Socioeconomic Inequalities in Heart and Circulatory Diseases in Northern Ireland

November 2023

1. Key Findings

- There are clear and consistent gaps between the most and least deprived groups across the cardiovascular pathway in Northern Ireland. This is evident in the prevalence of modifiable risk factors, hospital admissions, treatment, and overall health outcomes (particularly premature mortality due to heart and circulatory diseases).

British Heart Foundation

- The higher prevalence of modifiable risk factors undoubtedly contributes to CVD morbidity and mortality in Northern Ireland's most deprived groups. The gap between the most and least deprived groups is prevalent in smoking, obesity, and fruit and vegetable consumption.

- Hospital admissions for heart and circulatory diseases overall, and for those under 75, were consistently higher in the most deprived group compared to the least deprived group. The rates for those in the most deprived group on prescriptions for antihypertensives (blood pressure medications) and statins were higher compared to the least deprived group and Northern Ireland.

- The consolidation of deprivation rankings into local government districts may have muted or overlooked disparities seen in smaller geographies, particularly for measures seeking to assess the prevalence of CVD according to deprivation.

2. Introduction

An estimated 225,00 people are living with heart and circulatory diseases in Northern Ireland today.[1] Many thousands have risk factors for these conditions including raised cholesterol, type 2 diabetes, obesity, and high blood pressure. Heart and circulatory diseases cause nearly a quarter (24%) of deaths in Northern Ireland and a quarter of those people are under 75.[1]

There are many different risk factors that increase your likelihood of developing heart and circulatory diseases. In Northern Ireland, the leading modifiable risk factor for heart and circulatory diseases is hypertension (high blood pressure), affecting an estimated 400k people, but with up to a quarter of them undiagnosed. Hypertension is associated with around half of heart attacks and strokes in Northern Ireland. Other risk factors including diabetes and high cholesterol with the latter associated with 1 in 4 heart and circulatory disease deaths in Northern Ireland.[1]

Cardiovascular health and the wider determinants of health are strongly linked, with the disparities seen in heart and circulatory diseases being strongly influenced by income, housing, and environment as well as access to health services. On average, people in more deprived areas develop multi-morbidities 10-15 years earlier than in more affluent areas. People in more deprived areas are also more likely to develop multiple conditions in the first place – 28% of people in the most deprived areas have four or more health conditions, compared to 16% in the most affluent.[2] Social, economic, and environmental conditions play a major role in influencing health in Northern Ireland and, while life

[1] Northern Ireland Fact Sheet, BHF, https://www.bhf.org.uk/what-we-do/our-research/heart-statistics

[2] The Richmond Group, Health Foundation (2019) The Multiple Conditions Guidebook

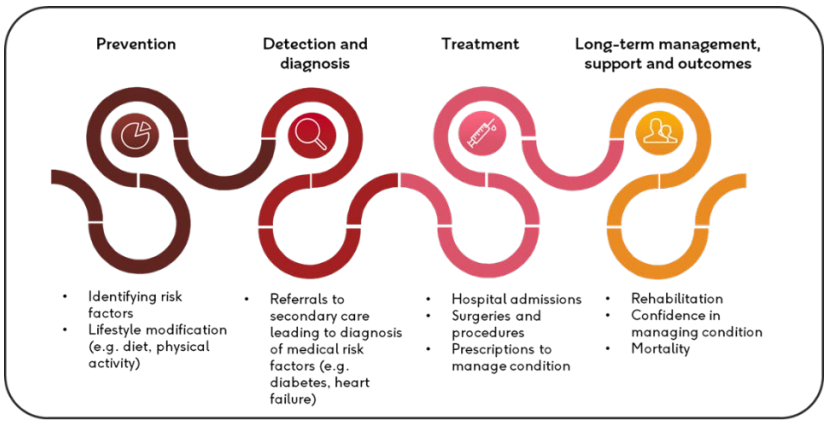
expectancy has increased in recent years for men and women, both in deprived areas and in Northern Ireland overall, there is no evidence of a narrowing of the inequality gap.[3]

Health inequalities are differences in health status, healthcare, and health-related risks between different population groups that are unfair and avoidable.[4] They include:

- **Health-related risks**: e.g., some people may find it harder to access healthy foods than others.
- **Healthcare**: e.g., some people may find it harder to access healthcare services than others.
- **Health status**: e.g., some people may have a shorter life expectancy than others.

This analysis examines the trends of inequalities in cardiovascular disease pre and post COVID-19 pandemic at multiple points on the cardiac pathway (Figure 1). This provides, for the first time, a holistic understanding of health inequalities surrounding cardiovascular disease, providing insight into the strengths in Northern Ireland's health system as well as where improvement is needed across all facets of healthcare.

Figure 1 The CVD Pathway



3. Methods

The main measure of inequality by geography is the Northern Ireland Multiple Deprivation Measure 2017 (NIMDM) which looks at 7 distinct domains: income, employment, health and disability, education, skills and training, access to services, living enviroment, and crime and disorder. We chose the NIMDM 2017 as a validated, well-recognized measure of deprivation that incorporates many wider determinants of health and deprivation and is not limited to simple 'rich – poor' income-based dimension.

It is important to note that NIMDM 2017 measures relative deprivation for geographic areas, and hence does not apply to each individual living in an area. The NIMDM 2017 measures Super Output areas (SOAs), ranking them from 1 (most deprived) to 890 (least deprived). As most of the data on cardiovascular risk factors and health outcomes is provided at the level of local government districts (LGDs), the ranks of SOAs in each LGD were averaged resulting in an overall deprivation ranking from 1 to 11 (Table 1). This may not be representitive of overall deprivation for a region as outlier SOAs may result in skewed results. However, many datasets provided deprivation rank data in conjunction with the risk factors discussed, allowing us to avoid any inaccuracies caused by condensing the NIMDM 2017 ranks.

[3] Cardiovascular Health and Wellbeing in Northern Ireland: HIA literature review_0.pdf (hscni.net)

[4] This definition of health inequalities is based on similar definitions provided by organisations including: Public Health Scotland, NHS England, The King's Fund, and the World Health Organization.

Table 1 LGD deprivation rank

Local Government District (LGD)	SOA Average Rank	LGD Rank
Antrim and Newtownabbey	559	9
Ards and North Down	566	10
Armagh City, Banbridge and Craigavon	459	7
Belfast	388	4
Causeway Coast and Glens	391	5
Derry City and Strabane	286	1
Fermanagh and Omagh	317	2
Lisburn and Castlereagh	669	11
Mid Ulster	437	6
Mid and East Antrim	516	8
Newry, Mourne and Down	368	3

This may not be representitive of overall deprivation for a region as outlier SOAs may result in skewed results. However, many datasets provided deprivation rank data in conjunction with the risk factors discussed, allowing us to avoid any inaccuracies caused by condensing the NIMDM ranks. Most of the provided deprivation statistics only included the most and least deprived 20%. This does mean that we have limited understanding how these deprivation levels were calculated.

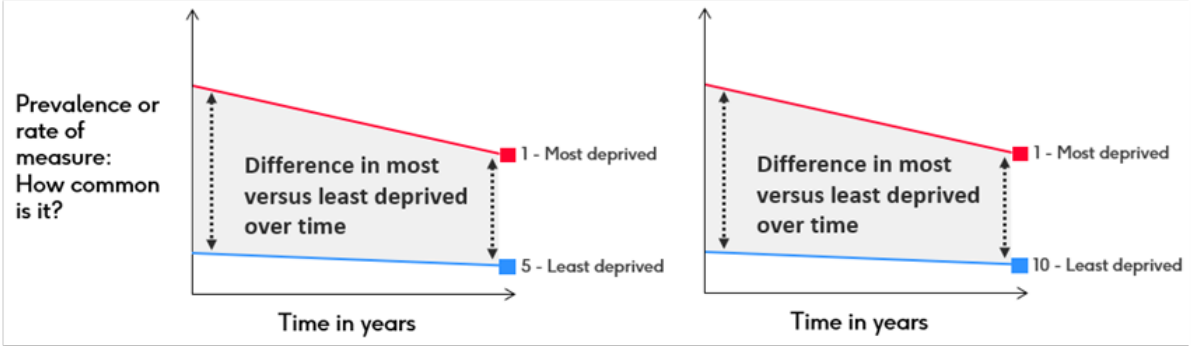
For national data, levels of deprivation is represented as deprivation rank (from 1 to 11) as calculated or as quintiles.

The following data sources were used:

- Northern Ireland Multiple Deprivation Measure (NIMDM)
- Health Inequalities Annual Report 2023
- British Heart Foundation Compendium
- Health Survey Northern Ireland 2022/23
- General Medical Statistics for Northern Ireland 2022/23
- Life Expectancy in Northern Ireland 2019-21

Data presentation: how to interpret the graphs

Most of this analysis is presented in graphs showing the trend in each deprivation decile or quintile over time. You can see whether the prevalence or rate is increasing or decreasing over time, and the variation between each decile or quintile. To look at the most versus least deprived, you can focus on their corresponding lines, as shown below, to see how the gap has changed over time.



4. Results

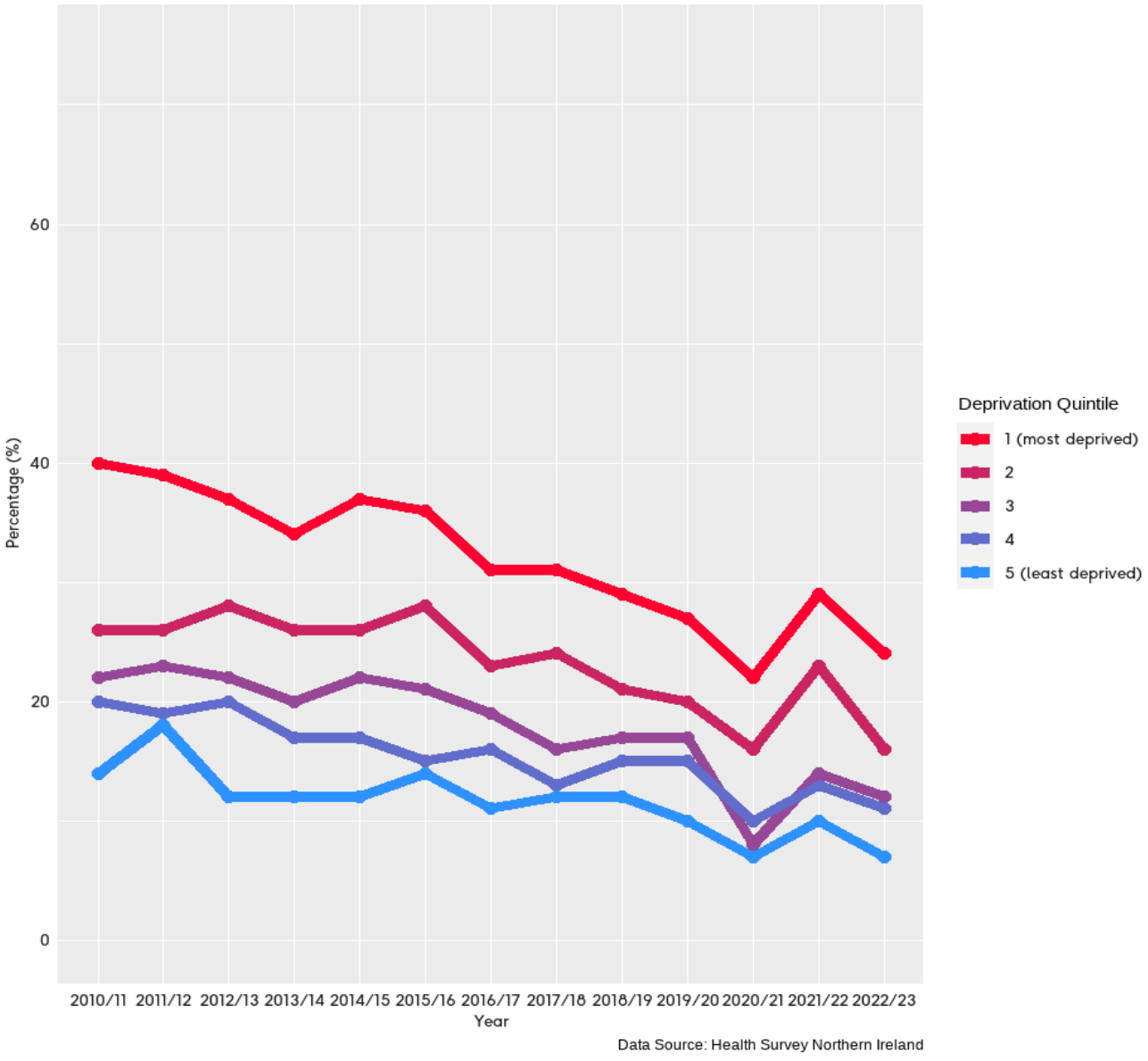
Prevention: modifiable risk factors for heart and circulatory diseases

Cardiovascular health is influenced by a range of modifiable factors which can be influenced by factors such as access to health and social care as well as the social, physical, and environmental factors present in individuals' lives.

Smoking

We know that smoking can lead to heart attack and stroke. In Northern Ireland, the prevalence of cigarette smoking has gradually declined over the last 10 years from 24% in 2010-11 to 17% in 2019/20. However, there remains a clear association between deprivation and smoking rates, which are higher in more deprived areas (Figure 2). Whilst, encouragingly, smoking prevalence has declined across all deprivation quintiles since 2010/11, those living in the most deprived quintile have consistently been 2 to 3 times as likely to smoke as those in the least deprived quintile. Whilst data for 2020/21 should be treated with caution due to the significantly smaller sample size of Health Survey Northern Ireland in the first year of the pandemic. An apparent increase in smoking rates was seen in 2021/22 in the two most deprived quintiles which could be attributed to the pandemic, but these values returned to pre-pandemic levels in 2022/23.

