

EMaterial

1.1 Disability data collected in HILDA

As mentioned in the methods section of the paper, the question used to identify people with disability at each wave in the Household Income and Labour Dynamics in Australia (HILDA) survey is:

“Do you have any long-term health condition, impairment or disability that restricts you in your everyday activities, and has lasted or is likely to last for six months or more?”

While this question is asked specific examples are shown to the respondent on a showcard. For example, the 2020 showcard includes the following text, with footnoted details on the slight changes that have been made over time:

“Disabilities / health conditions which:

- Have lasted, or are likely to last, 6 months or more;
 - Restrict everyday activity; and
 - Cannot be corrected by medication or medical aids.
-
- Sight problems not corrected by glasses or contact lenses
 - Hearing problems
 - Speech problems
 - Blackouts, fits or loss of consciousness
 - Difficulty learning or understanding things¹
 - Limited use of arms or fingers
 - A nervous or emotional condition which requires treatment
 - Any condition that restricts physical activity or physical work (e.g. back problems, migraines)²
 - Any disfigurement or deformity
 - Any mental illness which requires help or supervision
 - Shortness of breath or difficulty breathing³
 - Chronic or recurring pain⁴
 - Long term effects as a results of a head injury, stroke or other brain damage
 - A long-term condition or ailment which is still restrictive even though it is being treated or medication is being taken for it
 - Any other long-term condition such as arthritis, asthma, heart disease, Alzheimer’s disease, dementia etc.”

The items on the showcard largely correspond with the more detailed questions asked in Australia’s main source of data on disability prevalence – the Survey of

¹ In waves one and two this item was “Slow at learning or understanding things”

² In waves one and two this item did not include the text “(e.g. back problems, migraines)”

³ This item was not included in waves 1 and 2

⁴ This item was not included in waves 1 and 2

Disability Ageing and Carers (SDAC) (1). Administered by the Australian Bureau of Statistics (ABS), SDAC uses over 160 questions to identify people with disability and collect information on the underlying conditions that cause limitations in everyday activities.

The approach used by SDAC aligns with the International Classification of Functioning (2), in that it conceptualises disability as a multidimensional concept relating to body functions and health, activity limitations, the environment in which they live and personal factors.

In a survey, such as HILDA, where disability prevalence and characteristics are one of many topics respondents are asked about, having a long series of questions on disability is not feasible. However, each of the items on the showcard detailed above relate to sub-sections of module two questions in SDAC. The only sub-sections of module two that cannot be mapped to items on the HILDA showcards are questions added to SDAC in 2015 to better identify people with psychosocial disability.

The headline question used in HILDA aligns with the broad conceptualisation of disability used in SDAC and thus the ICF. To be included in the population of people with disability in HILDA an individual has to respond that their health condition, impairment or disability “restricts their everyday activity” and lasts longer (or will last longer) than six months (i.e. it is not temporary). So, someone *should not* report having a disability if for example they have a chronic health condition, but through things like medication, self-management and/or environmental adjustments, they do not experience restriction in their everyday activities. However, if for the same chronic health condition, a different individual experiences restrictions in everyday activities, they should report that they have a disability in response to the HILDA question.

1.2 Description of HILDA disability groups

How HILDA participants responded to the showcard information is made available as a series of variables from the third wave, 2003, onwards [reference HILDA data dictionary]. To help understand the composition of the group of people with disability, we have described the population according to their response to the showcards.

We have aggregated the items from the showcard into six disability groups. These six groups correspond with six summary groupings used by the ABS, in particular in SDAC.

Below we detail each group and how assignment to each group relates to the response on the showcard. Please note people may respond to more than one item in the showcard and therefore may be allocated to multiple disability groups:

Sensory

- Sight problems not corrected by glasses or contact lenses,
- Hearing problems,
- Speech problems

Physical

- Shortness of breath or difficulty breathing
- Blackouts, fits or loss of consciousness
- Chronic or recurring pain
- Limited use of arms and fingers
- Difficulty gripping things
- Limited use of feet or legs,
- Other condition that restricts physical activity or physical work (e.g. back problems, any disfigurement or deformity)
- Any disfigurement or deformity

Psychological

- any mental illness which requires help or supervision,
- a nervous or emotional condition which requires treatment)

Intellectual

- Difficulty learning or understanding things

Head injury, stroke or acquired brain injury

- Long term effects as a result of a head injury, stroke or other brain damage

Other

- A long-term condition or ailment which is still restrictive even though it is being treated or medication is being taken for it, any other long-term condition such as arthritis, asthma, heart disease, Alzheimer's disease, dementia etc., blackouts, fits or loss of consciousness)

ETable 1 below details the distribution of these disability groups in 2011 the mid-point of the period (2002-2020) where there was data available to construct disability groupings. Please note the six disability groups sum up to a higher count than the overall "all-report" disability count, as respondents may respond affirmatively to multiple items of the showcard.

ETable 1: description of disability groups in eleventh wave of HILDA, 2011, the midpoint of the period (2002-2020) where there was data available to construct disability groupings.

