity: 0–1	Plan: A	Risk: Very High (Q4)	Deprivation: Low	16070 484.
5	21	Sex: Male	Comorbidity: 4–5	Plan: A	Risk: High (Q3)	Deprivation: Low	16441 502.

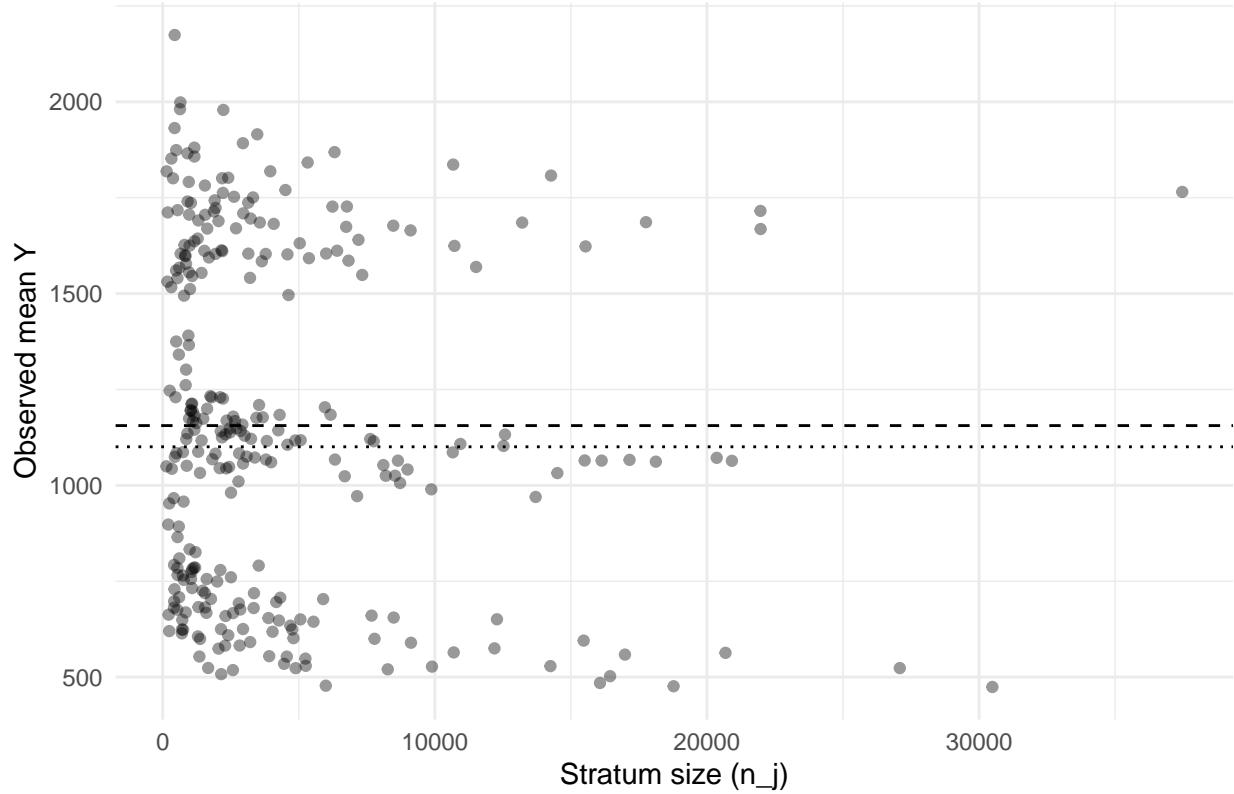
1 Load and merge ACIC Track 1

2 Recode to readable, teaching-friendly labels (strata inputs)

3 Descriptives



Observed stratum mean vs stratum size



4 Tutorial *Empty* and *Full* models (with VPC and PCV)

\begin{table}

\caption{Tutorial-style VPC and variances; PCV (empty \rightarrow full) = 99.6%}

model	VPC	Between-stratum variance	Residual variance
Empty: $1 + (1 \text{strata})$	0.0292	187216.235	6224331
Full: main effects + (1strata)	0.0001	783.827	6224495

\end{table}

Table 4: Variance Partition Coefficients for Model B

quantity	value
VPC (canonical, strata and residual only)	1e-04
VPC (design-faithful, all random parts)	1e-04