Figure 2 Percentage of those in NI who currently smoke cigarettes, by deprivation quintile from 2010 to 2023



Obesity

Living with excess weight and obesity can increase the risk of heart and circulatory diseases including stroke, heart attack, and vascular dementia.[5] In 2019/20, 27% of adults (16+) in Northern Ireland had obesity and a further 38% had a BMI classified as overweight. Obesity prevalence has increased over the decade to 2019/20 with some slight fluctuations. It is important to note that more recent data isn't available Obesity and level of deprivation have not shown a strong association (Figure 3). However, there is an association between obesity and level of deprivation when comparing the most and least deprived groups. Since 2010/11, obesity has consistently been more prevalent in the most deprived quintile compared to the least deprived quintile with a gap ranging between 2 and 7 percentage points. In 2019/20, 25% of those in the least deprived group were classified as obese while in the most deprived group, 32% were classified as obese.

The link between childhood obesity and the future risk of CVD in adulthood is indirect. Evidence suggests that childhood obesity is not an independent predictor of adult CVD, and that an observed increased in the risk of adult CVD for children with obesity is dependent on BMI tracking from childhood to adulthood.[6] Evidence also suggests that children and adolescents with obesity are around five times more likely to have obesity in adulthood[7], and subsequently any association between deprivation and childhood obesity would have consequences for inequalities in the prevalence of CVD by deprivation in Northern Ireland.

The 2023 Health Inequalities Annual Report measures obesity levels in children in Northern Ireland in primary 1. Both the most and least deprived quintiles have had increases in childhood obesity since 2015, but the gap has increased sharply from 1.9 to 4.4 percentage points.

[5] Your weight and heart and circulatory conditions - BHF

[6] Childhood obesity and adult cardiovascular disease risk: https://www.nature.com/articles/ijo200961

[7] Predicting adult obesity from childhood obesity: https://onlinelibrary.wiley.com/doi/abs/10.1111/OBR.12334

Figure 4 Percent of adults in Northern Ireland who are classified as obese by deprivation quintile.

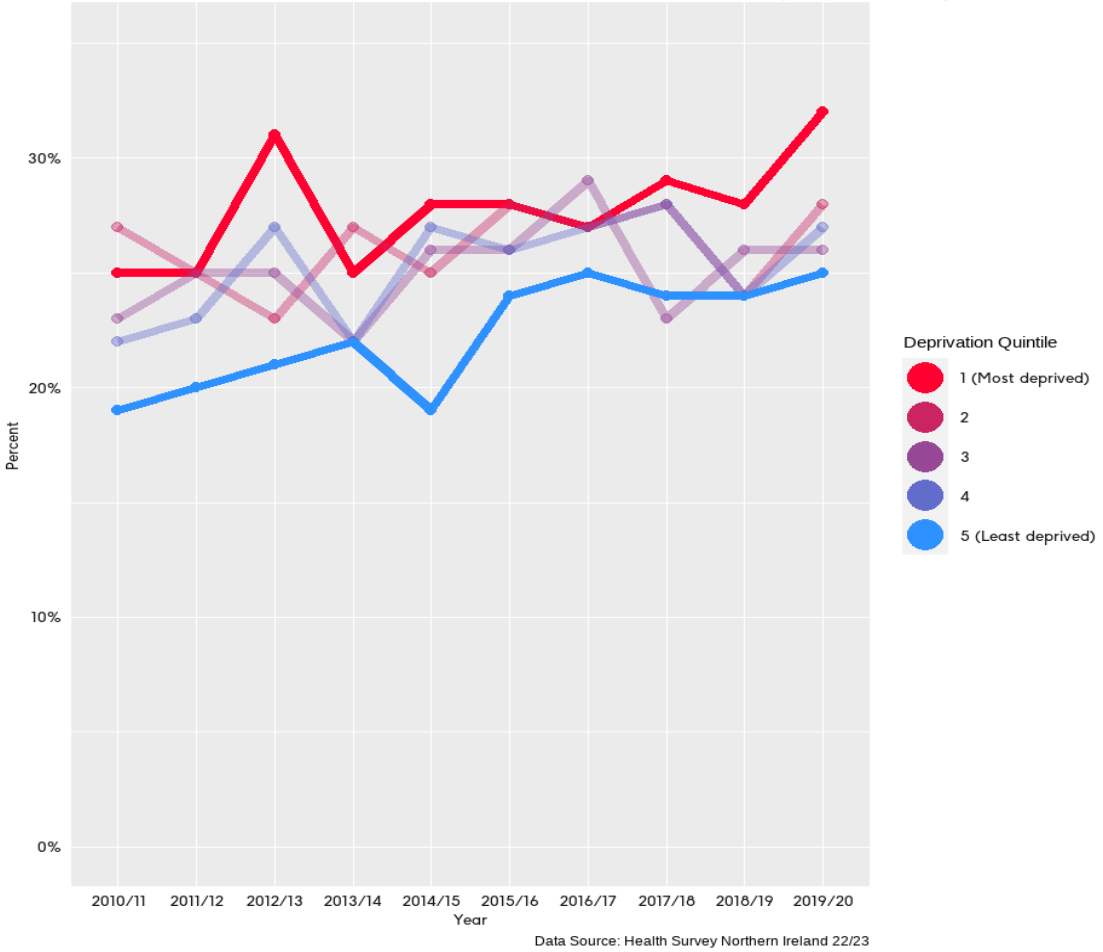
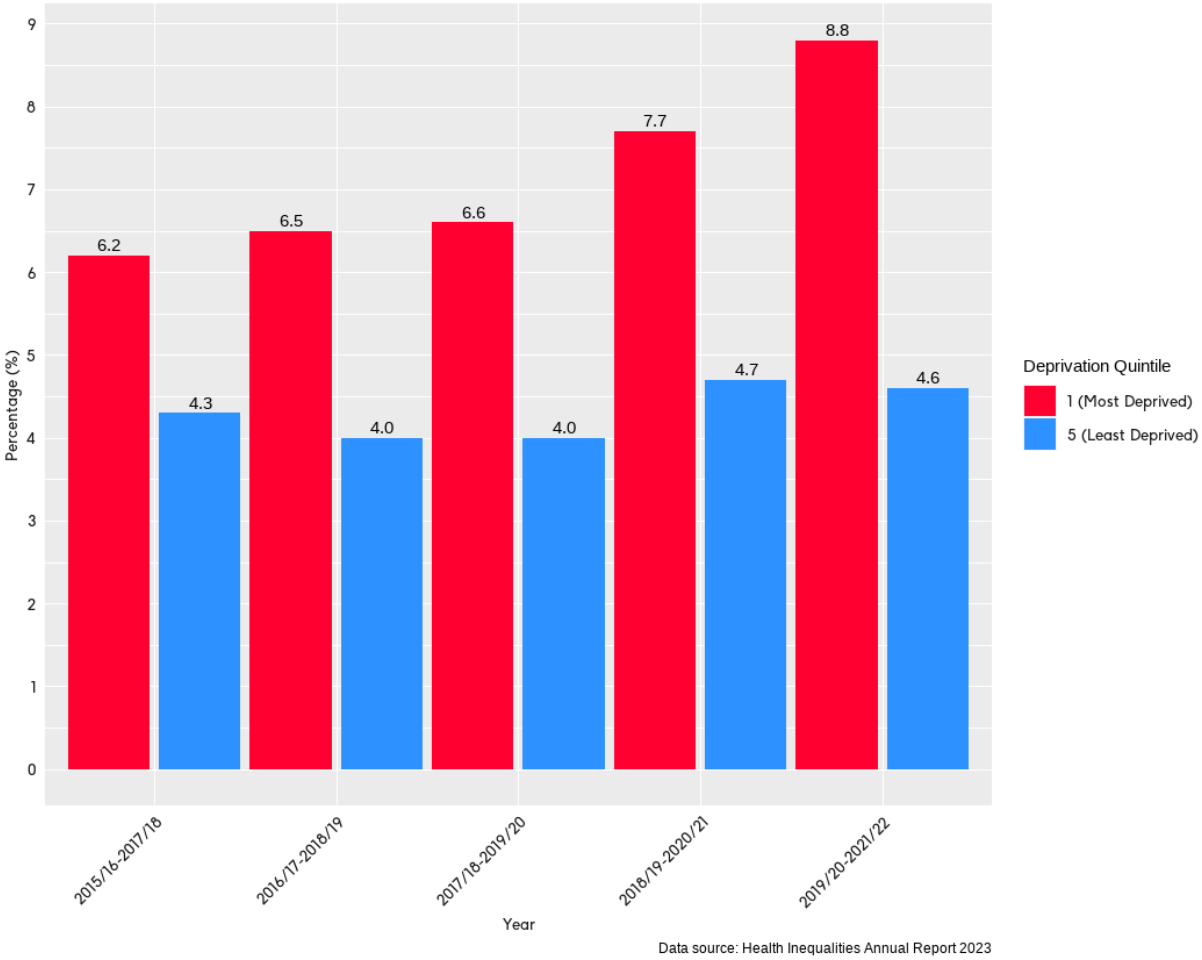


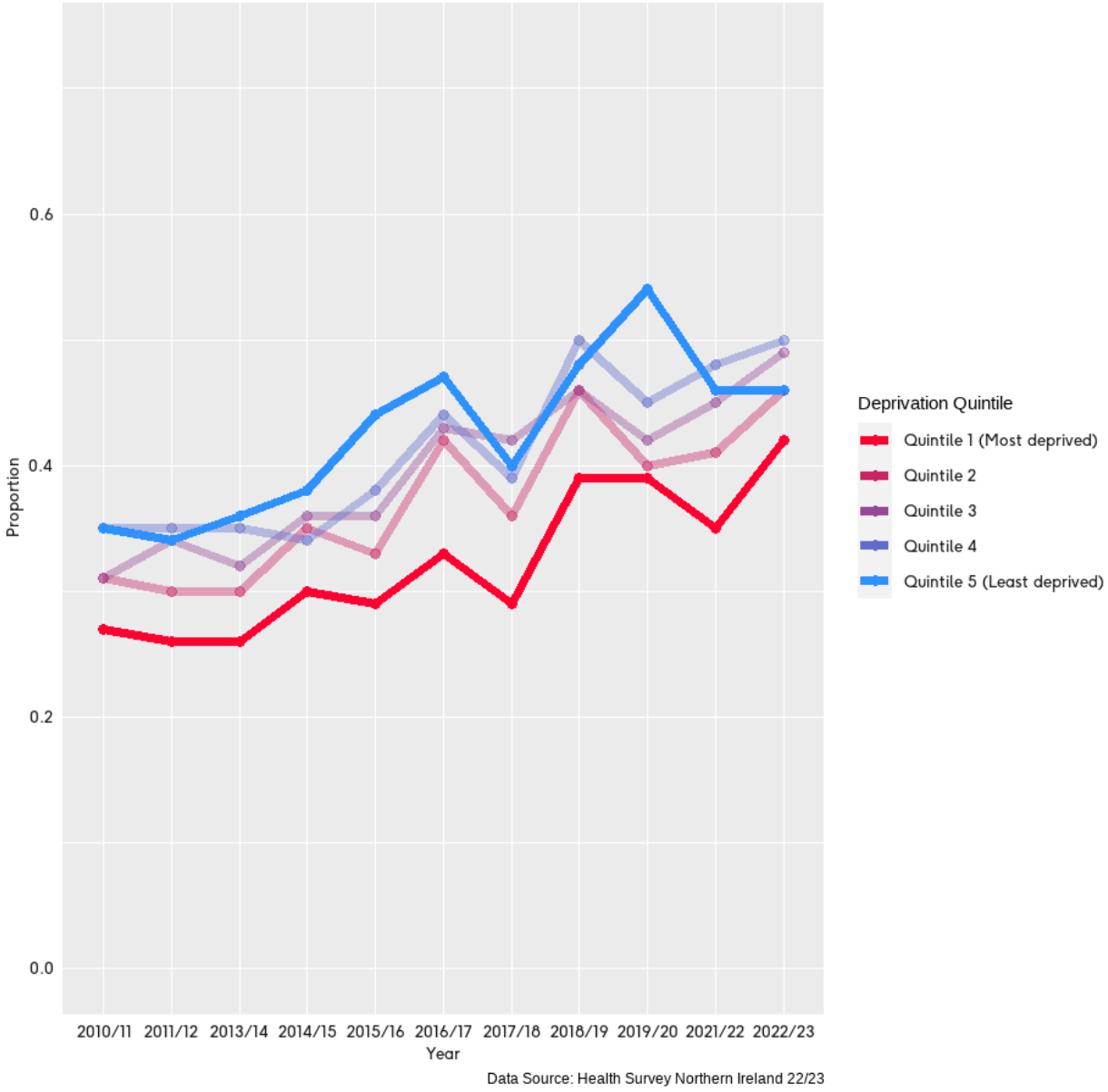
Figure 3 Percentage of N. Ireland children in P1 who are classified as obese from 2015-2022



Fruit and Vegetable Consumption

Evidence also shows that a low consumption of fruit and vegetables is associated with an increased risk of both cardiovascular morbidity and mortality.[8,9] In 2022/23, 56% of Northern Irish adults reported consuming less than 5 portions of fruit and vegetables in the previous 24 hours. As with the other outlined risk factors for CVD, fruit and vegetable consumption amongst adults is also associated with area deprivation (Figure 5). In 2022/23, 42% of those in the most deprived quintile consumed at least 5 portions of fruit and vegetables compared to 46% in the least deprived group. This represents a 4-percentage point difference between the least and most deprived quintiles. The gap between the most and least deprived quintiles has shrunk by 7% from 2021/2022 with 7% more of the most deprived quintile meeting the 5-a-day requirement.