	2011	
Disability Prevalence	N	%
No Disability	6581	85.2
With Disability	1143	14.8
Distribution of disability groups	N	%
Sensory	142	12.4
Intellectual	84	7.3
Psychological	291	25.5
Physical	517	45.2
ABI	22	1.9
Other	555	48.6

ETable 1: The top half of the table is the prevalence of disability in 2011. The bottom half of the table shows the distribution of disability groupings (based on the responses to the showcard detailed above) within the 1143 respondents with disability. People can respond to more than one item on the showcards, so the sum of the cells in the bottom half is greater than the 1143 figure in the top half of the table.

1.3 Income distribution within disability groups

ETable 2 below details the income tertile distribution within each disability group specified above. For purposes of presentation, the table uses data from our sample in 2011, the mid-point of the period (2002-2020) for which we have disability group information.

As in the main body of the paper, a high proportion of people with disability are in the low-income tertile. This gradient is also present in each of the disability groups within the population of people with disability.

ETable 2: Description of the income distribution for disability groups in eleventh wave of HILDA, 2011, the midpoint of the period (2002-2020) where there was data available to construct disability groupings.

Overall Disability Group	Income Tertile	N	%
No Disability	Low	1528	23.2
	Middle	2559	38.9
	High	2494	37.9
With Disability	Low	450	39.4
	Middle	400	35.0
	High	293	25.6
Disability Groups	Income Tertile	N	%
Sensory	Low	48	33.8
	Middle	54	38.0
	High	40	28.2
Intellectual	Low	49	58.3
	Middle	23	27.4
	High	12	14.3
Psychological	Low	153	52.6
	Middle	86	29.6
	High	52	17.9
Physical	Low	223	43.1
	Middle	171	33.1
	High	123	23.8
Acquired Brain Injury	Low	12	54.5
	Middle	7	31.8
	High	3	13.6
Other	Low	221	39.8
	Middle	194	35.0
	High	140	25.2

ETable 2: The top half of the table is the income distribution for people with and without disability in 2011. The bottom half of the table shows the income distribution within disability groupings (based on the responses to the showcard detailed above) within the 1143 respondents with disability. People can respond to more than one item on the showcards, so the sum of the cells in the bottom half is greater than the 1143 figure in the top half of the table.

1.4 Inequality typology plots – three prevalence change scenarios

To help aid understanding of the inequality typology plots, we have used some dummy data to create three different smoking prevalence change scenarios. These are displayed on EFigure 1 and show how different smoking prevalence change scenarios for people with and without disability (panel A) would map to the inequality typology plot (panel B).

The title of each plot corresponds to the respective inequality typology ('p', 'a', 'r') assigned to each prevalence change scenario (for full details outlining each component of the typology see the methods section in the manuscript). Each of the scenarios starts at the same place – prevalence of 30% and 20% for people with and without disability, a prevalence difference of 10 (per 100 people) and a prevalence ratio of 1.5.

The first scenario – a reduction in prevalence from 30% to 20% for people with disability and 20% to 10% for people without disability - is like what we see in figure 1 in the manuscript. This maps to the three components of the inequality typology as follows:

- **Component 1, falling smoking prevalence for people without disability ('p↓')**: smoking prevalence has fallen from 20% to 10% for people without disability, denoted by the blue line on Panel A, Scenario 1. This translates to a shift leftwards from 20% to 10% in respect of the x-axis on the inequality typology plot (Panel B, Scenario 1).
- **Component 2, stable absolute inequalities ('a-')**: the prevalence difference, equivalent to the additional smokers per 100 people with disability (compared to 100 people without disability), is 10 at the beginning of the time series (i.e. 30 - 20) and 10 at the end of the time series (i.e. 20 - 10). In other words, the gap between the red and blue lines on Panel A, Scenario 1 is constant. This translates to a flat line, tracking along 10 per 100, in respect of the y-axis on the inequality typology plot (Panel B, Scenario 1).
- **Component 3, increasing relative inequalities ('r↑')**: the prevalence ratio, equivalent to how many times higher smoking prevalence is among people with disability compared to people without disability, is 1.5 (i.e. 30 / 20) at the beginning of the time series and 2 (i.e. 30 / 10) at the end of the time series. This translates to moving from the '*1.5 times higher*' contour toward the '*2 times higher*' contour on the inequality typology plot (Panel B, Scenario 1).

The second scenario – a reduction in prevalence from 30% to 25% for people with disability and 20% to 10% for people without disability – is like what we see among people on a low-income on figure 2 in the manuscript. This maps to the three components of the inequality typology as follows:

