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Supplementary appendix 1

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Securing a sustainable, fit for purpose UK health and care workforce: Appendix 1

Contents

Supply and Demand Side Modelling

Supply-based modelling utilises either one or a combination of the following approaches, focusing on: the training process, productivity, workforce skills or worker-to-population ratios (Table 1). Training models aim to predict entrants and leavers to the workforce, utilising university places, migratory flows and dropout rates. Productivity models explore the possibility of improving the output of the workforce by the reorganisation of services, incentives or composition of the workforce. Skill-mix models assess the tasks performed by each professional and investigate the potential of horizontal substitution (between different medical specialities) and vertical substitution (between different professions) to improve the output of the workforce. Finally, worker-to-population ratios modelling establishes desired ratio for the number of healthcare professionals per unit of population.

Demand-based modelling takes account of either healthcare needs, healthcare demand or service targets to estimate the workforce required (Table 1). Healthcare needs modelling utilises demographic and epidemiological data such as population size and disease prevalence to estimate future healthcare needs which the workforce will have to meet. Healthcare demand models estimate the degree to which healthcare needs translate into realised demand, recognising that in some contexts people face barriers in accessing care. However, given the UK's low reliance on out-of-pocket payments, the gap between need and demand model predictions would be lower than elsewhere. Lastly service target models involve normative judgements about requirements for subsystems of the healthcare system and estimate the required workforce necessary to achieve these targets.

Table 1 Workforce Planning Models

Supply based Models		
Type of Model	**Advantages**	**Limitations**
Training Models	A simple model with minimal data requirements	There is no assessment if current levels are adequate to meet demand
Productivity Models	Offers immediate solutions, as does not include a change in headcount , taking current workforce as given	Limitations to what improving productivity can achieve; short term focus
Skill-mix Models	Offers immediate solutions, as does not include a change in headcount, taking current workforce as given	May be met with resistance from some professional groups; short term focus
Worker-to-population ratio Models	Simple model with minimal data requirements. Can allow cross country comparisons.	Both the numerator (workers) and denominator (population) tend to be crude measures of requirements
Demand based Models		
Health Need Based	Most accurate estimate of required workforce at regional/national level. Can facilitate workforce planning according to different disease areas.	Requires detailed data. May produce estimates of demand which exceed what is possible with resources available.
Economic Demand Based	Most accurate estimate of actual demand on healthcare services and labour.	Requires availability of detailed data. Ignores the significant unmet need in healthcare systems with large out-of-pocket payments.
Service Targets Based	A simple model, easy to define and minimal data requirements	Targets may not be well designed or poorly evidenced.