Figure 5 Proportions of adults in Northern Ireland who report meeting 5-a-day requirements by deprivation quintile from 2010-2023



[8]Zhan J, Liu YJ, Cai LB, Xu FR, Xie T, He QQ. Fruit and vegetable consumption and risk of cardiovascular disease: A meta-analysis of prospective cohort studies. Critical reviews in food science and nutrition. 2017 May 24;57(8):1650-63. https://doi.org/10.1080/10408398.2015.1008980

[9] Wang X, Ouyang Y, Liu J, Zhu M, Zhao G, Bao W, Hu FB. Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: systematic review and dose-response meta-analysis of prospective cohort studies. Bmj. 2014 Jul 29;349. https://doi.org/10.1136/bmj.g4490

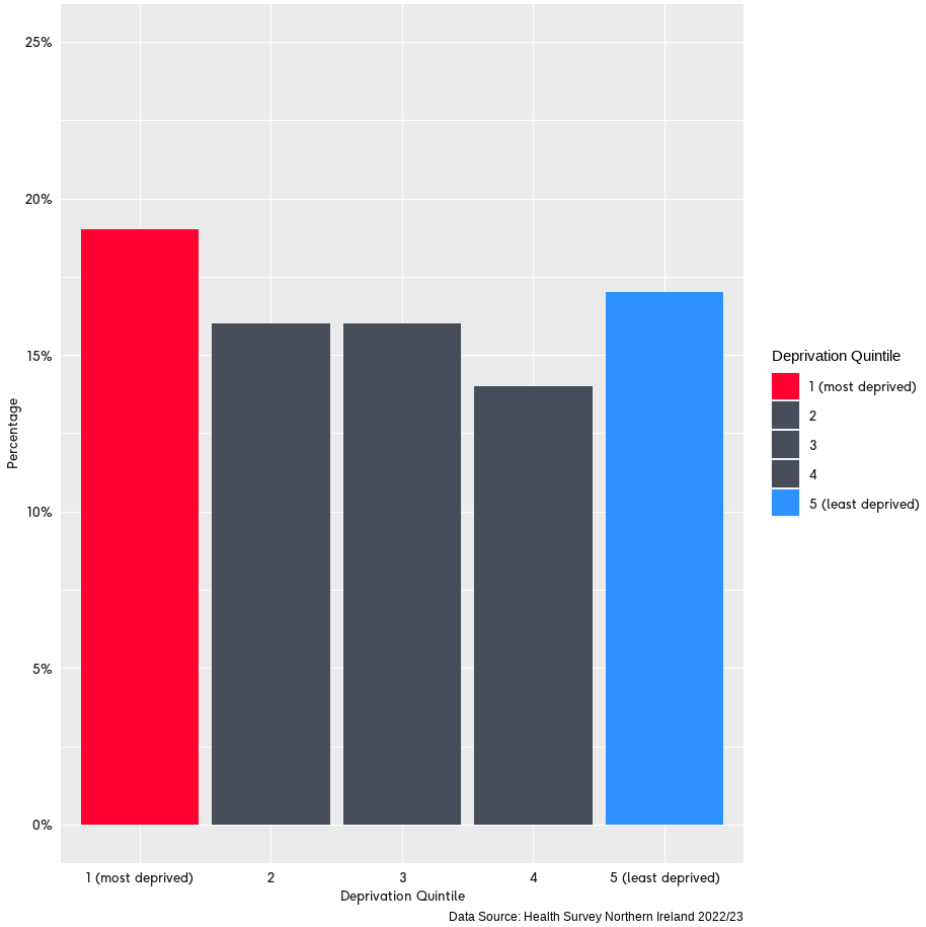
Alcohol Consumption

Drinking more than the recommended amount can be detrimental to heart and general health, with people regularly consuming 14 units or more of alcohol at increased risk of abnormal heart rhythms, heart muscle damage, stroke, high blood pressure, and vascular dementia.[10] Figure 6 shows the various levels of alcohol consumption of adults in Northern Ireland in 2019/20.

There is an association between level of deprivation and consumption of alcohol above weekly limits, with a larger percentage of people in the least deprived areas drinking above weekly limits (Figure 7). 21% of those living in the least deprived quintile drink above weekly limits compared to 14% in the most deprived quintile. Additionally, the most deprived quintile has the largest percentage of non-drinkers at 27%, with a 9 percent point gap between the least deprived. However, in 2022/23 there was a 2-percentage point gap between the most and least deprived quintiles with the most deprived quintile having the largest proportion of the population drinking above weekly limits (Figure 6). It is important to note that the quintile with the second largest proportion of the population drinking above weekly limits was the least deprived quintile.

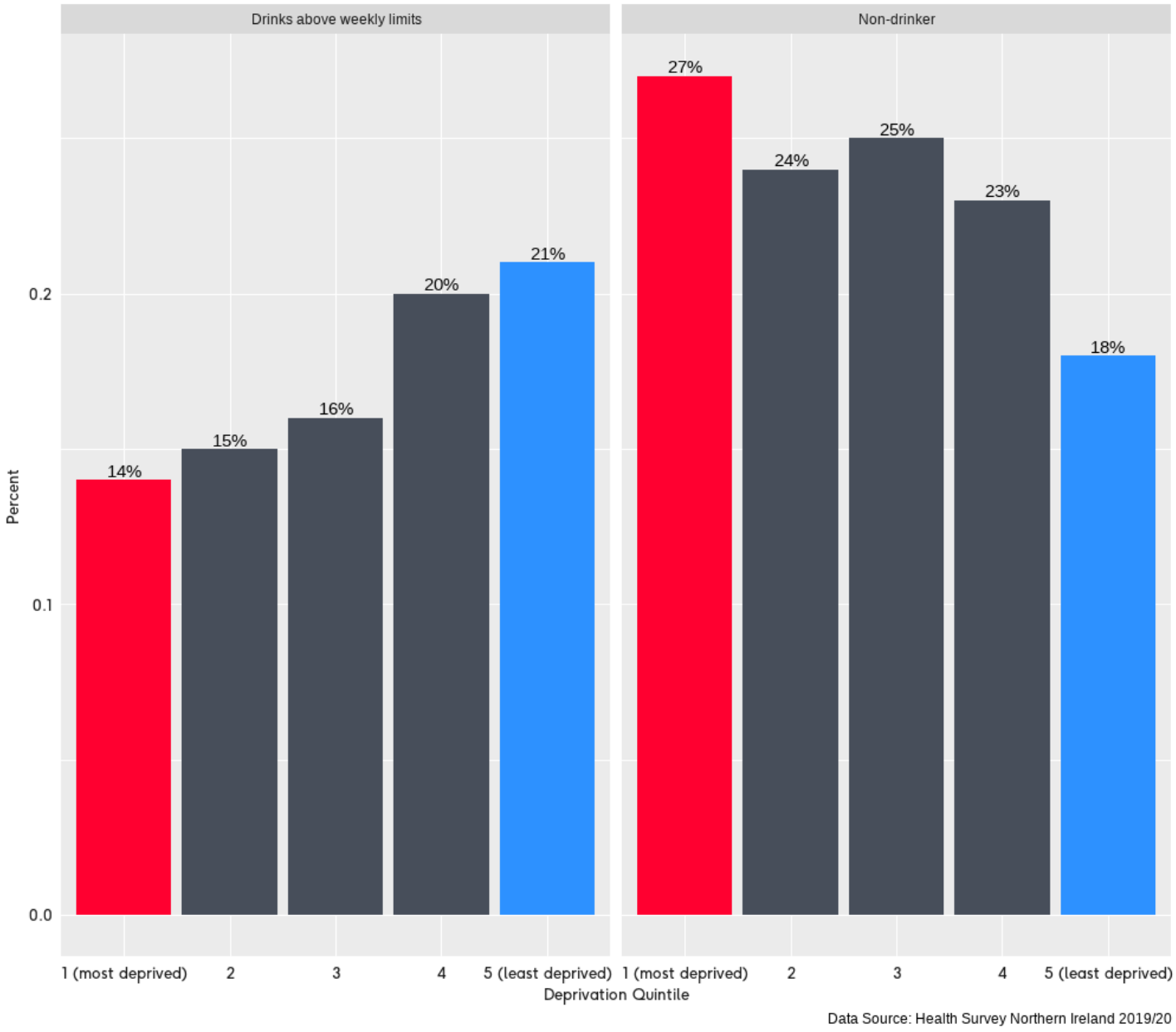
In the last decade, there has been an overall increase in individuals consuming alcohol 3 or more days a week. The least deprived quintile consistently has the highest percentage of adults who drink alcohol 3 or more days a week with the opposite being seen for the most deprived quintile (Figure 8). In 2021/22, there was a 10-percentage point gap between the most and least deprived quintiles. However, there was a drop in those who drink 3+ days a week in 2022/23 across deprivation quintiles, decreasing the gap between the most and least deprived quintiles to 4-percentage points. This highlights the variability in results each year which could be attributed to survey sample size which increased from 1981 in 2019/20 to 3556 in 2022/23.

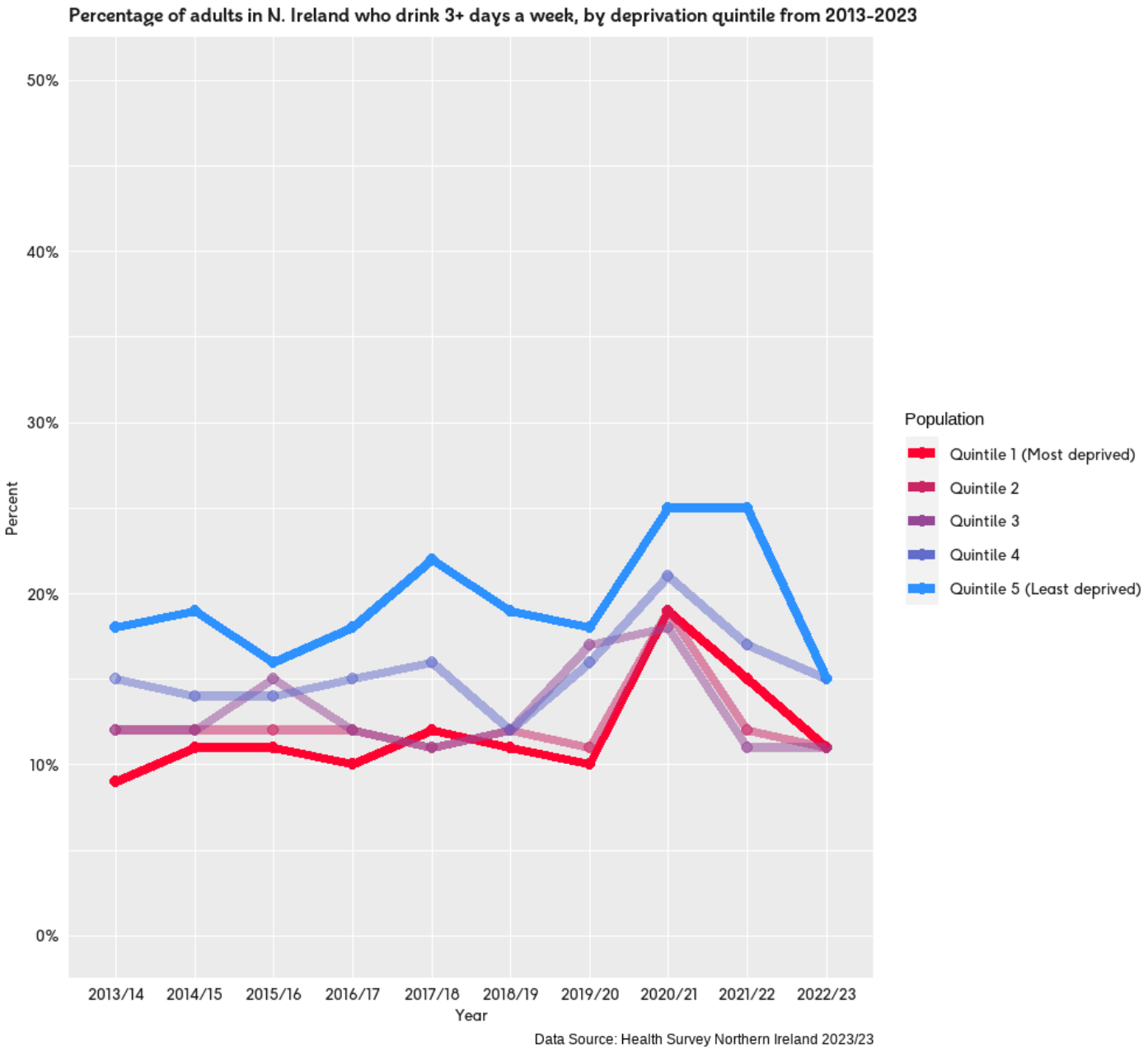
Figure 6 Percentage of those in Northern Ireland who drink above the weekly limit by deprivation quintile in 2022/23



[10] Alcohol - BHF

Figure 7 Alcohol consumption in Northern Ireland in 2019/20 by deprivation quintile