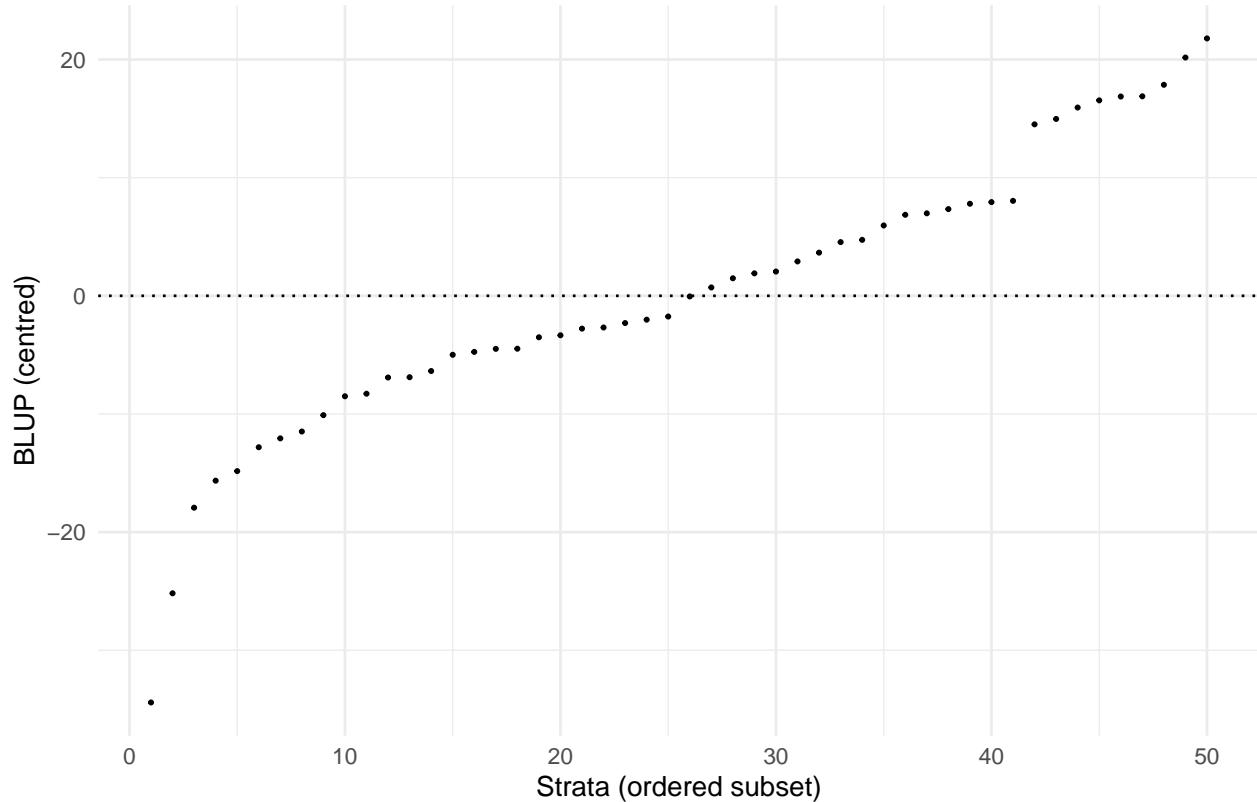
5 MAIHDA ($A \rightarrow B \rightarrow C$)

6 VPC for Model B and slope heterogeneity for Model C

7 Caterpillars (random intercepts and random slopes)

Caterpillar: strata random intercepts (Model B)

Showing 50 of 288 strata (top)



Caterpillar: strata random slope for Wc (Model C)

Showing 50 of 288 strata (top)