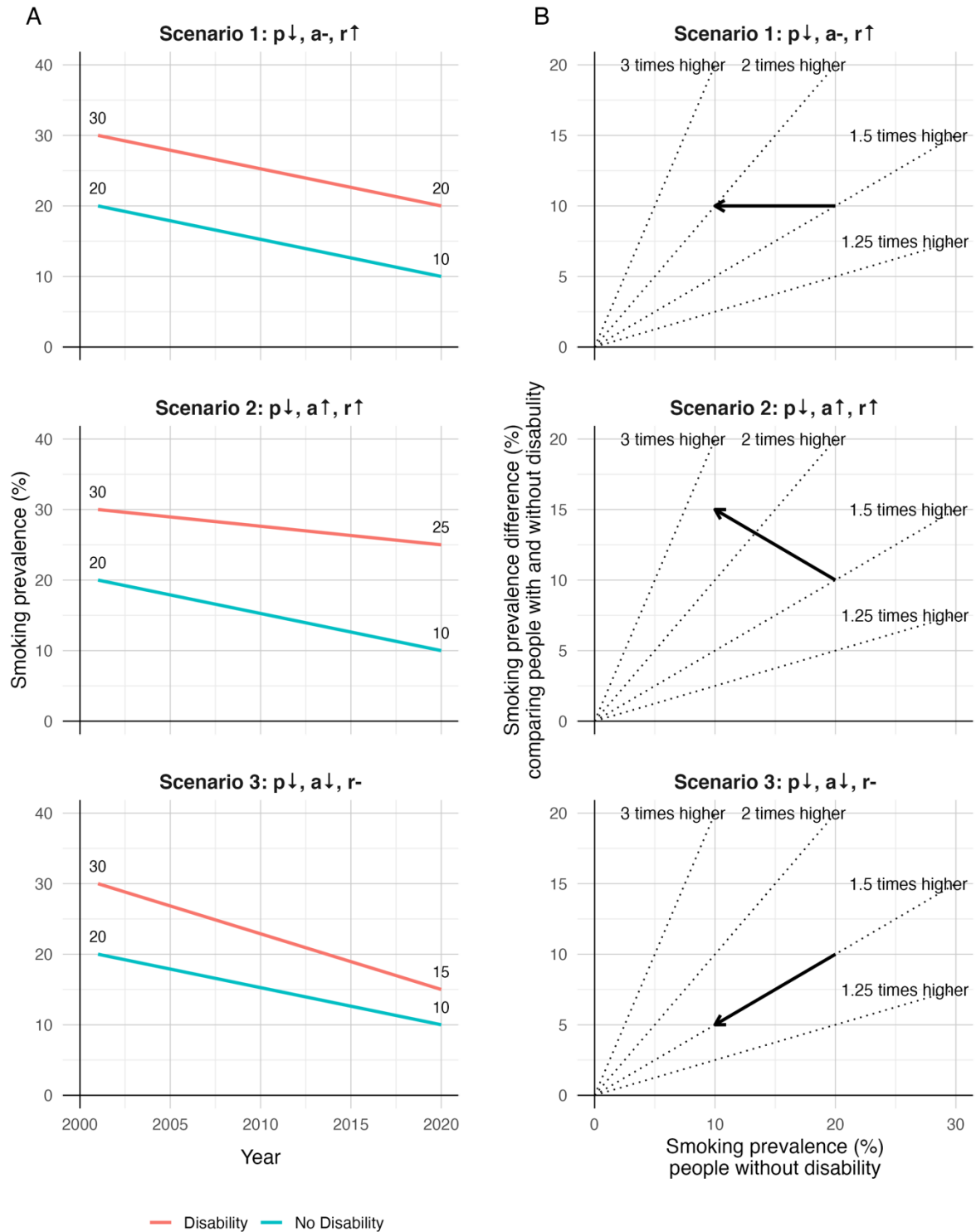
- **Component 1, falling smoking prevalence for people without disability ('p↓')**: like in Scenario 1 prevalence has fallen from 20% to 10% among people without disability (Panel A, Scenario 2), resulting in a shift leftward in respect of the x-axis on the typology plot (Panel B, Scenario 2).
- **Component 2, increasing absolute inequalities ('a↑')**: the prevalence difference, the gap between the red and blue lines, is getting larger over the time period – at the beginning there are 10 additional smokers per 100 people with disability (i.e. 20 – 10) whereas at the end there are 15 additional smokers per 100 people with disability (i.e. 25 – 10). This translates to the line moving upwards from 10 to 15 (per 100), in respect of the y-axis on the inequality typology plot (Panel B, Scenario 2).
- **Component 3, increasing relative inequalities ('r↑')**: the prevalence ratio, is 1.5 (i.e. 30 / 20) at the beginning of the time series and 2.5 (i.e. 25 / 10) at the end of the time series. This translates to moving from the '*1.5 times higher*' contour to halfway between the '*2 times higher*' and '*3 times higher*' contour on the inequality typology plot (Panel B, Scenario 2)

The third scenario – a reduction in prevalence from 30% to 15% for people with disability and 20% to 10% for people without disability – is like what we see among people on a high-income on figure 2 in the manuscript. This maps to the three components of the inequality typology as follows:

- **Component 1, falling smoking prevalence for people without disability ('p↓')**: again, smoking prevalence has fallen from 20% to 10% among people without disability (Panel A, Scenario 3), resulting in a shift leftward in respect of the x-axis on the typology plot (Panel B, Scenario 3).
- **Component 2, falling absolute inequalities ('a↓')**: the prevalence difference, the gap between the red and blue lines, is closing over the time period – at the beginning there are 10 additional smokers per 100 with disability (i.e. 20 – 10) whereas at the end there are 5 additional smokers per 100 people with disability (15 – 10). This translates to the line moving downwards from 10 to 5 (per 100), in respect of the y-axis on the inequality typology plot (Panel B, Scenario 3).
- **Component 3, stable relative inequalities ('r-')**: the prevalence ratio, is 1.5 (i.e. 30 / 20) at the beginning of the time series and 1.5 (i.e. 15 / 10) at the end of the time series. This translates to the inequality typology moving along the '*1.5 times higher*' contour on the inequality typology plot (Panel B, Scenario 3)

Relating smoking prevalence trends to inequality typology plots

'p': prevalence, 'a': absolute inequality, 'r': relative inequality



EFigure 1: Relationship of three exemplar smoking prevalence change scenarios (panel A) to the inequality typology plots (panel B). Panel A shows exemplar smoking prevalence (y-axis) time trends (x-axis) for people with and without disability. Panel B, an inequality typology plot, shows smoking prevalence for people without disability (x-axis), absolute (y-axis) and relative inequalities (contour lines).

1.5 Predicted smoking prevalence, people with and without disability

We obtained predicted smoking prevalence and credible intervals from our hierarchical models for the first and last waves of the study.

ETable 3: Predicted prevalence (95% credible intervals) for the first (2000) and last wave (2020) of the study for people with and without disability, and for people with and without disability within income tertiles.

Income Tertile	No Disability Wave 1	No Disability Wave 20	With Disability Wave 1	With Disability Wave 20
Total	28.6 (28, 29.1)	13.5 (13.1, 13.8)	39 (37.6, 40.4)	25.6 (24.5, 26.7)
Low	36.0 (34.9, 37.3)	22.5 (21.5, 23.4)	47.3 (45.0, 49.7)	37.5 (35.6, 39.5)
Middle	28.7 (27.8, 29.6)	13.2 (12.7, 13.8)	37.3 (35.0, 39.7)	24.5 (22.7, 26.2)
High	24.3 (23.5, 25.2)	9.2 (8.8, 9.7)	32.2 (29.7, 34.9)	11.0 (9.7, 12.4)

1.6 Smoking prevalence inequality trends by disability groups

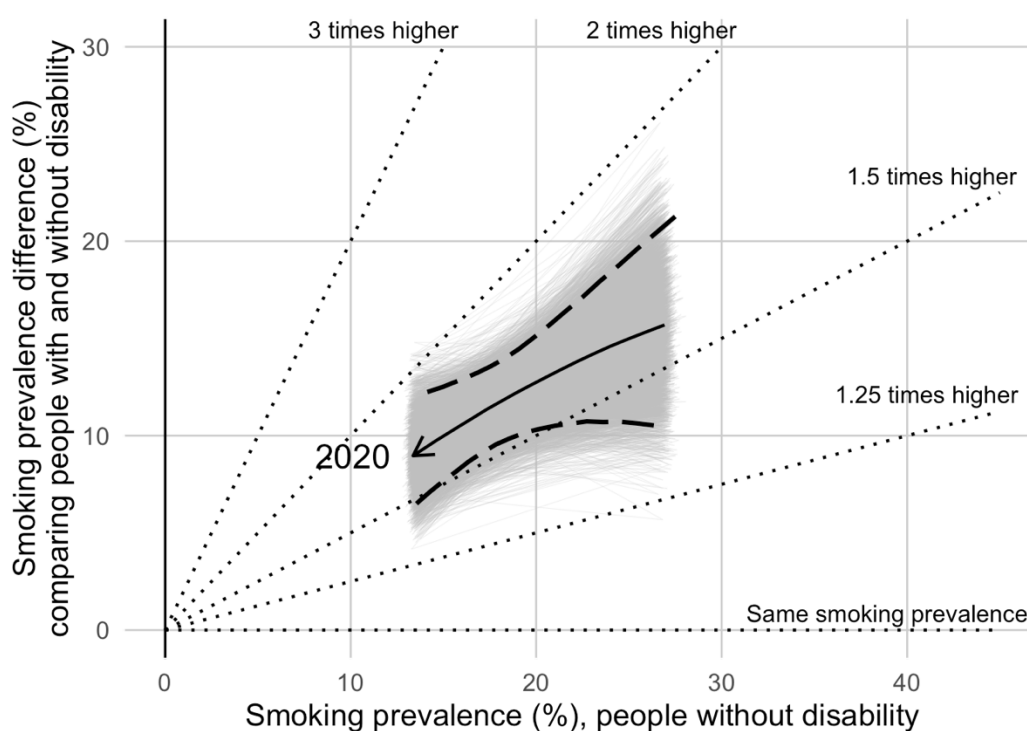
We used the statistical model detailed in the manuscript to estimate smoking prevalence and inequality trends, comparing disability groups to people without disability. As shown in ETable 2, there are small numbers in the sample in the acquired brain injury group. As such, we place the acquired brain injury group into the physical disability group for this analysis. We do this as it is plausible that people with acquired brain injury, could have physical functional limitations.