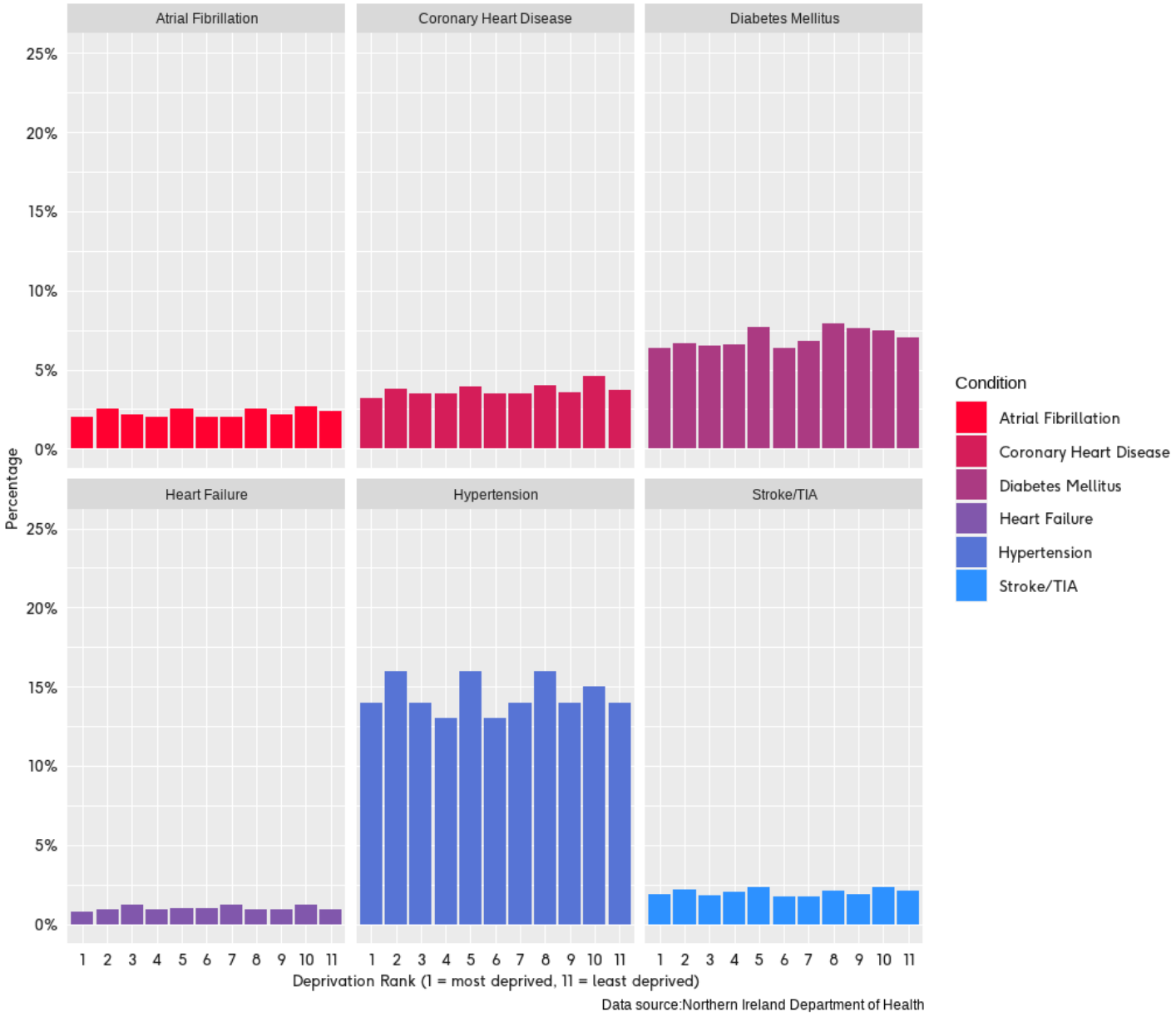



Percentage of adults in N. Ireland who drink 3+ days a week, by deprivation quintile from 2013-2023
50%
40%
30%
20%
10%
0%
Percent
2013/14
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20
2020/21
2021/22
2022/23
Year
Population
Quintile 1 (Most deprived)
Quintile 2
Quintile 3
Quintile 4
Quintile 5 (Least deprived)
Data Source: Health Survey Northern Ireland 2023/23

Prevalence

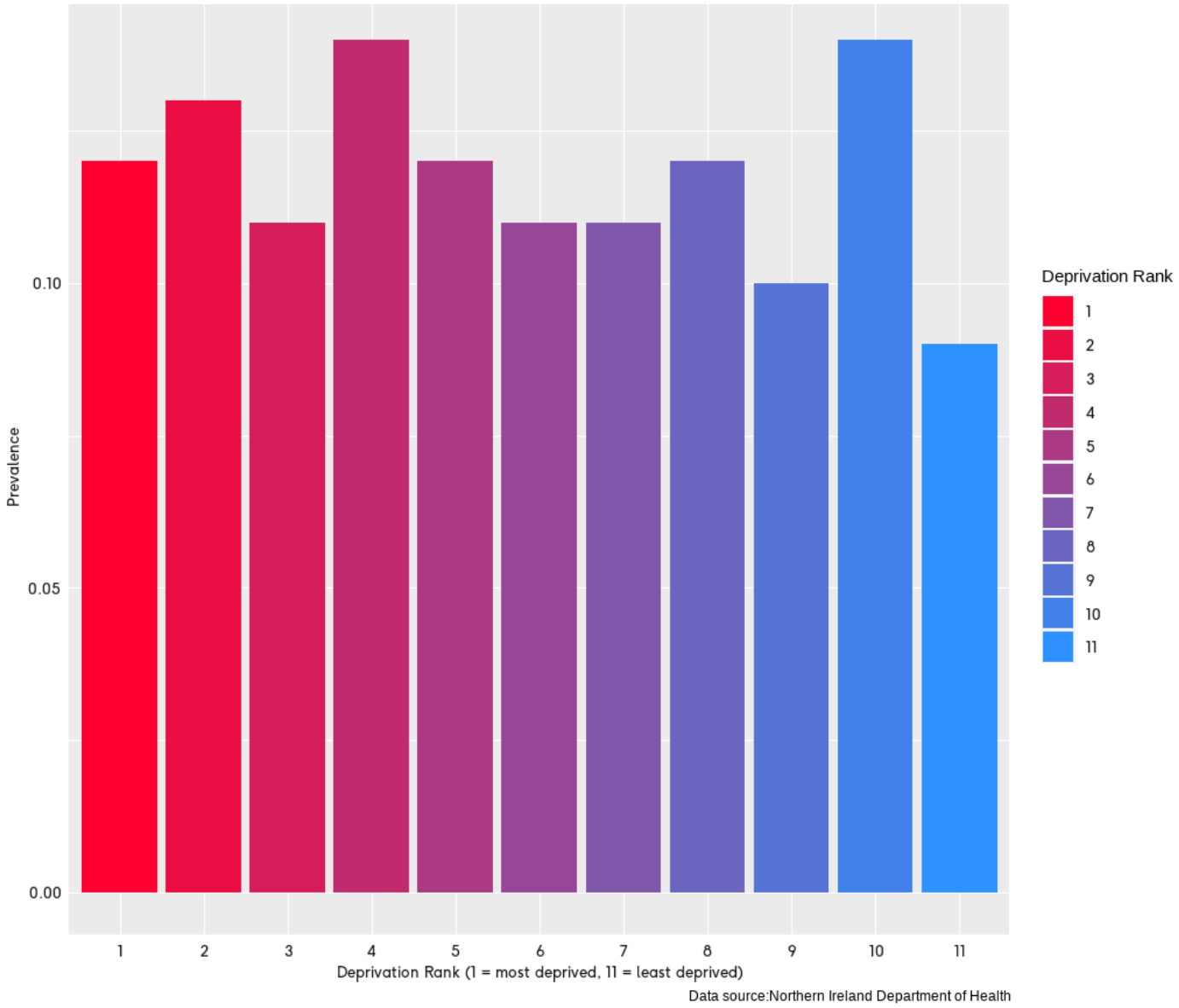
Data from the Northern Ireland Department of Health prevalence statistics provides insight into CVD and morbidity. Figure 8 shows the prevalence of multiple heart and circulatory conditions, and major risk factors (hypertension and diabetes), across each LGD ordered by decreasing deprivation (where 1=most deprived). Hypertension is the most prevalent condition across all LGDs, ranging from 13% to 16%. Additionally, no association is seen between any of the conditions measures and deprivation rank. It is important to note that these prevalence statistics aren't age standardised. In equivalent data for England, we have seen big differences between raw counts and age-standardised data.

Figure 9 Prevalence of heart and circulatory conditions and risk factors by LGD deprivation rank in 2022/23



The BHF CVD prevalence estimate calculated from Northern Ireland Department of Health prevalence statistics highlights the overall association between CVD prevalence and deprivation rank. The most and least deprived LGDs had a 3-percentage point difference in prevalence. However, the highest CVD prevalence (14%) is seen in the 4th and 10th most deprived groups.

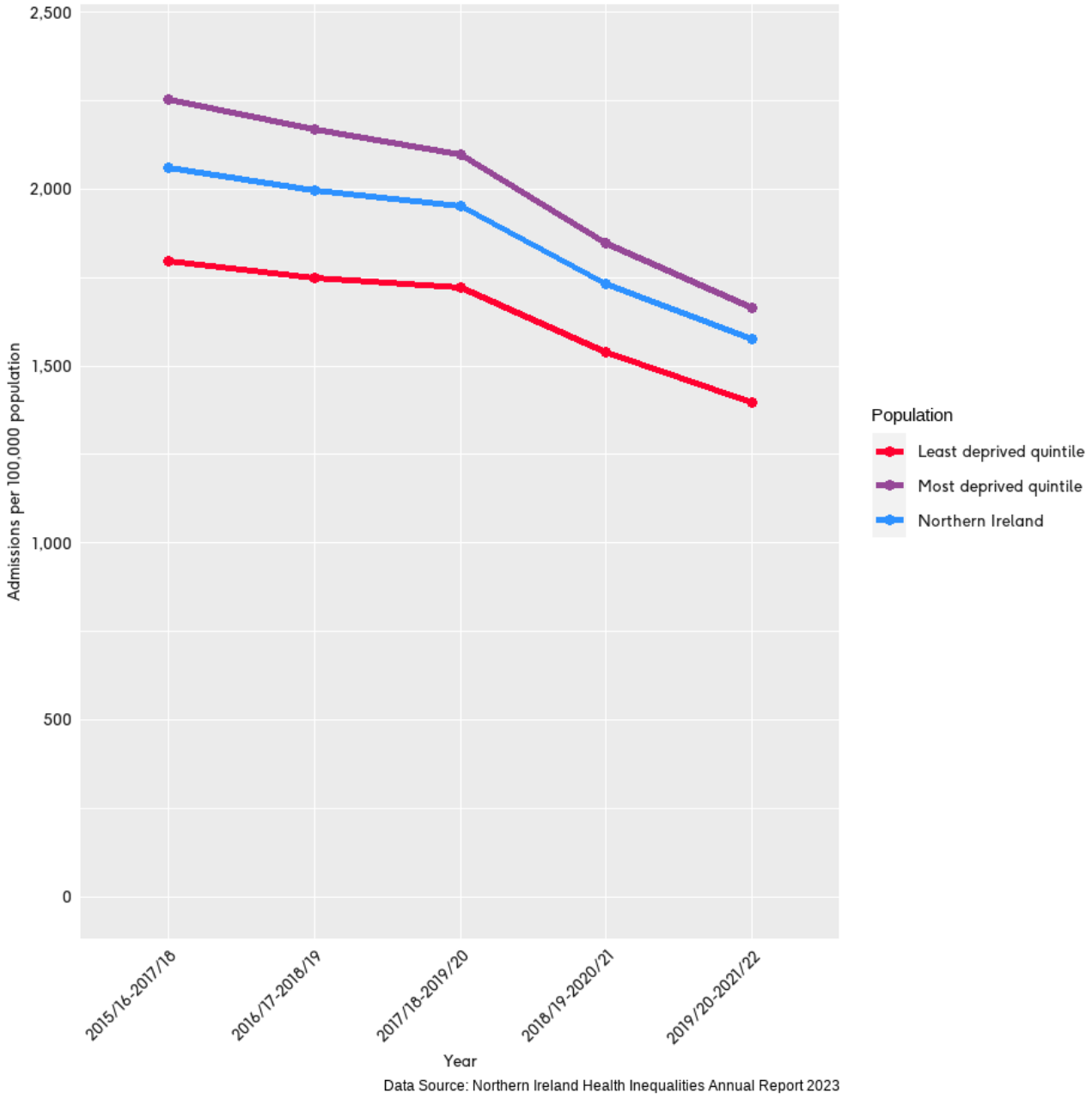
Figure 10 BHF CVD estimate in N. Ireland by Deprivation rank in 2022/23



Secondary care

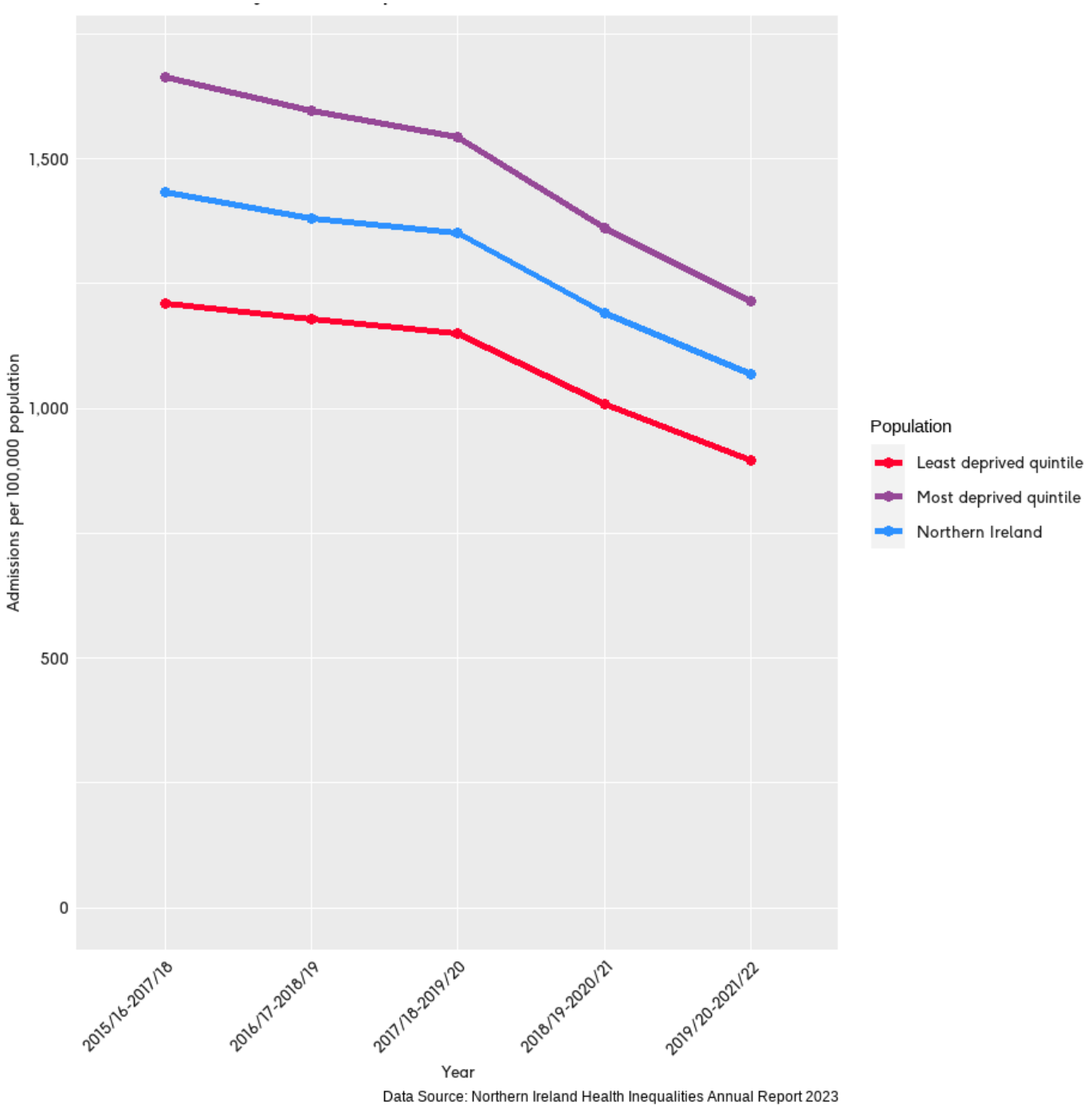
There is a clear gap in the cardiac pathway when it comes to available deprivation data for cardiology services in secondary care. However, we can measure the three-year average rate of hospital admissions for heart and circulatory conditions (ICD-10 codes I00-I99) in Northern Ireland. There is a clear association between level of deprivation and rate of hospital admissions. From 2019-2022 the most deprived quintile saw 1,666 hospital admissions for heart and circulatory conditions per 100,000 population. This was higher than the least deprived quintile, which the rate was 1,398 per 100,000. The rate of heart and circulatory condition hospital admissions, as well as the gap between the most and least deprived quintiles, have decreased since 2015. For the period 2019-2022, the gap between the most and least deprived quintiles sat at 268 per 100,000 population.

