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Module: Data Visualisation

Title of Report: Factors Driving Nurse Emigration: Insights into the Irish Healthcare System

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Introduction

Problem

There is a trend of Irish-trained nurses emigrating abroad, which has been a significant concern in Ireland (Independent.ie, 2023). It has contributed to a shortage of nurses within the Irish healthcare system, which puts pressure on the remaining nursing staff and can result in increased workloads, burnout, and decreased quality of patient care.

Audience

The audience for insights: Chief Executive of the Health Service Executive (HSE)

Images: Flaticon.com

"
As the Chief Executive of the HSE, I would like to understand the pain points leading to the decisions of Irish-trained nurses to emigrate, so that I can advocate for meaningful improvements of their working conditions informed by data.
"

The Chief Executive of the HSE is responsible for managing and delivering public healthcare services in Ireland. A part of this responsibility is to oversee the workforce planning and recruitment strategies of nurses and address issues related to workload, staffing levels, work-life balance, and job satisfaction. They are looking for data insights that help them advocate for meaningful improvements with an aim to address the challenges faced by Irish-trained nurses and slow down the trend of emigration abroad. Questions to be answered are:

- What is our capacity to provide inpatient care? How does it compare to other countries? Has it changed since 1980?
- How many people are on waiting lists to receive inpatient/day case care? How much strain are our hospitals under?
- Are our nurses paid well compared to Ireland's average wage? How does it compare to other countries mentioned as popular emigration destinations for Irish-trained nurses (O'Halloran, 2017)? Has it changed since 1990?

Datasets

Data from the five sources below were used in this analysis.
- [Hospital beds (per 1,000 people)](#) from World Bank
- [Health Care Resources: Remuneration of health professionals](#) from OECD.Stat
- [Average annual wages](#) from OECD.Stat (used in an alternative visualisation)
- [IPDC Waiting List by Hospital](#) 2023 from eHealth Ireland
- `hospital_geolocation.csv` created for this assignment

Pre-processing

Hospital Beds Data

Dataset from [Hospital beds (per 1,000 people)](#):
- Dropped unnecessary columns `Indicator.Name`, `Indicator.Code`, and `X`
- Removed "X" from column names (e.g. "X1960" to "1960")
- Removed rows with `Country.Code` values that are not valid ISO-3 codes
- Removed columns other than 1980 - 2018 (where there are no data for Ireland)
- Dropped countries that are missing more than 30% of the data for 1980 - 2018
- Restructured the dataset to have all the years in `Year` column
- Made `Year` column from character to an integer
- Imputated the missing value with the previous value within the country
- Imputated the remaining missing values by carrying the next value backwards
- Rounded `Value` to 1 decimal point

Nurses Wage Data

Dataset from [Health Care Resources: Remuneration of health professionals](#):
- Filtered the dataframe by `Variable`, `Measure`, and `Country`
- Dropped unnecessary columns
- Renamed column names
- Manually imputed a value for Australia in 2020 by carrying forward a value from 2019

Alternative Visualisation

Dataset from [Health Care Resources: Remuneration of health professionals](#):
- Filtered the dataframe by `Variable`, `Measure`, and `Country`
- Dropped unnecessary columns
- Renamed column names

Dataset from [Average annual wages](#)
- Filtered the dataframe by `Series`
- Dropped unnecessary columns
- Renamed column names
- Merged with the dataset above from [Health Care Resources: Remuneration of health professionals](#)

Hospital Waiting List Data

Dataset from [IPDC Waiting List by Hospital 2023](#):
- Converted `ArchiveDate` to date format
- Filtered the dataframe by `ArchiveDate`
- Dropped unnecessary columns
- Converted `Total` to numeric
- Grouped by HospitalName and calculated the sum of `Total`