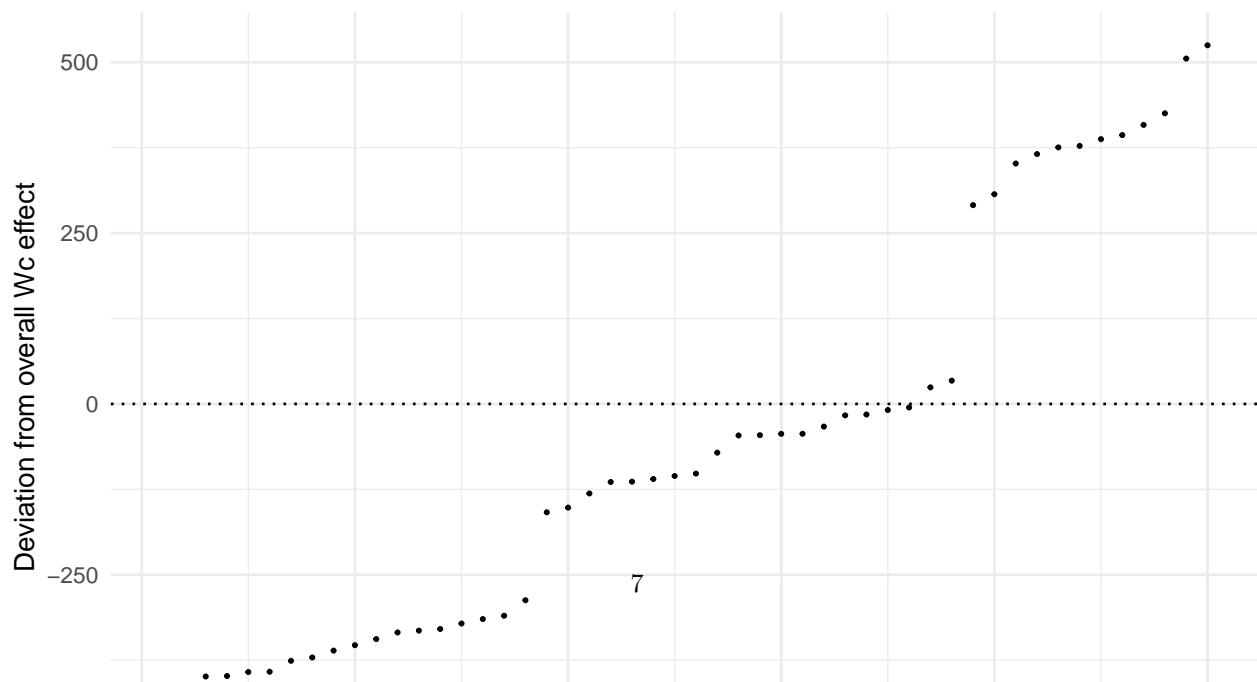


Table 5: Top fifteen intersectional strata by number of patient-year observations (with mean outcome and exposure rate).

Strata (readable)	n	patients	practices	Mean
Sex: Female Risk: Low (Q1) Comorbidity: 2–3 Deprivation: High Plan: A	37467	11320	495	176
Sex: Male Risk: Very High (Q4) Comorbidity: 2–3 Deprivation: Low Plan: A	30489	10660	500	47
Sex: Male Risk: High (Q3) Comorbidity: 2–3 Deprivation: Low Plan: A	27087	9366	498	52
Sex: Female Risk: Medium (Q2) Comorbidity: 2–3 Deprivation: High Plan: A	21973	6631	484	166
Sex: Female Risk: Low (Q1) Comorbidity: 4–5 Deprivation: High Plan: A	21967	6625	483	171
Sex: Female Risk: Low (Q1) Comorbidity: 2–3 Deprivation: Mid Plan: A	20917	6723	494	100
Sex: Male Risk: Medium (Q2) Comorbidity: 2–3 Deprivation: Low Plan: A	20682	7194	494	56
Sex: Female Risk: Medium (Q2) Comorbidity: 2–3 Deprivation: Mid Plan: A	20360	6482	490	107
Sex: Male Risk: Very High (Q4) Comorbidity: 4–5 Deprivation: Low Plan: A	18774	6508	494	47
Sex: Female Risk: High (Q3) Comorbidity: 2–3 Deprivation: Mid Plan: A	18123	5778	495	100
Sex: Female Risk: High (Q3) Comorbidity: 2–3 Deprivation: High Plan: A	17760	5396	490	168
Sex: Female Risk: Very High (Q4) Comorbidity: 2–3 Deprivation: Mid Plan: A	17156	5454	496	106
Sex: Female Risk: Very High (Q4) Comorbidity: 2–3 Deprivation: Low Plan: A	16987	5903	494	55
Sex: Male Risk: High (Q3) Comorbidity: 4–5 Deprivation: Low Plan: A	16441	5741	494	50
Sex: Male Risk: Medium (Q2) Comorbidity: 2–3 Deprivation: Mid Plan: A	16130	5068	488	100

8 Results

```
## **Automatic summary**
## - Fixed effect of centred W (Model C): 519.78 (SE 20.02, t = 25.96)
## - Strata VPC (canonical): 1e-04
## - Strata VPC (design-faithful): 1e-04
## - Standard deviation of the Wc random slope (Model C): 305.74
## - Correlation between strata intercept and Wc slope: NA
```

Interpretation (reader-friendly):