EFigures 2-6 display the inequality results for 2003 to 2020 for each disability group. As mentioned above, the available HILDA data does not contain responses to the showcards used to derive the disability groupings for the first two waves of study.

The plotting technique used for EFigures 2-6 is the same as for the figures 1 and 2 in the manuscript.

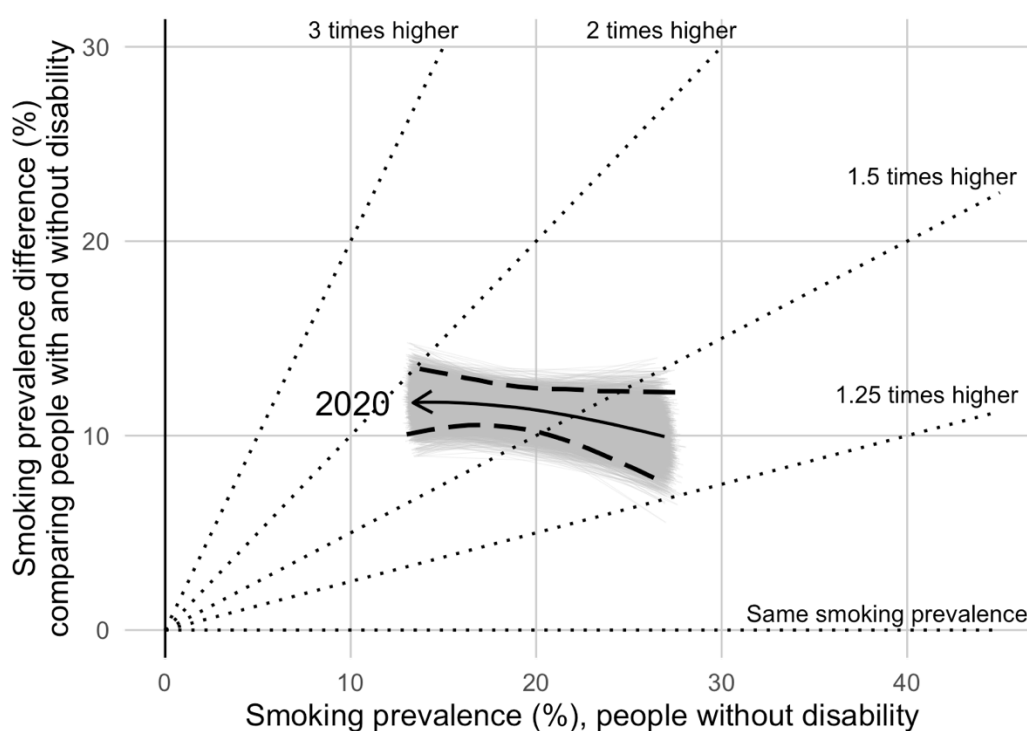
While there is greater uncertainty for each disability grouping's inequality estimate than for the all-report disability group results presented in the manuscript, there are substantive inequalities for each disability group.

Intellectual Disability



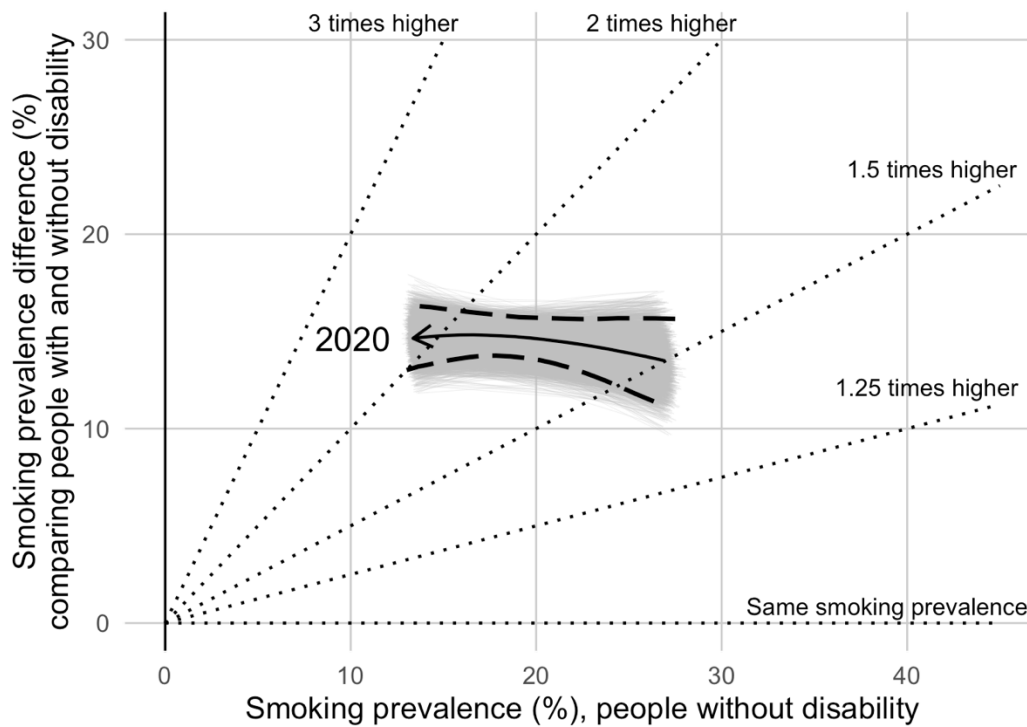
EFigure 2: inequality typology plot for “Intellectual Disability”, comparing smoking prevalence for people without disability (x-axis), absolute (y-axis) and relative inequalities (contour lines)