Dataset `hospital_geolocation.csv`
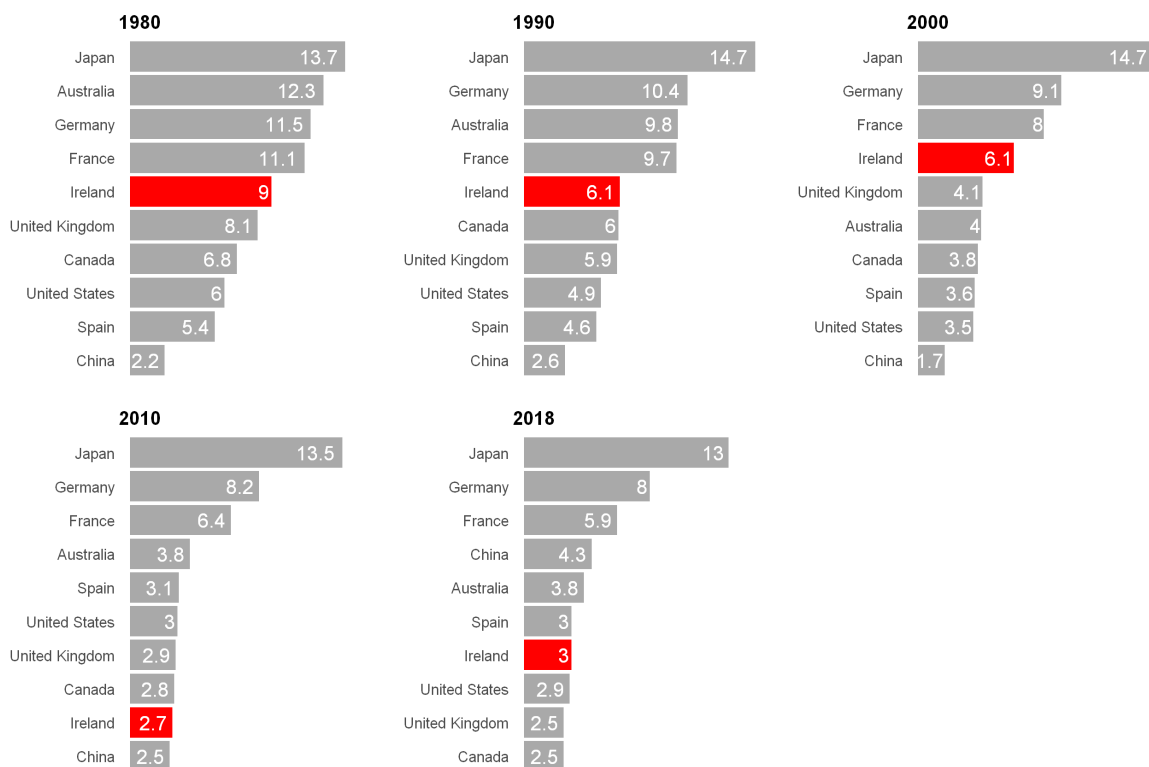- Merged with the dataset above from [IPDC Waiting List by Hospital 2023](#)

Visualisations

Decline of Hospital Beds per 1,000 People

The number of hospital beds is an indicator of a nation's healthcare system and ability to deliver inpatient care. It is also an indicator of emergency preparedness and response during public health crises or natural disasters.
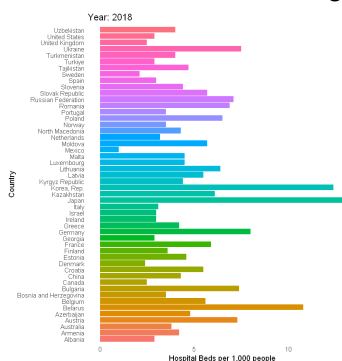
Hospital Beds per 1,000 People

Ireland used to have 9 hospital beds per 1,000 people in 1980, but the numbers declined dramatically between 2000 and 2010 from 6.1 to 2.7 beds.

Previous Iteration

The visualisation below is a previous iteration. Some of the issues with this graph were:
- Overcrowded and country names are not visible
- Bars are not ordered by the number of hospital beds
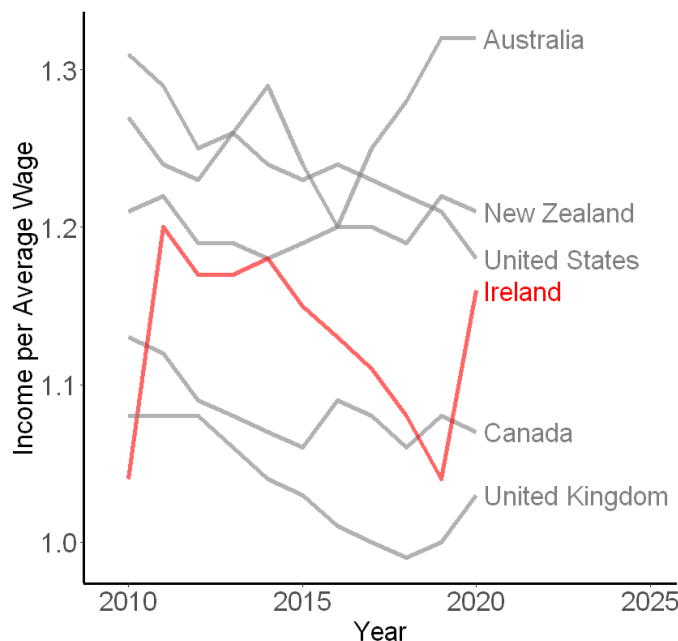- Colours are not highlighting Ireland