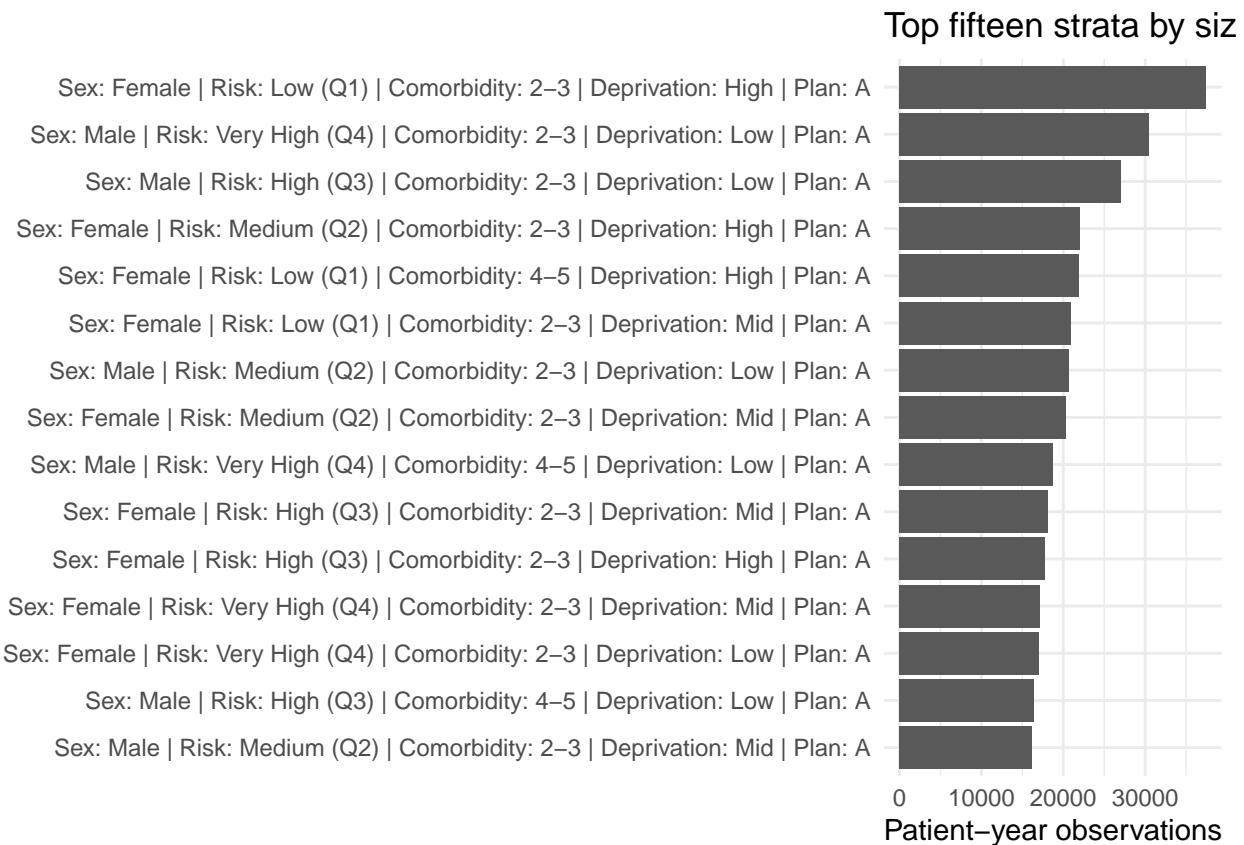
On average, exposure in treated post-periods (centred W) is associated with a change of about **520** units (SE 20).

Baseline differences between intersectional strata are **very small** on the tutorial scale (VPC 0%).

Treatment effects **vary across strata**: the random-slope standard deviation is about **305.7**, so many strata lie roughly between **-92** and **1131** around the average effect.

The intercept-slope correlation (NA) suggests **unclear**.

9 Top fifteen strata by size



10 Notes

- The **tutorial pair** (*Empty* and *Full*) reproduces the sequence from the videos and yields **VPC** and **PCV** exactly as taught.
- The **MAIHDA** keeps practice and patient random intercepts and adds a **random slope of centred W** by strata to study treatment-effect heterogeneity.
- Two **VPCs** are reported: the **canonical** (following George's Youtube tutorials) and the one including all random components.
- Caterpillars show **shrinkage** of stratum means and the distribution of **stratum-specific treatment slopes**.