Other Disability



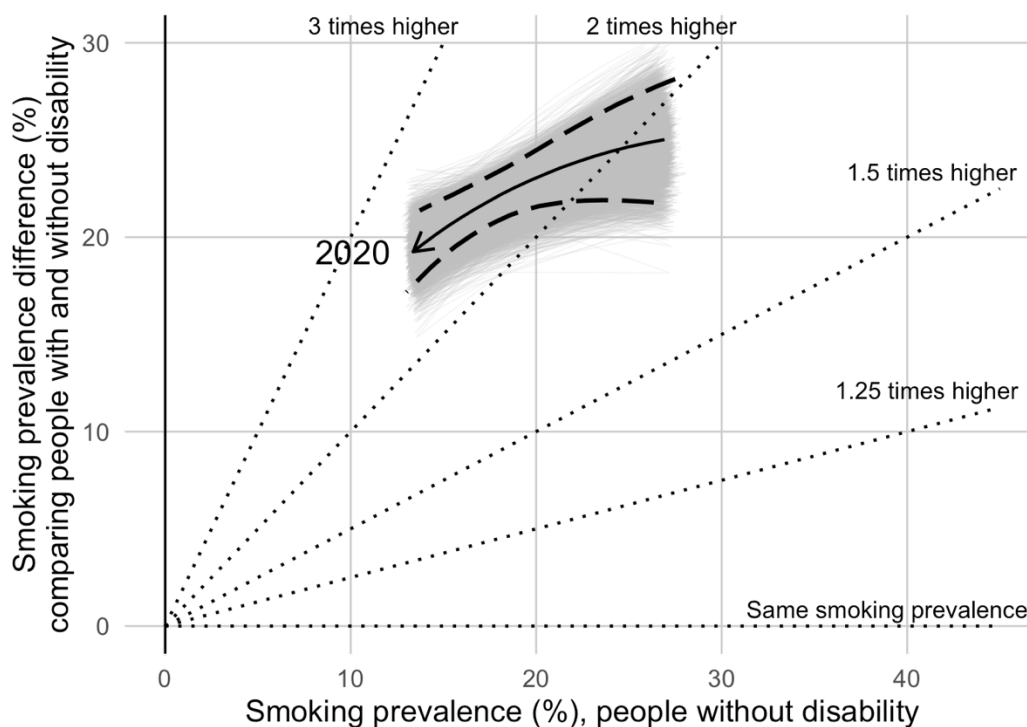
EFigure 3: inequality typology plot for “Other Disability”, comparing smoking prevalence for people without disability (x-axis), absolute (y-axis) and relative inequalities (contour lines)

