Data Analytics and Visualisation Project Proposal

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Title: An Exploration of Nurses Per Capita by Country

Background and Rationale:

Maintaining proper nurse patient ratios is an important part of ensuring safe conditions for both staff and patients in hospitals. Lower nurse patient ratios have been linked to higher mortality rates in hospitals and lower levels of staff satisfaction. We can get a good indication of how well staffed a country's medical system is by looking at the number of nurses per capita in that country. A 2021 study conducted by the OECD found that Ireland had 14.7 nurses per 1,000 people marking it as the 4th in terms of this metric across the OECD.

Objective and Research Questions:

The goal of this project is to examine data related to nurses per capita across a number of countries and to explore the relationships between these statistics and wider health outcomes in these countries.

Through the analysis of relevant datasets, this project aims to answer these research questions:

- Which countries have the highest levels of nurses per capita
- How do the levels of nursing vary across countries considered
- Is there a relationship between nurses per capita and certain health outcomes within the countries considered in this project (particularly life expectancy)
- How does Ireland in particular fit in to the overall picture in terms of nurses per capita and health outcomes

Methodology:

This project will analyse public data sets in order to answer the research questions.

Datasets have been obtained from Health resources - Nurses - OECD Data, Nurses and midwives (per 1,000 people) | Data (worldbank.org) and Life expectancy at birth, total (years) | Data (worldbank.org)

I will create an Interactive dashboard in a Python Juypter notebook using Plotly and Dash.

Plan of work:

- Preliminary research on topic
- Obtain appropriate datasets
- Data Preprocessing
- Create visualizations of global data related nurses per capita and health outcomes
- Create world map visualisation shown how statistic on nurses per capita vary for different countries/regions
- Create visualisation showing how nurses per capita statistics have changed over time

Note on project and references:

This project does not relate exactly to the topic I chose for my literature review as I decided to pick a new topic more suited to visualisation. My literature review was carried out based on the Nurse Scheduling Problem and I had originally intended to create a tool for generating a roster through the dashboard. If the link between literature review and final project is extremely important I could still attempt to create this tool for the project in which case my references will be taken from my literature review:

[1] Ahmed Kheiria,, Angeliki Gretsistab, Ed Keedwellc, Guglielmo Lullia, Michael G.Epitropakisd and Edmund K. Burkee, A hyper-heuristic approach based upon a hidden Markov model for the multi-stage nurse rostering problem. Computers & Operations Research (June 2021) Volume 130

[2] Komarudin, Tim De Feyter, Marie-Anne Guerry, Greet Vanden Berghe, The extended roster quality staffing problem: addressing roster quality variation within a staffing planning period. Journal of Scheduling (2020) 23:253–264

[3] Tai-Hsi Wua, Jinn-Yi Yehb, Yueh-Min Lee , A Particle Swarm Optimization Approach with Refinement Procedure for Nurse Rostering Problem. Computers & Operations Research (February 2015) Volume 54, Pages 52-63

[4] Franklin Leung, Yee-Chun Lau , Martin Law , Shih-Kien Djeng, Artificial intelligence and end user tools to develop a nurse duty roster scheduling system. International Journal of Nursing Sciences 9 (2022) Pages 373-377

[5] Kazuki Ikeda, Yuma Nakamura, Travis S. Humble, Application of Quantum Annealing to Nurse Scheduling Problem. Nature Research (06 September 2019)

[6] OR-Tools. https://developers.google.com/optimization

[7] Zahraa A. Abdalkareem, Amiza Amir, Mohammed Azmi Al-Betar, Phaklen Ekhan & Abdelaziz I. Hammouri, Healthcare scheduling in optimization context: a review Health and Technology volume 11, pages 445–469 (2021)