Workforce Forecasting for Nursing using System Dynamics Modelling

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Abstract: Nursing workforce forms the backbone of the healthcare industry, which is an essential service for the population. As a consequence of the growing demand for such services for care and treatment, there has been an exponentially growing need for the nursing workforce in the present and the future. In order to meet this demand, it is crucial to forecast the supply of the nursing workforce. Furthermore, it is necessary to find ways to reduce the on-demand requirements of such a workforce during crises and emergencies.

This dissertation addresses the problem by building a simulation model to forecast the nursing workforce in the future. The stock-flow modelling approach is employed using the VensimPLE software to build the model. By collecting relevant nursing data from HSE and NMBI, the nursing workforce is modelled as a stock, and the underlying features of graduate nurses, immigrant nurses, returnees, attrition nurses and attrition returnees are modelled as flows and variables responsible for the nursing workforce estimation. Finally, the forecasts are computed for the upcoming ten years, and VensimPLE simulations are used to measure the impact of varying underlying features, on the nursing workforce stock.

Based on the simulation observations, appropriate graphs of results are presented to gather meaningful insights from the forecasting model. The model revealed that a gradual increase in graduate nurses and immigrant nurses over the next ten years could lead to an increase in the nursing workforce supply by almost 25%. Similarly, reducing the attrition rate and increasing the attrition returnee rate for employees to return to the public healthcare system enhances the workforce supply by almost 40%. Policymakers can consume these insights to make appropriate economic and organisational decisions to manage the workforce in the future. Future work includes the integration of demand forecasting with the proposed supply forecasting side of the model.