

# Relationship between antidepressant prescriptions and education across Scotland

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## Background

The relationship between mental health and education level has been studied extensively, with a number of theories emerging on how the two interact. Correlative trends have been observed in PhD students, possibly owing to increased stress (1.). While other studies have shown a significantly reduced incidence of mental illness in educated individuals, hypothesising a protective effect (2.).

This report aims to explore the relationship between antidepressant prescriptions and education level in specific healthboards across Scotland, using Public Health Scotland prescribing data from and data from Scotland's most recent census in 2022. The prescribing data will be focused on August 2025, minimising any recording of repeat prescriptions following the NHS' prescribing recommendations, indicating an optimal 28-day repeat prescription duration (3, 4.).

```
library(tidyverse)
library(janitor)
library(gt)
library(here)
library(dplyr)
library(ggrepel)

data_jan_june25 <- read_csv("https://www.opendata.nhs.scot/dataset/84393984-14e9-4b0d-a797-b288db64d088"
  clean_names()
```

First, we need to find all the antidepressants being prescribed in Scotland. This is made possible by the inclusion of BNF item codes in the Public Health Scotland prescribing data set. By identifying the relevant codes for antidepressants we can filter the data set down to just the drugs we want to look at.

In order to identify the code for antidepressants, we can look at the BNF code information provided by the NHS Business Services Authority. Available at: <https://opendata.nhsbsa.net/dataset/bnf-code-information-current-year>

```
BNF_info <- read_csv(here("data/bnf_code_current_202506_version_88.csv"))

# We filter the data to show just the antidepressants
BNF_info_antidepressants <- BNF_info %>%
  filter(BNF_SECTION == "Antidepressant drugs")

unique(BNF_info_antidepressants$BNF_SECTION_CODE)

## [1] "0403"
```

Now we can see the section code, 0403, and we could also get the codes for specific antidepressant drugs and even formulations or dosages if needed.

bnf_item_description	total_quantity
AMITRIPTYLINE 10MG TABLETS	5518112
FLUOXETINE 20MG CAPSULES	4341105
SERTRALINE 100MG TABLETS	4032703
SERTRALINE 50MG TABLETS	3450573
CITALOPRAM 20MG TABLETS	1877826
AMITRIPTYLINE 25MG TABLETS	1674912
MIRTAZAPINE 15MG TABLETS	1211480
DULOXETINE 60MG GASTRO-RESISTANT CAPSULES	1064728
AMITRIPTYLINE 50MG TABLETS	974069
MIRTAZAPINE 30MG TABLETS	971199
MIRTAZAPINE 45MG TABLETS	937713
CITALOPRAM 10MG TABLETS	937644
VENLAFAKINE 75MG TABLETS	723771
NORTRIPTYLINE 10MG TABLETS	697220
DULOXETINE 30MG GASTRO-RESISTANT CAPSULES	553228
CITALOPRAM 40MG TABLETS	517497
TRAZODONE 100MG CAPSULES	480164
TRAZODONE 50MG CAPSULES	435854
VENLAFAKINE 150MG MODIFIED-RELEASE TABLETS	412604
VENLAFAKINE 37.5MG TABLETS	404317

Let's use this information to filter the original dataset, and we can look at the most commonly prescribed antidepressants too.

```
data_antidepressants <- data_jan_june25 %>%
  filter(startsWith(bnf_item_code, "0403")) # show only the antidepressants prescribed

data_antidepressants_table <- data_antidepressants %>%
  group_by(bnf_item_description) %>%
  summarise(total_quantity = sum(paid_quantity)) %>%
  arrange(-total_quantity) %>%
  head(n = 20) %>%
  gt()

data_antidepressants_table
```