Physical Disability and Acquired Brain Injury

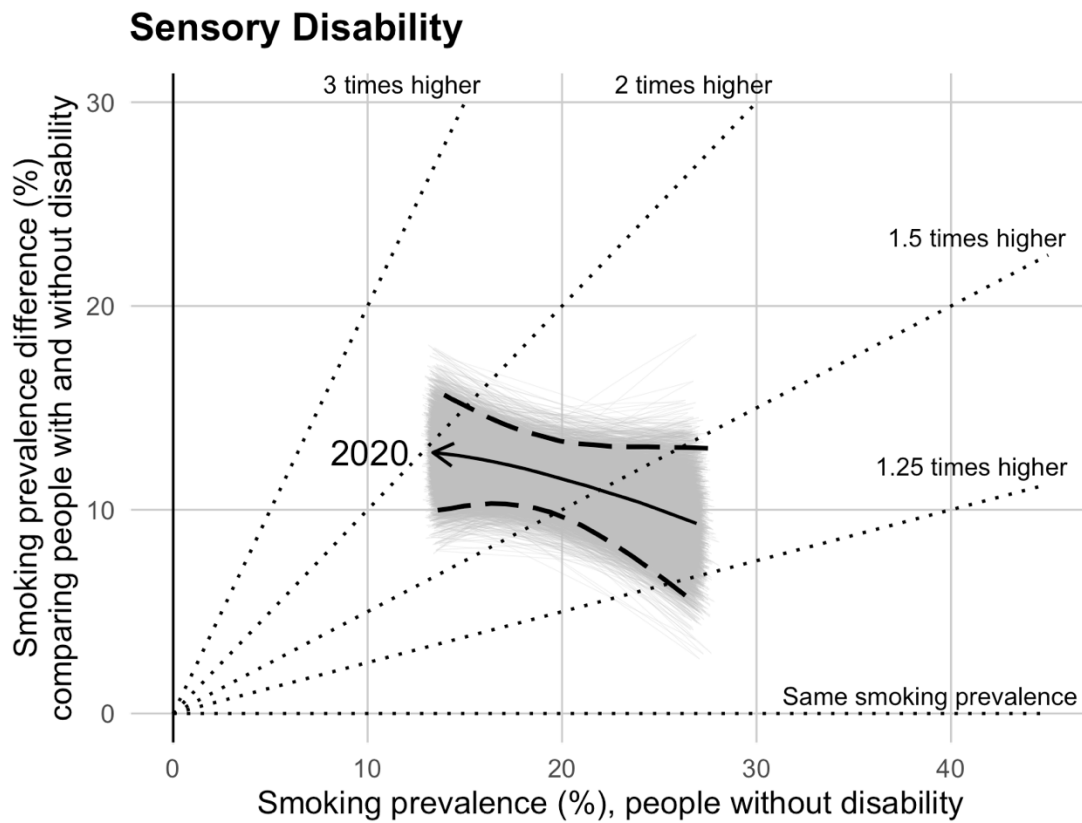


EFigure 4: inequality typology plot for “Physical Disability and Acquired Brain Injury”, comparing smoking prevalence for people without disability (x-axis), absolute (y-axis) and relative inequalities (contour lines)

Psychosocial Disability



EFigure 5: inequality typology plot for “Psychological Disability”, comparing smoking prevalence for people without disability (x-axis), absolute (y-axis) and relative inequalities (contour lines)



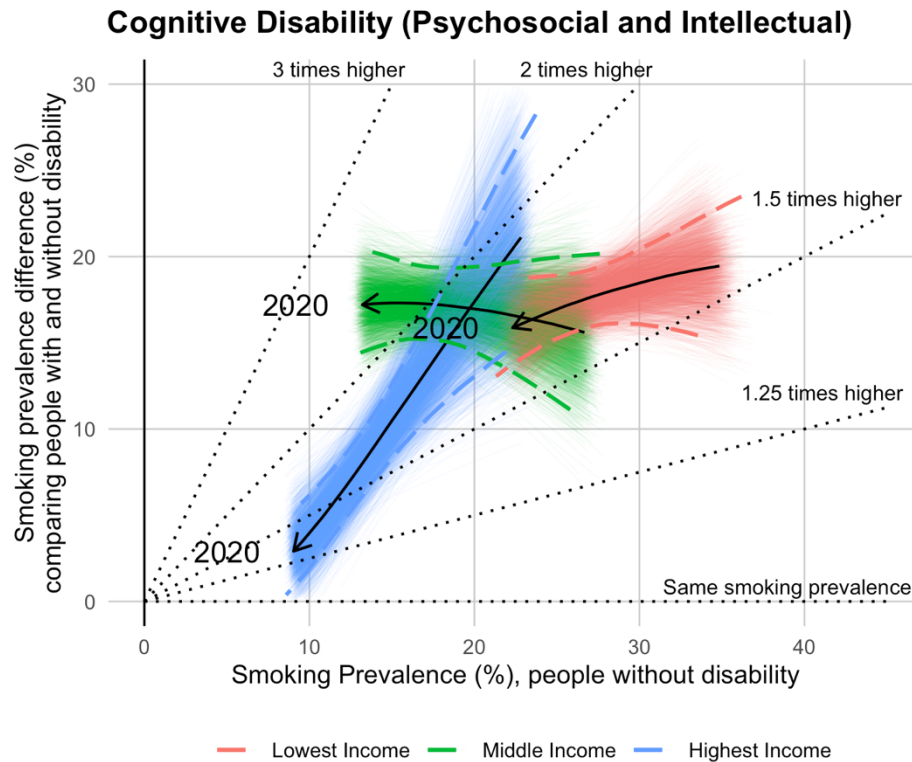
EFigure 6: inequality typology plot for “Sensory Disability”, comparing smoking prevalence for people without disability (x-axis), absolute (y-axis) and relative inequalities (contour lines)