Figure 11 Heart and circulatory hospital admissions per 100,000 population from 2015-2022



A similar trend is seen for under-75 heart and circulatory disease admissions with the most deprived quintile consistently having more admissions per 100,000 population compared to the least deprived quintile (Figure 12). Like the overall standardised admission rate, admissions and the gap between the most and least deprived quintiles have both reduced since 2015. As expected, the standardised admission rate is lower for the under 75s, however, the gap between the most and least deprived groups is larger at 319 per 100, population compared to 268 in 2019/20-2021/22.

Figure 12 Under 75s heart and circulatory condition hospital admission rate from 2015-2022



Primary Care

Similarly, to the rest of the UK[11,12], significantly more people from the most deprived areas in NI are admitted to hospital as emergency admissions (Appendix D) Whilst a gap also exists for elective admissions, it is significantly larger for emergency admissions (Appendix D), which could be driven by limited primary care access in more deprived areas. In Northern Ireland, there is an association seen between level of deprivation and number of GPs per 100,000 population with a difference of 6.8 GPs per 100,000 between the most and least deprived group. Outliers seen in Figure 12 can be attributed to specific geographies with rank 4 being Belfast (Appendix B), having the second largest number of GPs per population.

It is also important to explore how the number of GP practices has changed with time. Figure 13 compares the number of GPs in 2014 and 2023 in decreasing levels of deprivation. From 2014 to 2023 all LGDs lost GPs except for Causeway Coast and Glens (5th most deprived) which stayed the same at 25 GPs. Most LGDs saw a loss of between 5 and 7% of GPs, However, Belfast (4th most deprived), Ards and North Down (10th most deprived), and Fermanagh and Omagh (2nd most deprived) saw a loss of 12%, 14%, and 29% of GPs. While Fermanagh and Omagh saw the proportionally largest loss in GPs and was ranked in the top 3 most deprived areas, this was an outlier which means we cannot establish an association between loss of GPs to level of deprivation.

[11] How inequalities contribute to heart and circulatory diseases in England - BHF
[12] Cardiovascular inequalities in Scotland - BHF

Figure 14 Number of GPs per 100,000 population, by deprivation rank in March 2023

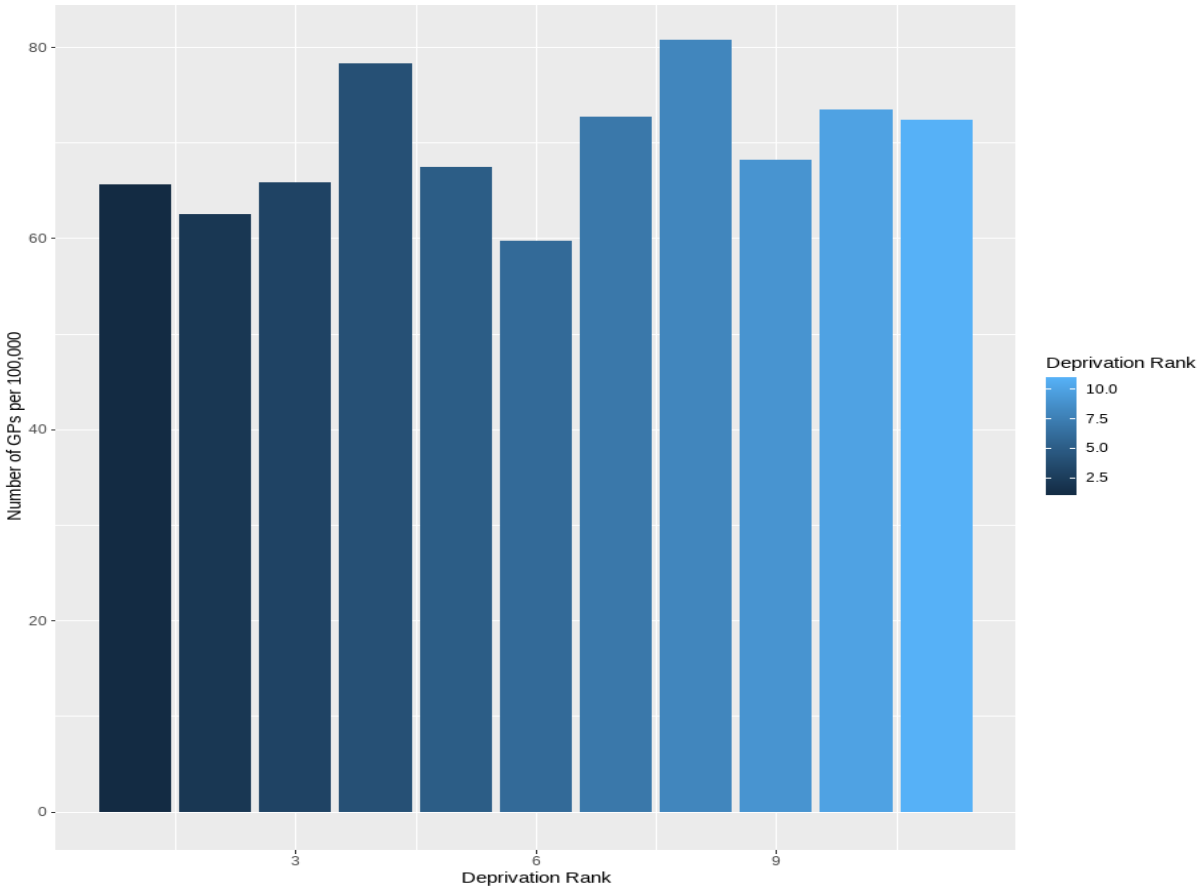
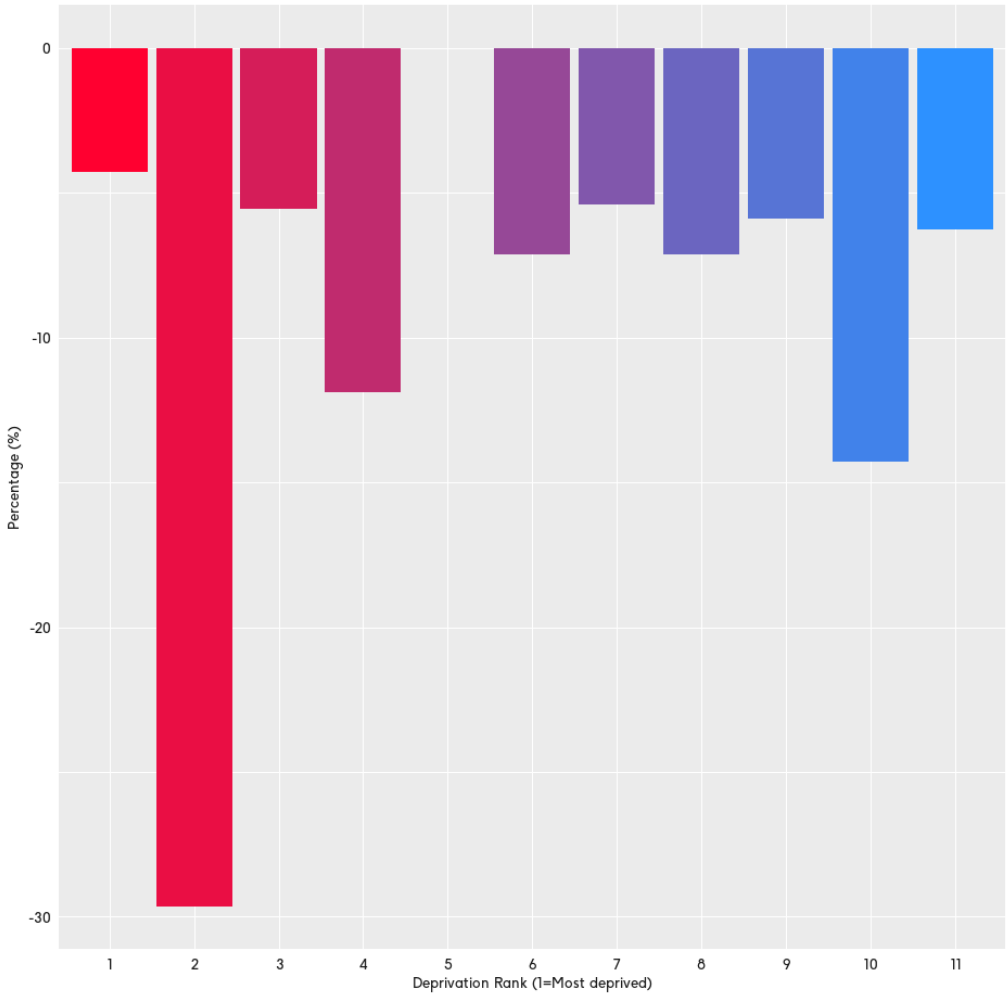


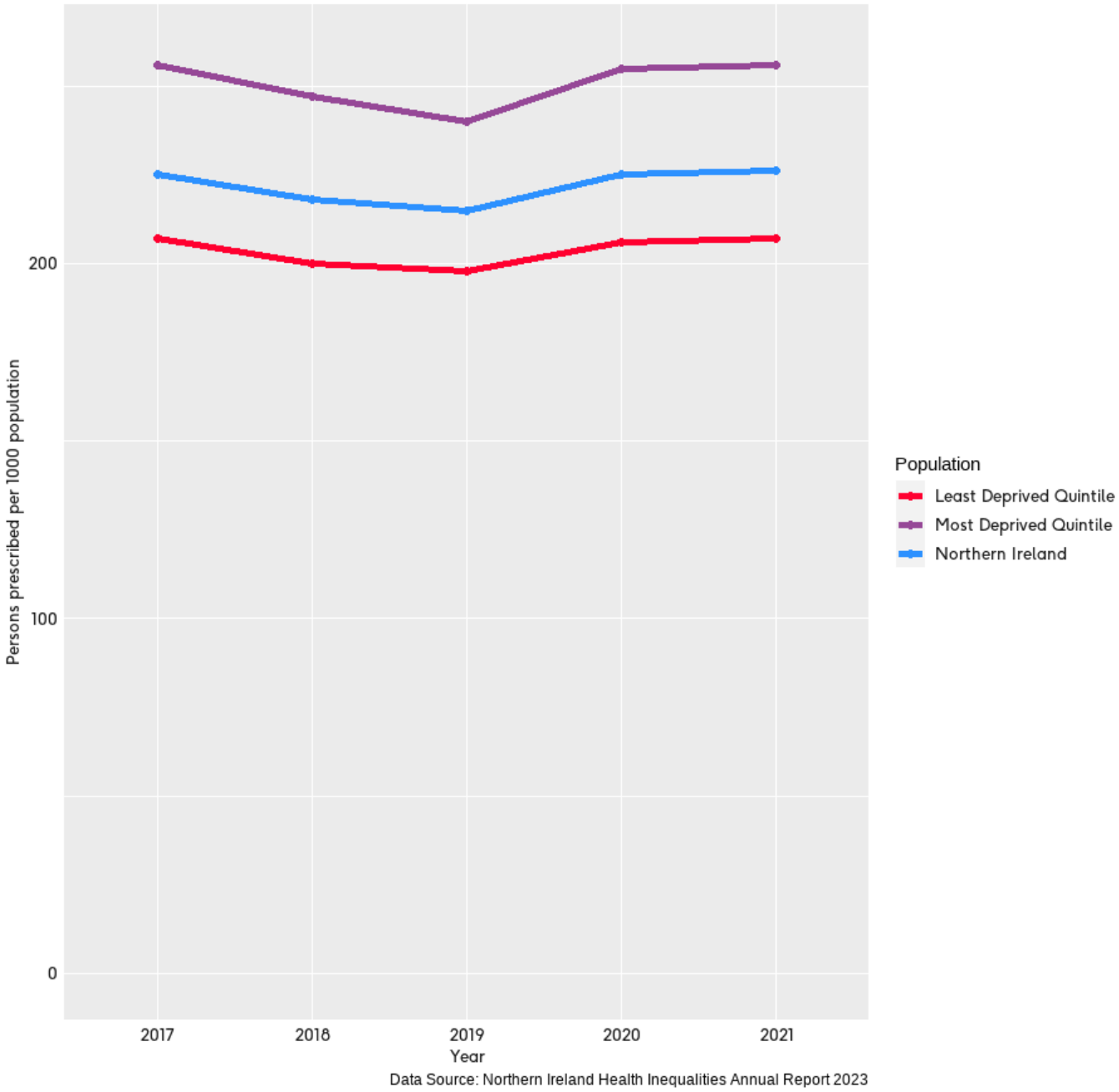
Figure 13 Percent change in number of GPs from 2014-2023, by decreasing deprivation.