Next, let's add some names for the healthboard to our table, and we can get a feel for which healthboard are at the top in antidepressant prescription numbers.

```
hb_names <- read_csv("https://www.opendata.nhs.scot/dataset/9f942fdb-e59e-44f5-b534-d6e17229cc7b/resource/antidepressants-prescription-data.csv")

data_antidepressants <- hb_names %>%
  inner_join(data_antidepressants, by = c("HB" = "hbt")) %>%
  select(!c(HBDateEnacted, HBDateArchived, Country)) %>%
  clean_names()

prescriptions_totals <- data_antidepressants %>%
  group_by(hb_name) %>%
```

```
summarise(total_prescriptions = sum(paid_quantity)) %>% # grouping data so that we have total prescriptions
arrange(-total_prescriptions)
```

Using the flexible table builder on the Scottish census website, I have created a table with the numbers for highest level of education achieved by healthboard. We can join this with the data for antidepressants, using the healthboard names we just added.

Resource is available at: <https://www.scotlandscensus.gov.uk/search-the-census#/>

```
census_data22 <- read_csv(here("data/education_level_healthboard.csv")) %>%
  clean_names %>%
  filter(health_board_area_2019 != "Total")

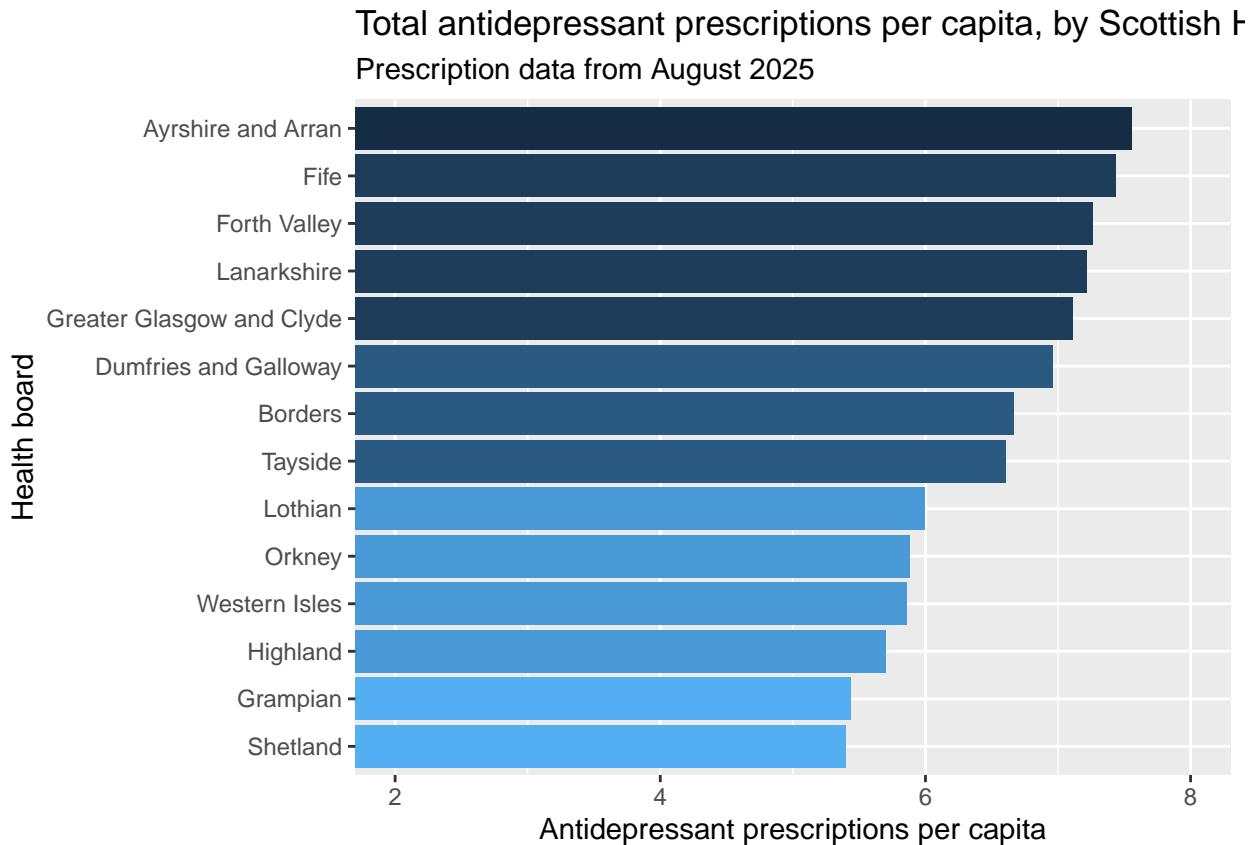
prescriptions_totals <- prescriptions_totals %>%
  mutate(hb_name = gsub("^NHS ", "", hb_name)) # removes the NHS prefix in the antidepressant dataset, as it's included in the healthboard names

education_antidepressants <- prescriptions_totals %>%
  full_join(census_data22, by = c("hb_name" = "health_board_area_2019"))
```