1.7 Smoking prevalence inequality trends by income tertiles and disability groups

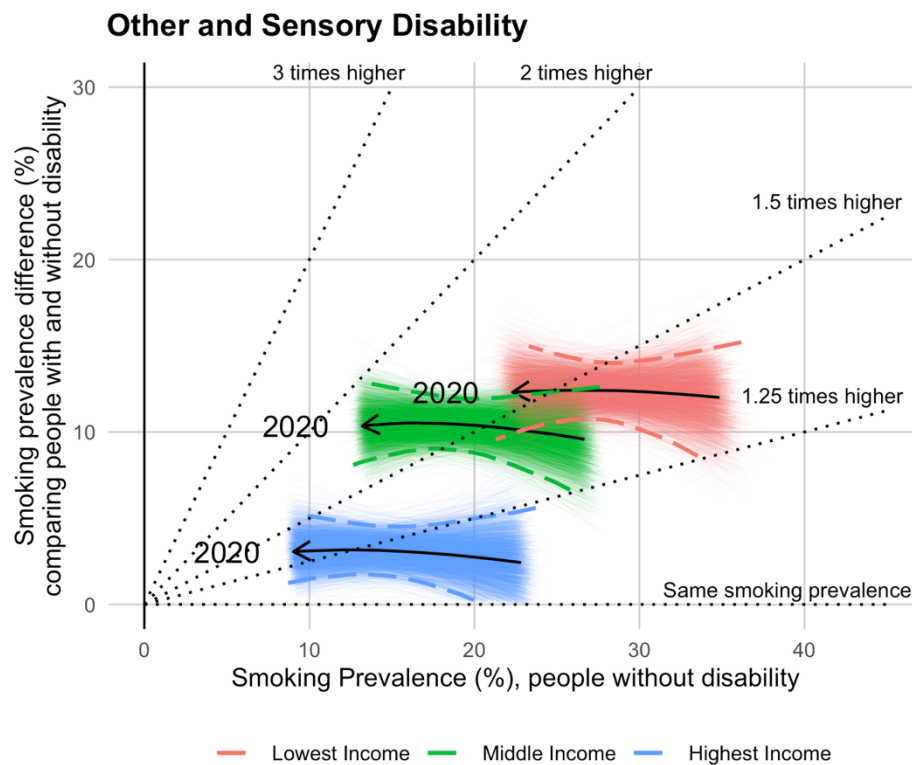
Again, we used the statistical model detailed in the manuscript to estimate disability group inequalities within each income tertile strata. This extra level of disaggregation can result in small numbers in income strata within disability groups (see ETable 2). As such we placed people with intellectual and psychological disabilities into a group we named cognitive disability and placed people with sensory disability into the “other disability” grouping, resulting in three groups:

- Cognitive disability – intellectual disability and psychological disability
- Other disability and sensory disability
- Physical disability and acquired brain injury.

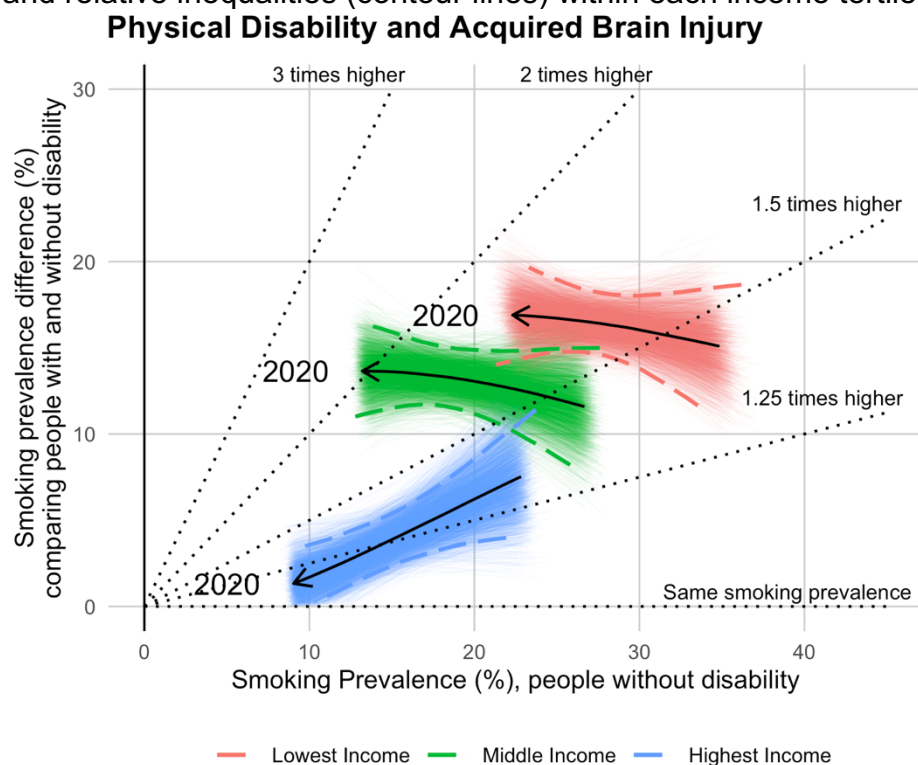
EFigures 7-9 display these disability group inequality results for 2003-2020 within each income strata. There are consistent inequalities for low- and middle- income groups within each of the three disability groups



EFigure 7: inequality typology plot for “Cognitive Disability”, comparing smoking prevalence for people without disability (x-axis), absolute (y-axis) and relative inequalities (contour lines) within each income tertile.



EFigure 8: inequality typology plot for “Other Disability and Sensory Disability”, comparing smoking prevalence for people without disability (x-axis), absolute (y-axis) and relative inequalities (contour lines) within each income tertile.



EFigure 9: inequality typology plot for “Physical Disability and Acquired Brain Injury”, comparing smoking prevalence for people without disability (x-axis), absolute (y-axis) and relative inequalities (contour lines) within each income tertile.

References

1. Statistics ABo. 4431.0.55.002—ABS Sources of Disability Information, 2012–2016. Canberra, Australia: ABS; 2018.
2. Organization WH. Global health risks: mortality and burden of disease attributable to selected major risks: World Health Organization; 2009.