Prescriptions: Antihypertensives

Blood pressure medications (antihypertensives) are medications prescribed to lower blood pressure in various ways including causing blood vessels to widen so blood can get through more easily or remove excess fluids from your blood or block natural hormones that raise blood pressure.[13] A clear association is present between level of deprivation and antihypertensive prescription rate, with those in the most deprived quintile receiving more hypertensive prescriptions compared to the least deprived group and Northern Ireland as a whole. The largest gap is seen in both 2017 and 2021 with a rate difference of 49 persons prescribed per 1000 population. On the other hand, prescription trends are similar across the most and least deprived quintile as well as Northern Ireland as a whole, with a steady decrease from 2017-2019 then a sharp increase in 2020. The reasons for this trend over time are presently unclear.

Figure 15 Standardised prescription rate for antihypertensives from 2017-2021

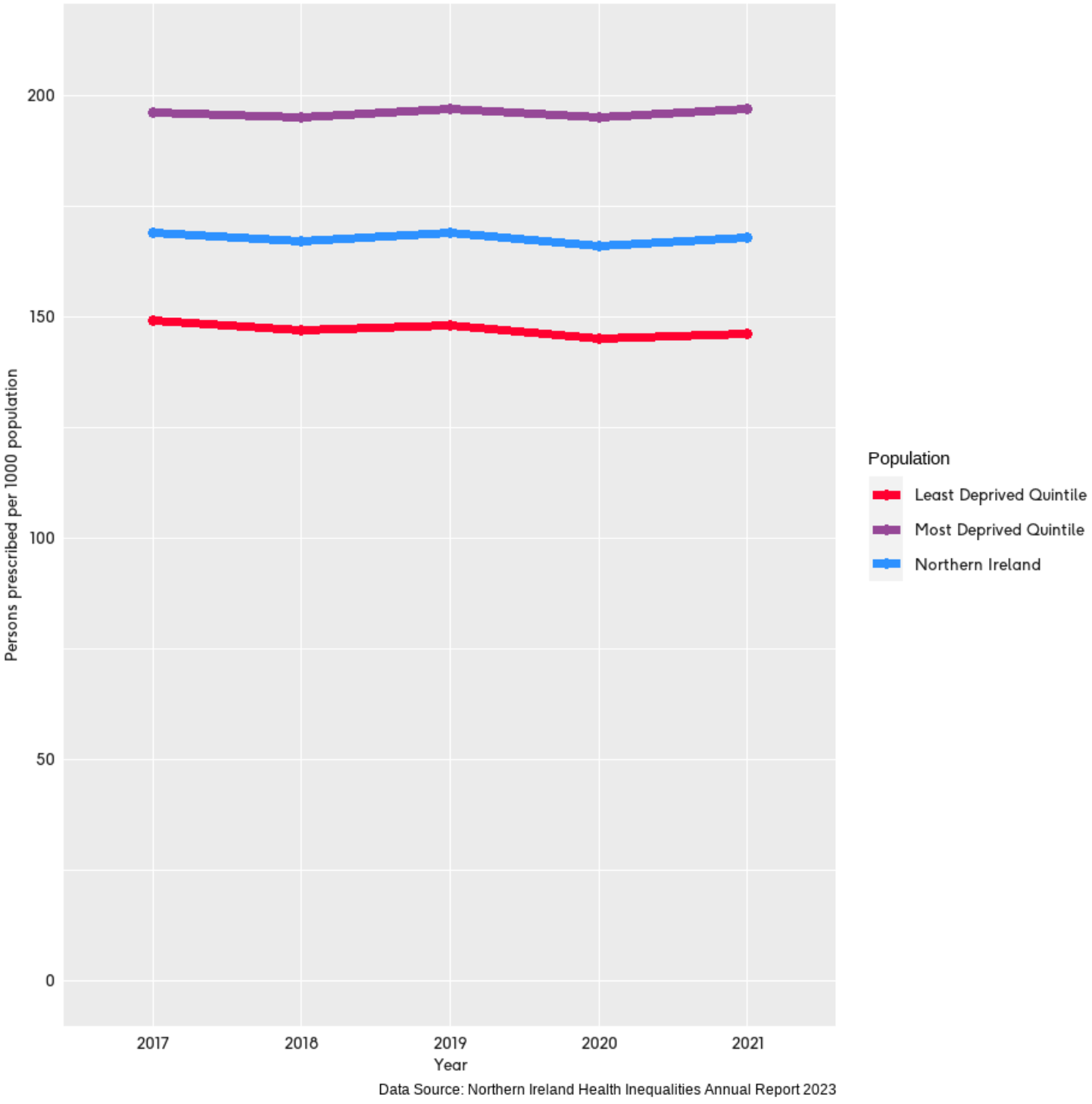


[13] Types of Blood Pressure Medication (Antihypertensives) (clevelandclinic.org)

Prescriptions: Statins

Statins are a group of medications that lower cholesterol levels in the blood to prevent a hardening and narrowing of the arteries.[14] The rate of statin prescriptions has remained relatively constant from 2017 to 2021 across the most and least deprived quintiles as well as Northern Ireland as a whole. There is, however, is a clear association between deprivation and the rate of statin prescriptions, with the most deprived quintile having more people prescribed for statins compared to the least deprived quintile and Northern Ireland. This gap between the most and least deprived quintile widening appears to have increased slightly since 2017, and in 2021 there was a difference of 51 persons prescribed per 1000 population.

Figure 16 Standardised prescription rate for statins from 2017-2021

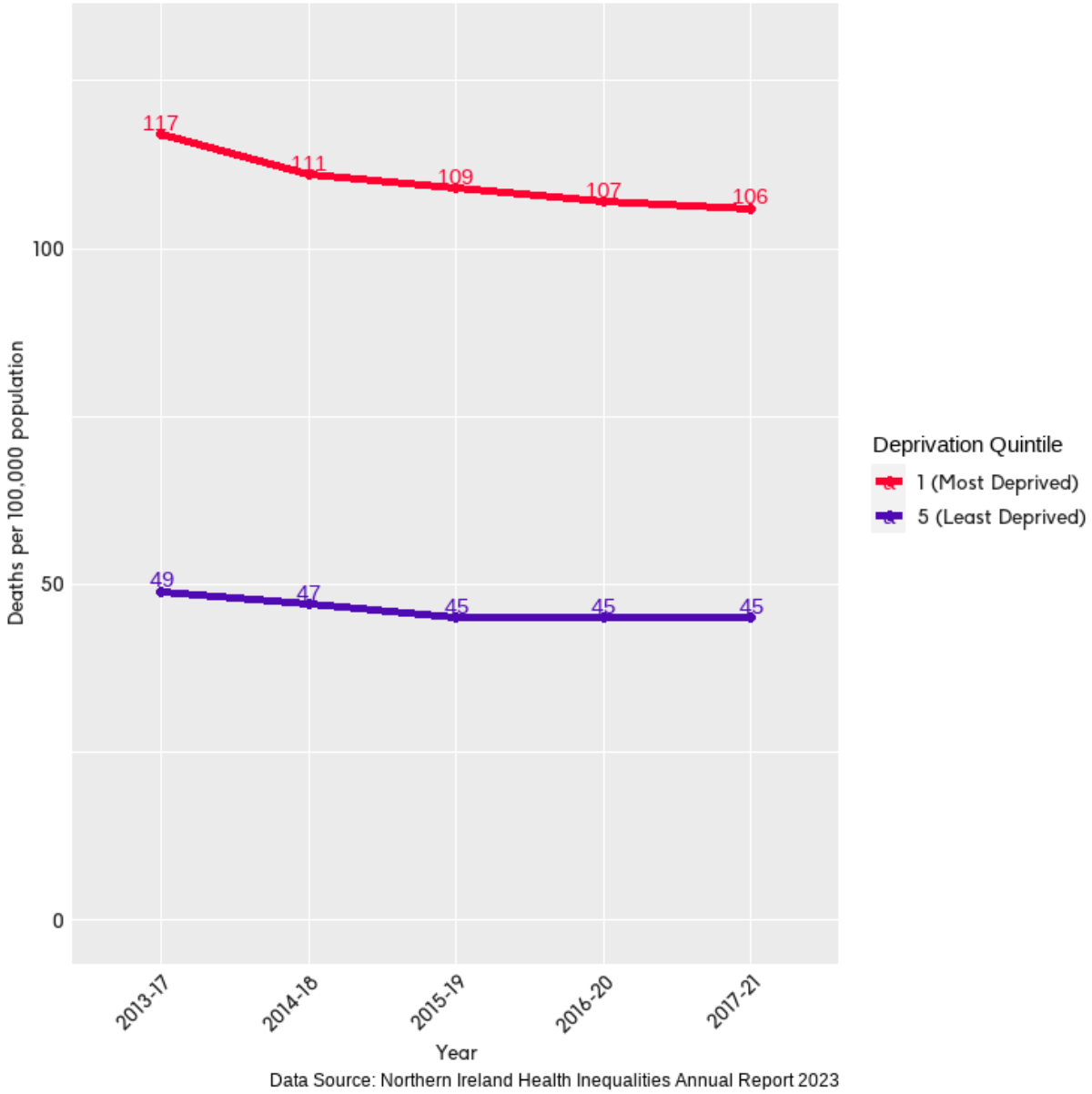


[14] Statins: Common questions answered - Heart Matters magazine - BHF

Mortality

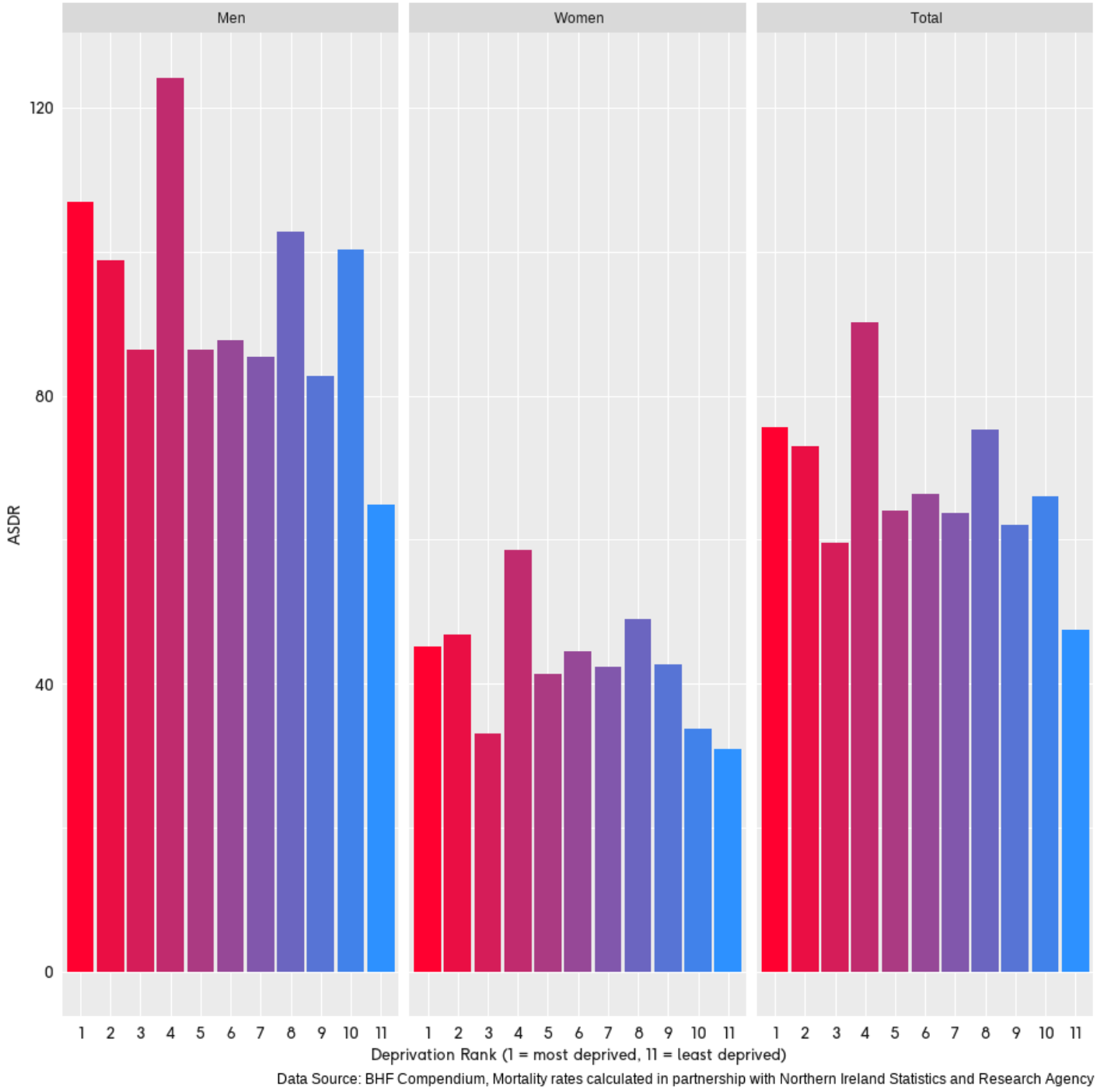
In Northern Ireland, the availability of national data that measures deprivation and health indicators is sometimes limited. Any lack of data can pose challenges when it comes to understanding the full scope of health disparities across groups of different levels of deprivation within the region. One of the key metrics that offers some insight into this issue is premature heart and circulatory (under 75) standardised death rate (Figure 17). Over the decade from 2012 to 2021 there has been a gradual decrease in the premature death rate due to CVD. This trend suggests some progress in the overall management and treatment of CVD within the population. However, the premature circulatory death rate for the least deprived group has consistently been over half that of the most deprived group, highlighting how deprivation plays a role in CVD health outcomes. Figure 18 shows LGD deprivation ranks for premature CVD deaths, using a three-year average. In this case, an association between age-standardised death rate for CVD and level of deprivation is observed when examining the most and least deprived areas. Despite this a weaker association is seen across all 11 LGDs. Similar trends are observed when comparing men and women in terms of the deprivation trend. However, there is a large gap in the age-standardised mortality rate between men and women. Overall, the least deprived group did see the lowest mortality rates. Unlike the national data, the most deprived group had the second largest age-standardised death rate which highlights potential deprivation distribution factors that may influence the analysis of deprivation as a factor in CVD outcomes.