Because all we have right now are flat numbers, we need to show these in proportion to properly gauge the relative prescribing rate of antidepressants. Luckily, we have a total column from the census data that shows us the population of each healthboard, so we can create a new column with the antidepressant prescriptions per capita.

```
education_antidepressants <- education_antidepressants %>%
  mutate(ratio = total_prescriptions / total, degree_pct = degree_level_qualifications_or_above_education)

education_antidepressants %>%
  ggplot(aes(ratio, reorder(hb_name, ratio), fill = ratio)) +
  geom_col(stat="identity") +
  coord_cartesian(xlim=c(2, 8)) + # zooms in on the disparities between boards
  labs(x = "Antidepressant prescriptions per capita", y = "Health board", title = "Total antidepressant prescriptions per capita by Health Board") +
  scale_fill_steps(low = "#56B1F7", high = "#132B43") +
  guides(fill = "none")
```

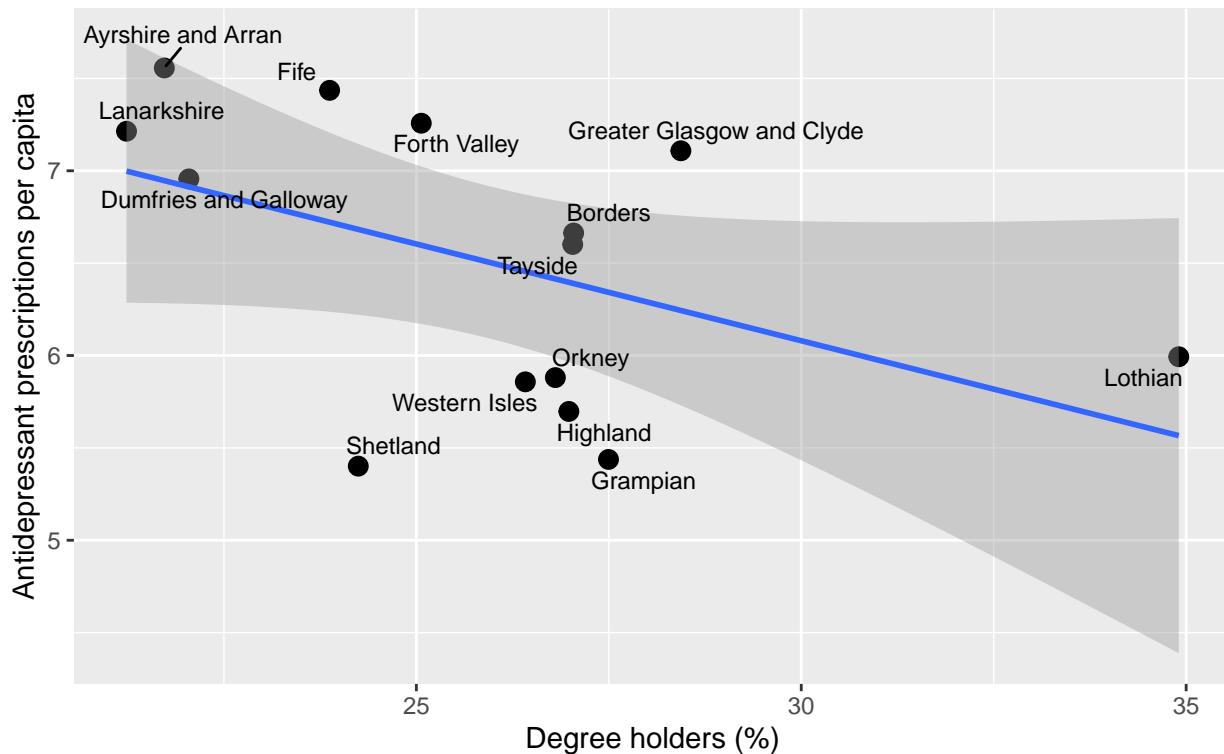


The graph displayed shows the antidepressant prescriptions over from January to June 2025 in all 14 Scottish health boards, proportional to the population of each healthboard. Fife appears to have the highest prescribing rate when it comes to antidepressants, with Ayrshire and Arran following closely in second, while Shetland has the lowest rate of the lot. The total range of prescriptions per capita is noticeable, with a difference of almost 12.5 between the highest and lowest prescribing health boards.

Now, we can display the antidepressant prescriptions alongside the education data. We'll do this by using the percentage of each healthboard's population that are degree holders we calculated earlier.

```
ggplot(education_antidepressants, aes(x = degree_pct, y = ratio)) +
  geom_point(size = 3) +
  geom_smooth(method = "lm", se = TRUE) +
  geom_text_repel(aes(label = hb_name), size = 3) +
  labs(
    x = "Degree holders (%)",
    y = "Antidepressant prescriptions per capita",