Comparison of Nurses' Wages and Average Wages

In an article discussing the emigration of Irish healthcare professionals, the issue of dissatisfaction with salary is repeatedly highlighted (White, 2022). The graph below shows the ratio of nurses' income per average wage for countries listed as the top destinations for Irish nurses working abroad (O'Halloran, 2017).
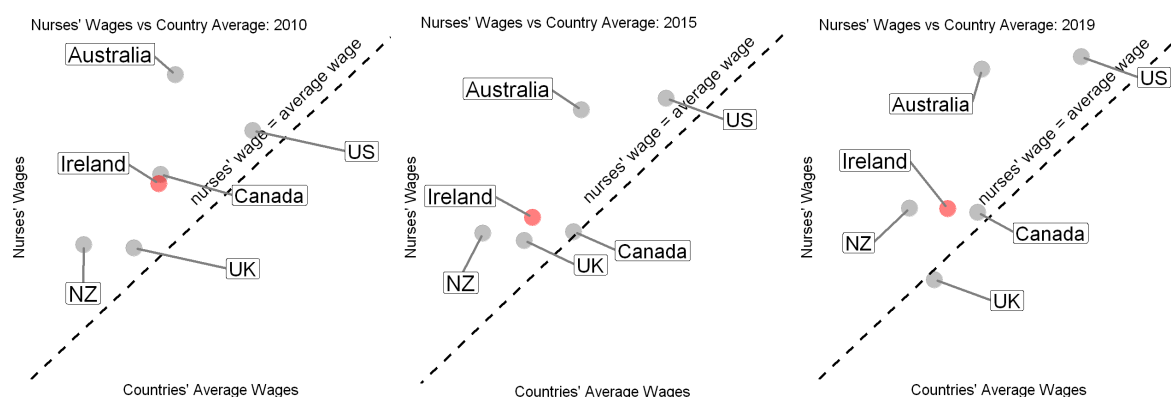
Nurses' Income per Average Wage

From 2010 to 2020, Australia, New Zealand, and the United States consistently offered nurses higher income per average wage than Ireland.

Alternative Visualisation

The scatter plots below show the relationship between nurses' wages and countries' average wages for the years 2010, 2015, and 2019. These visualisations have the advantage of showing direct comparisons between wages. They are however harder to grasp at a glance.
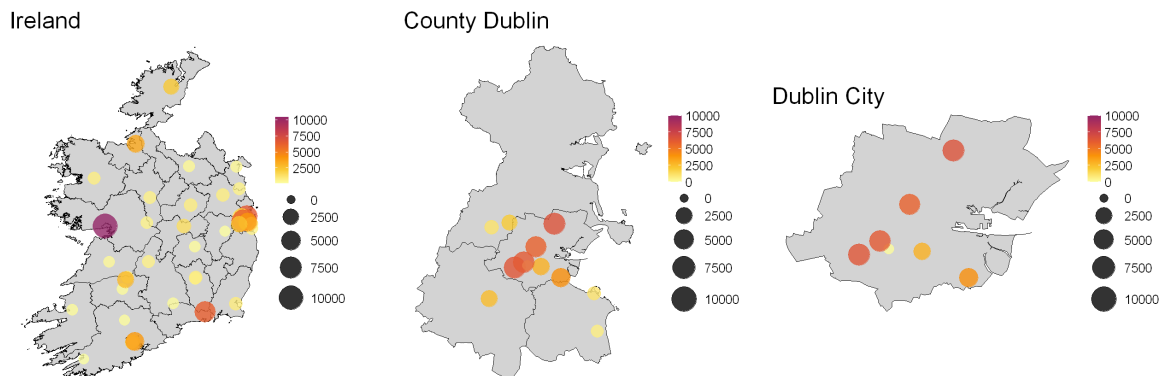
Map of Inpatient/Day Case Waiting Lists

The inpatient/day case waiting list is an indicator of the demand and capacity mismatch within a healthcare system. A large waiting list can have implications for increased workload and longer working hours for nurses. The maps below show the number of people on the inpatient/day case waiting list for each hospital in Ireland.

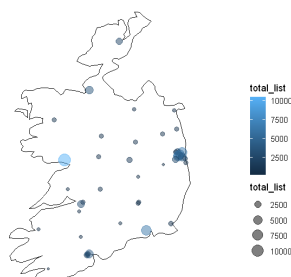**Inpatient/Day Case Waiting List: 30th March 2023**

Galway University Hospitals have a high number of patients waiting for admission or day-case procedures. The Dublin area has higher demands but also benefits from having a greater number of hospitals.

Previous Iteration

The visualisation below is a previous iteration. Some of the issues with this map were:
- The dots are too small compared to the map
- Overlapping dots around Dublin are hard to see
- Lighter blue as a colour is not representative of a situation where more patients are waiting to be treated
- Using the `maps` library which does not have boundary data within the country, we cannot zoom in to resolve issues with occlusion

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