Figure 17 Standardised death rate for under-75s for circulatory conditions from 2013-2023



Data Source: Northern Ireland Health Inequalities Annual Report 2023

Figure 18 Age standardised death rates (ASDR) per 100,000 of under 75s for CVD, by gender in Northern Ireland from 2019-2021



Life Expectancy

Cardiovascular disease burden inequalities factor into the glaring differences in life expectancy between those in the most and least deprived quintiles in Northern Ireland. The life expectancy in 2019-21 was 78 and 82 for males and females, respectively. The most recent data for 2019-21, Figure 18 shows a seven- and five-year age gap for males and females respectively, between the most and least deprived quintiles.

More staggeringly, females in the most deprived group are expected to have 52 healthy years of life[15] compared to 67 in the least deprived quintile (a gap of 15 years). Males see a similar trend with 66 healthy years in the least deprived group compared to 55 in the least (a gap of 11 years). The gap in healthy life expectancy for women has increased from 2015-17 from 14.5 to 15.1 in 2019-21. Inversely for males this has drastically decreased from 14.3 to 11.2 years. Additionally, there is a gap of around a decade between the most and least deprived quintiles for both males in females for disability free years[16]. From 2015 to 2021, gaps in life expectancy at birth and after 65 have remained constant with a slight increase in the last 2 years. However, gaps in disability-free life expectancy have decreased for both males and females. For females it has decreased from 13 to 11.3 years and even more so for males from 14.3 to 9.8. This indicates that while overall life expectancy may be improving, the experience of those extra years in terms of health and disability can vary greatly between genders and levels of deprivation.

[15] The average number of years a person can expect to live in good health. Life expectancy in Northern Ireland 2019-21 (health-ni.gov.uk)

[16] The average number of years a person can expect to live disability free. Life expectancy in Northern Ireland 2019-21 (health-ni.gov.uk)

Figure 20 Life expectancy of those in N. Ireland living in the most and least deprived quintiles, by gender in 2020-22

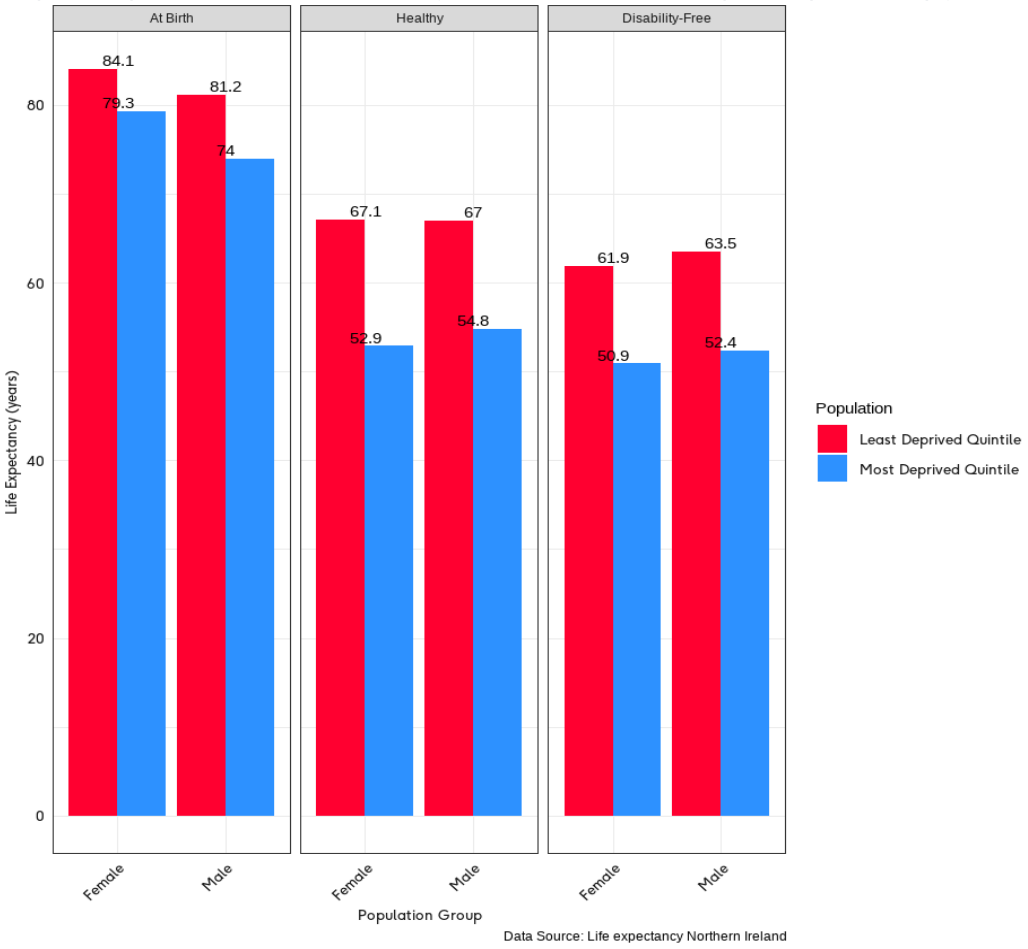
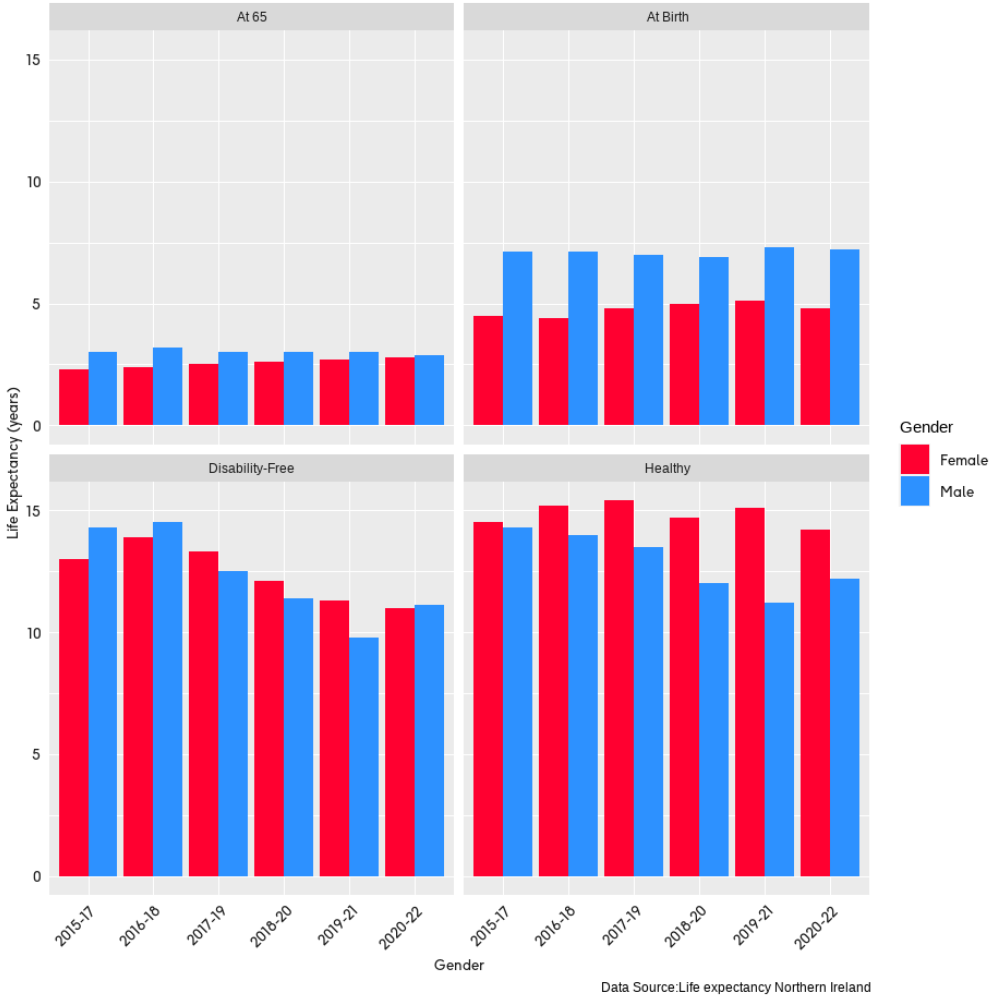


Figure 19 Life expectancy gap between the most and least deprived quintiles in N. Ireland, by gender from 2015-2022



5. Discussion

Health inequalities are a composition of a variety of factors and the CVD pathway is no exception. In Northern Ireland there are clear and consistent gaps between the most and least deprived groups across the CVD pathway. This is the case for modifiable risk factors, hospital admissions, treatment, and CVD outcomes (particularly, mortality).

The higher prevalence of modifiable risk factors undoubtedly contributes to CVD morbidity and mortality in Northern Ireland's most deprived groups. The gap between the most and least deprived groups was shown to be evident and consistent in smoking, obesity, and fruit and vegetable consumption. These gaps are consistently to the disadvantage of the most deprived populations, which have higher rates of smoking, a higher prevalence of obesity, and a lower reported fruit and vegetable consumption. Alcohol consumption follows the deprivation paradox to some degree. The deprivation paradox shows that those in the most deprived areas are less likely to drink alcohol, but those that do are more likely to be high risk drinkers (above daily or weekly limits) hence more likely to suffer from alcohol related conditions[17]. This report shows that a higher percentage of people in the least deprived quintile drank above weekly limits than the most deprived quintile. This could be due to the cost associated with consuming substantial amounts of alcohol. However, in 2022/23, those in the most deprived group had the largest prevalence of high risk drinking which, like the rest of the UK follows the deprivation paradox[17].

Circulatory condition hospital admissions overall and for those under 75 were consistently higher in the most deprived group compared to the least deprived group and compared to Northern Ireland as a whole. The percentage of those in the most deprived group on prescriptions for antihypertensives and statins were higher compared to the least deprived group and Northern Ireland. This indicates that CVD is a significant problem in the most deprived group. However, data from the Northern Ireland Department of Health showed that no association was seen between the most and least deprived groups and prevalence of heart and circulatory conditions. This could be due to the deprivation distributions present in each LGD that may have been averaged out in the DOH's calculations.

Over the past nine years, all Local Government Districts (LGDs) in Northern Ireland, apart from one, have lost GPs with the second most deprived group seeing a near 30% reduction. This significant loss of GPs has implications for access to primary care across Northern Ireland. Primary care, provided by GPs, is often the first point of contact for individuals seeking medical attention. It plays a crucial role in the early detection and management of health conditions, including cardiovascular disease (CVD).

The decrease in the number of GPs could potentially hinder individuals, particularly those in the most deprived groups, from seeking early care for CVD. Early intervention is key in managing CVD and can significantly improve health outcomes. Furthermore, a weak association has been observed between the number of GPs per population and deprivation rank. This suggests that access to primary care may not be equitably distributed across distinct levels of deprivation. The most deprived groups, who are often the most in need of medical services, may have less access to primary care compared to less deprived groups.

A clear disparity is present in the premature CVD death rate between the most and least deprived quintiles at a national level. This emphasises that deprivation does impact CVD health outcomes and adds weight to the notion that the DOH's presentation of CVD morbidity by LGD deprivation rank may be disguising an inequality in morbidity prevalence within the NI population as a whole. It is also notable that, when examining the data at the Local Government District (LGD) level, there is significant

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[17]Drinkware monitor 2021: https://media.drinkaware.co.uk/media/bvclxbax/drinkaware_northern_ireland__nations_report_2021.pdf?rnd=132884457141100000#:~:text=The%20deprivation%20paradox,suffer%20alcohol%2Drelated%20harm

variation among women. This could be influenced by a range of factors, including lifestyle habits such as alcohol consumption, or excess mortality due to the COVID-19 pandemic.

6. Limitations

As discussed in the methods section, as the deprivation rankings for some CVD measures were consolidated into LGDs to be more compatible with other datasets, it is likely that disparities seen in smaller geographies have been muted or overlooked. This may impact the overall accuracy of the trends seen and as discussed above in relation the CVD morbidity, there is evidence that this approach may disguise—to some extent—the presence of CVD inequalities according to deprivation that may be present at a national level.

It should also be noted that the data and measures of deprivation available cannot offer a comprehensive understanding of patient demographics and how they relate to CVD. The effects of deprivation may be compounded by other social factors. Intersectionality, or how ethnicity, socioeconomic, and sex may overlap, can also affect health outcomes, and is difficult to analyse and couldn't be addressed due to aggregate data used.

The data collected also provided little information surrounding multiple conditions which contributes greatly to health and wellbeing and is linked to deprivation.[18] It is important to remember that individuals move across the cardiac pathway and to emphasise that those measured at certain stages are not static.

Additionally, it is apparent that data collection in Northern Ireland was affected during the COVID-19 pandemic. In some instances, survey questions were not asked and in others the data sample collected was much smaller than in previous years and frequently, less data was collected for more deprived groups. For example, for cigarette smoking in 2019/20 a total of 4,082 answers were collected across all deprivation quintiles and in 2020/21 that number dropped to 1,408. A smaller sample leads to a larger margin of error, which could explain outlier data points seen for that year in many plots for risk factors. Society's experience during the COVID-19 pandemic may also have led to a change in population risk behaviours, but it is challenging to prove that in this instance.