    title = "Association between education level and antidepressant prescribing by Scottish Health boards",
    subtitle = "Prescribing data from August 2025"
  )
```

## Association between education level and antidepressant prescribing by Scott Prescribing data from August 2025



## Next Steps

- table of contents with headings for each figure/visualisation
- can force a function somewhere maybe
- find data for all anxiety/depression drugs
- plot top 20 most frequently prescribed
- join demographic data
- look at correlations generally
- explore dosages?
- possibly look at outcome disparities - where would I get data for that
- could stratify with industry
- could find geometric dataset for healthboards in scotland, then colour code the prescriptions to population ratio
- gen ai acknowledgement

## References

1. Bergvall, S., Fernström, C., Ranehill, E., & Sandberg, A. (2025). The impact of PhD studies on mental health-a longitudinal population study. *Journal of health economics*, 104, 103070. Advance online publication. <https://doi.org/10.1016/j.jhealeco.2025.103070>
2. Maguire, A., Moriarty, J., O'Reilly, D. et al. (2017). Education as a predictor of antidepressant and anxiolytic medication use after bereavement: a population-based record linkage study. *Qual Life Res* 26, 1251–1262. <https://doi.org/10.1007/s11136-016-1440-1>

3. NHS Business Services Authority. Electronic Repeat Dispensing Handbook. 2020. Available at: [https://www.nhsbsa.nhs.uk/sites/default/files/2020-07/Electronic%20Dispensing%20Handbook\\_Digital\\_WEB\\_S-1589995676.pdf](https://www.nhsbsa.nhs.uk/sites/default/files/2020-07/Electronic%20Dispensing%20Handbook_Digital_WEB_S-1589995676.pdf) [Accessed 21 Nov 2025].
4. Hertfordshire & West Essex Integrated Care Board. (n.d.) Prescription duration guidance. Available at: <https://www.hweclinicalguidance.nhs.uk/prescribing-guidance/prescription-duration-guidance-hwe-icb/> [Accessed 21 Nov 2025].