7. Conclusion

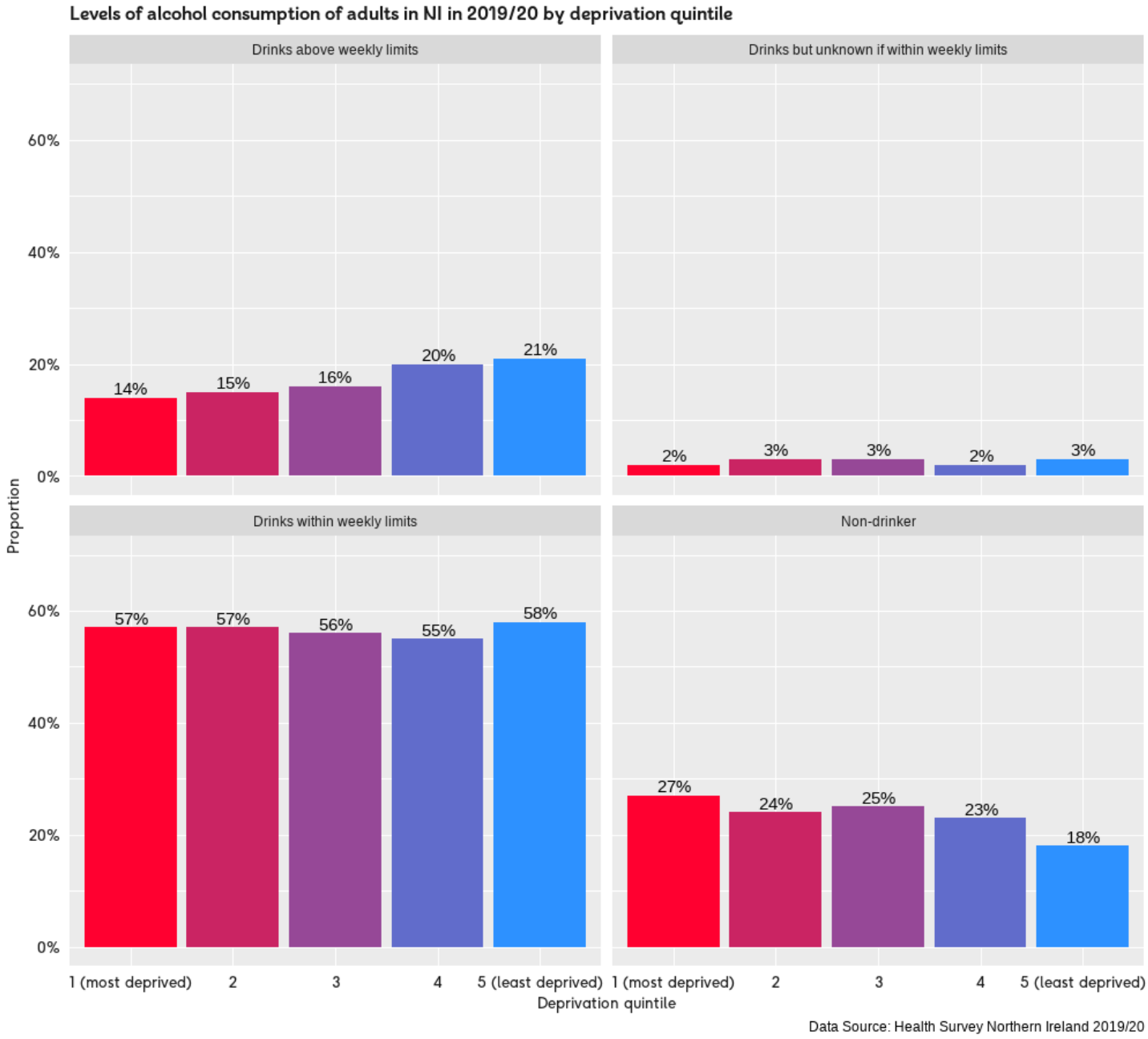
Overall, there is a clear association between deprivation and cardiovascular outcomes in Northern Ireland. This is evident across the cardiac pathway from prevention to outcomes. However, a lack of national deprivation data makes it more challenging to draw conclusions about certain areas, particularly for the prevalence of CVD. However, there is good data available relating to modifiable risk factors, prescriptions, and hospital admissions, which provide a clear understanding that those in more deprived areas are at an increased risk for CVD, in ways that undoubtedly contribute to poorer CVD outcomes for those in the most deprived areas (particularly, premature mortality). It is also a testament to the significant degree to which socioeconomic conditions contribute to the overall burden of CVD in Northern Ireland.

[18] The Health Foundation (2018) Understanding the health care needs of people with multiple health conditions

8. Appendix

Appendix A: Level of alcohol consumption (all categories)

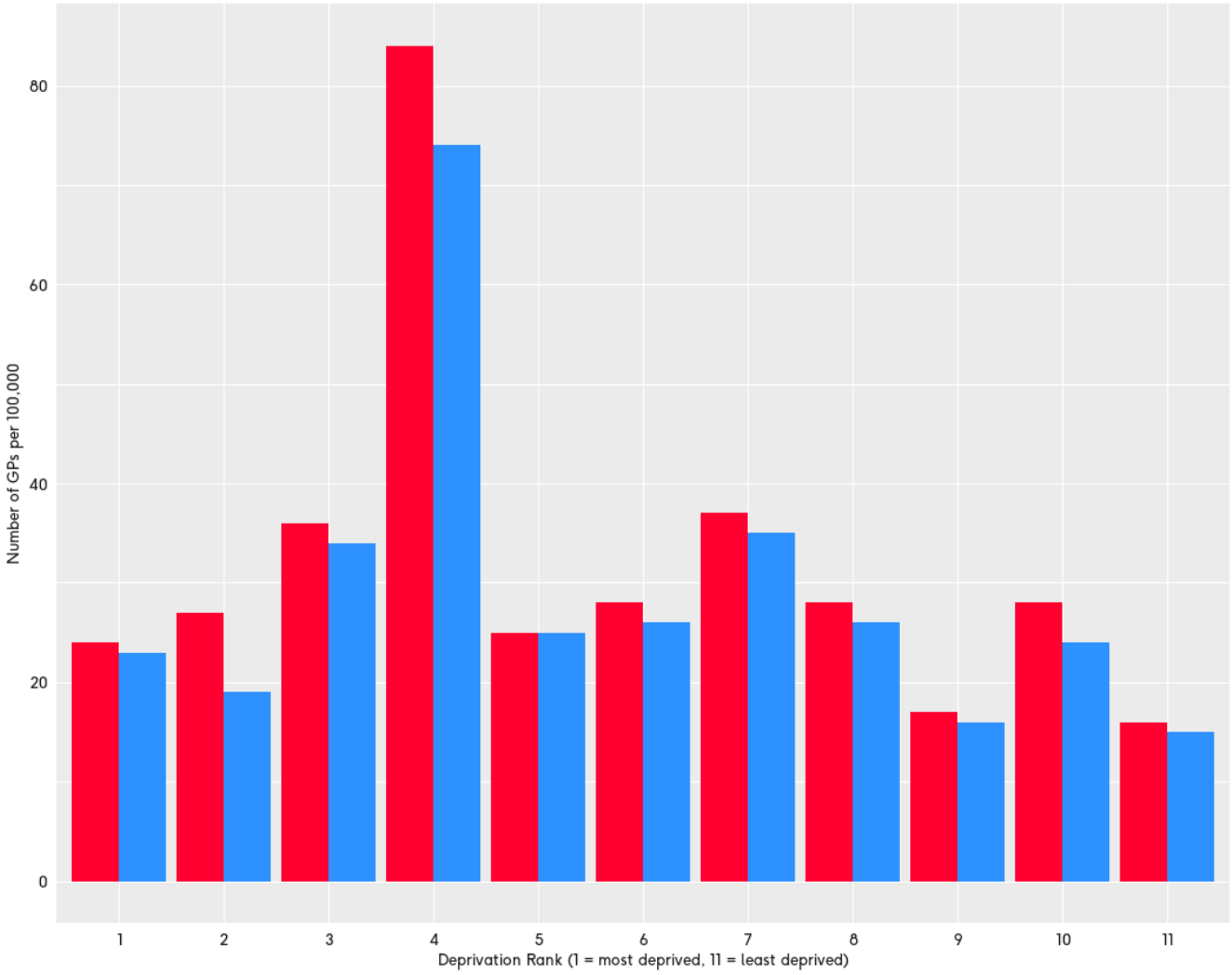
Expanding on Figure 2, percentages are similar for drinks an unknown quantity and those who drink within weekly limits. The difference between the most and least deprived groups sits at 1% for both other categories.



Appendix B: Number of GPs in 2014 and 2023 by LGD of decreasing deprivation

Building on Figure 13, Figure 21 provides insight in the number of GPs lost by decreasing depravity. From 2014 to 2023 all LGDs lost GPs except for Causeway Coast and Glens which stayed the same at 25 GPs. While the most deprived quintile has fewer GPs than the least deprived quintile in 2014 and 2023, little association is seen between number of GPs and level of deprivation overall. It is important to note that varying levels of deprivation and geographic differences between LGDs may influence the results of this plot.

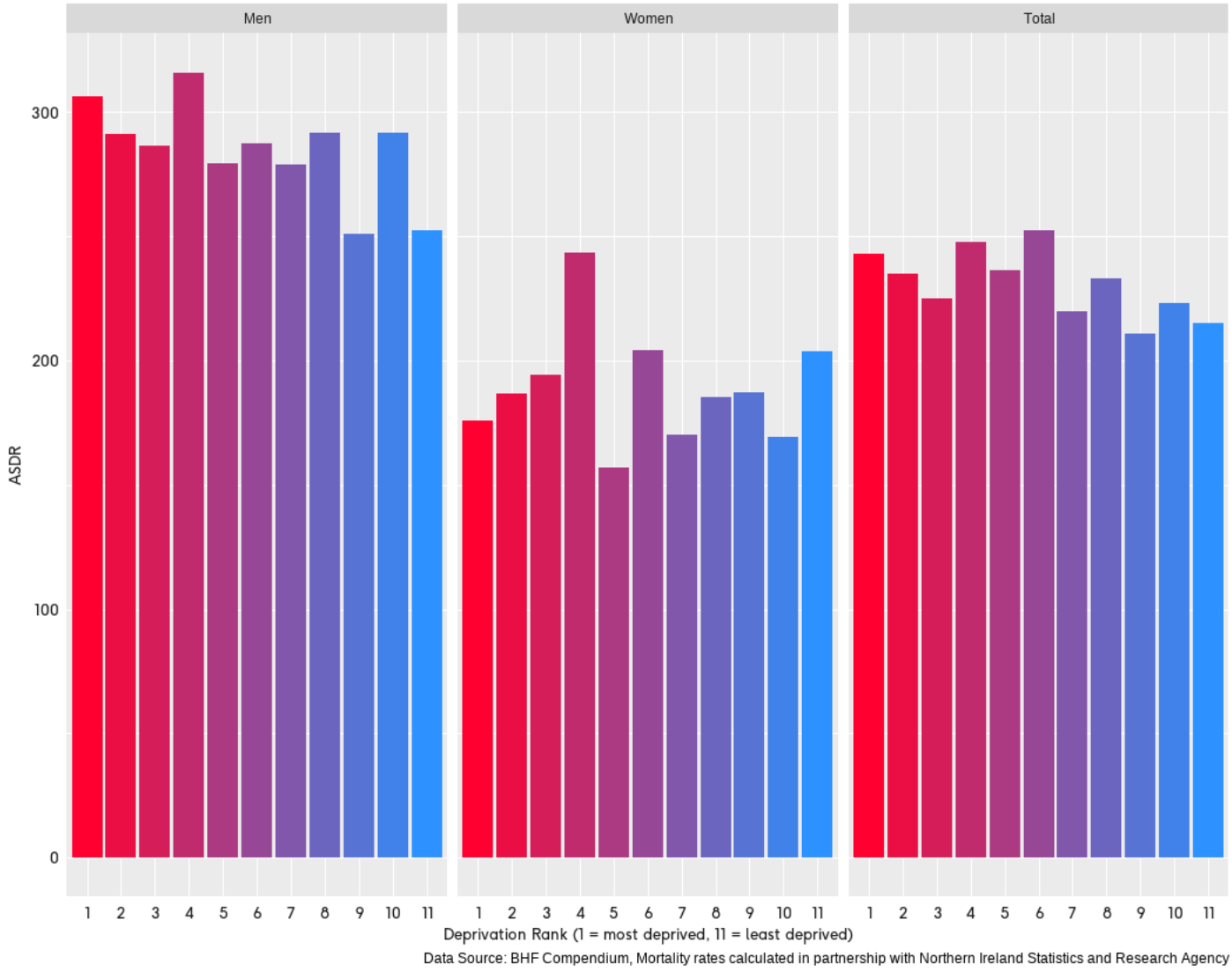
Figure 22 Number of GPs in 2014 and 2023 by deprivation rank



Appendix C: Overall age standardised death rates per 100,000 for CVD, by gender

Figure 23 Age-standardised death rates per 100,000 for CVD, by gender in Northern Ireland from 2019-2021 takes a 3-year average of age-standardised mortality rates for CVD from 2019-2021. An association is seen between age-standardised death rate and level of deprivation; however, the largest gap is seen in between the 6th lowest deprivation rank and the least deprived group at 38 per 100,000 population. Additionally, no association is seen for women when comparing age-standardised death rate to level of deprivation. The COVID-19 pandemic could play a role in the variations seen as many who died from COVID-19 would otherwise have died from CVD. Additionally, examining time series data could provide additional information.

Figure 23 Age-standardised death rates per 100,000 for CVD, by gender in Northern Ireland from 2019-2021



Appendix D: Emergency and elective hospital admissions

Comparing elective and emergency care in the most and least deprived quintiles highlights the rate of referral and care-seeking. Figure 18 shows that the rate of emergency admissions is higher than the rate for elective care admissions for both deprivation groups, and care seeking is higher for the most deprived group in both cases. However, the gap between the most and least deprived areas is significantly higher for emergency admissions. In 2021/22, the difference between the most and least deprived quintile for emergency admissions was around 4,000 admissions per 100,000 population, compared to a gap of just under 300 for elective admissions. The fact that this gap is significantly larger for emergency admissions could suggest that more people from the most deprived areas are presenting to emergency care for conditions that could have been addressed earlier via elective care, which could signal that these groups are being underserved in primary care.

Figure 24 Comparison of emergency and elective hospital admission rate in N. Ireland from 2017-2022