Additional Panels and Figures

Panel 1: An Integrated Health and Social Care Workforce Plan for Scotland
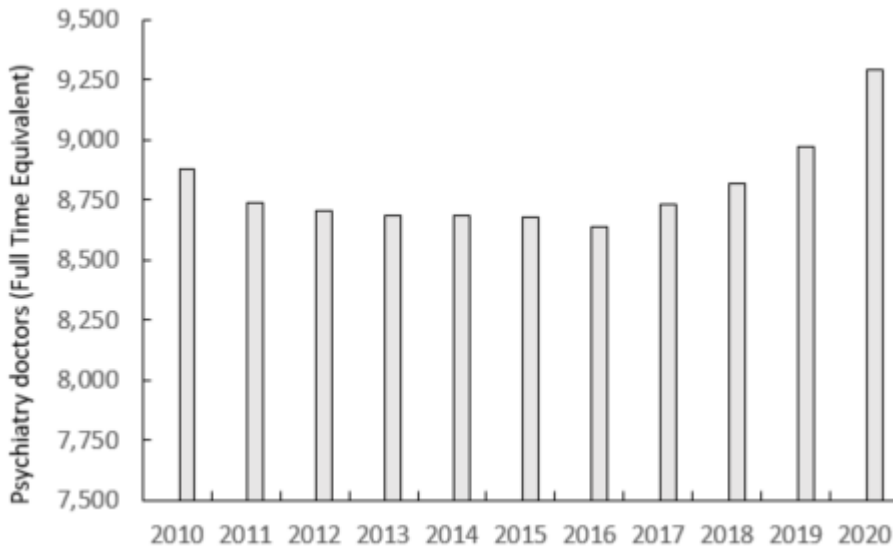
The Integrated Health and Social Care Workforce Plan for Scotland (2019) accompanies the move to Integrated Joint Boards in Scotland and views the health and care workforce collectively, encompassing local authorities, independent providers and the third care sector, all of which are represented in the National Workforce Planning Group.[1] Implementation of the Workforce Plan has been supported by legislation in the form of the Health and Care (Staffing) (Scotland) Act 2019.[2] This legislation includes guiding principles for those who commission and deliver health and care and includes specific measures such as ensuring clinical team leaders have adequate time to fulfil their leadership role, and placing a statutory duty on social care providers to ensure there are appropriate staffing levels. The Workforce Plan is underpinned by three separate frameworks produced to identify major priorities to improving workforce planning across secondary, primary, and social care in anticipation of developing an integrated approach to workforce planning.[3–5] The Workforce Plan and its accompanying frameworks seek to move from a focus on individual professions to a whole workforce approach and applies scenario planning to improve projections of supply and demand. It draws on examples from other countries, particularly the Netherlands, which has moved to an integrated workforce approach in its projections, for example modelling the substitution of roles within general practice. Such integrated models allow different scenarios to be tested rather than focusing on projecting a single target figure for numbers of health professionals. This allows for a more nuanced approach better tailored to wider policy changes.[6]

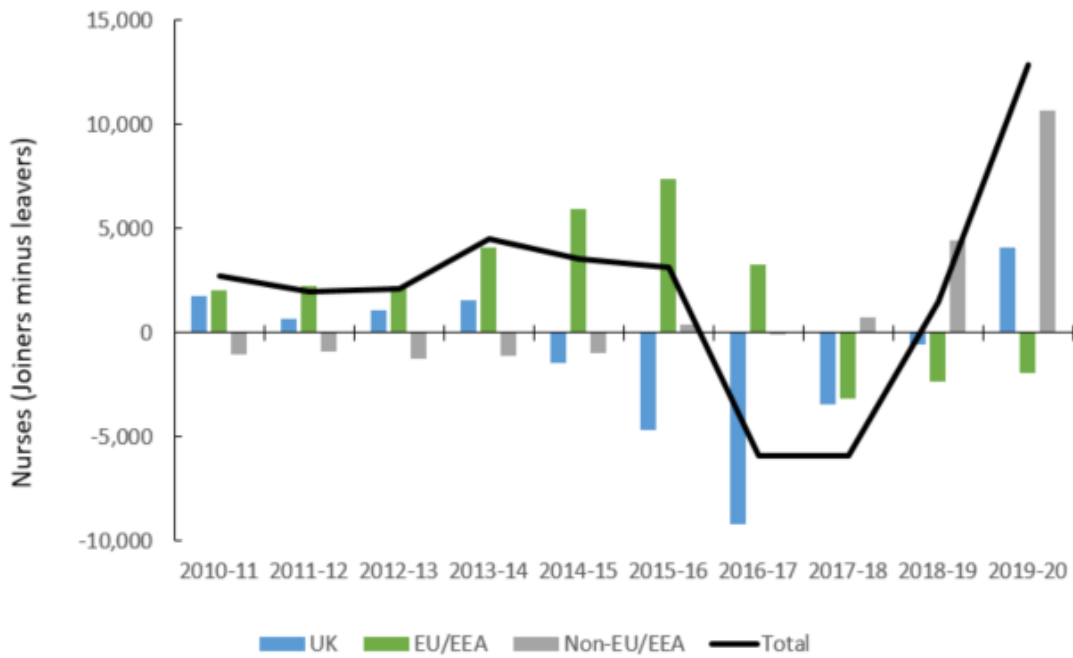*Figure 1: Headacount of nurses per 1,000 across the UK*
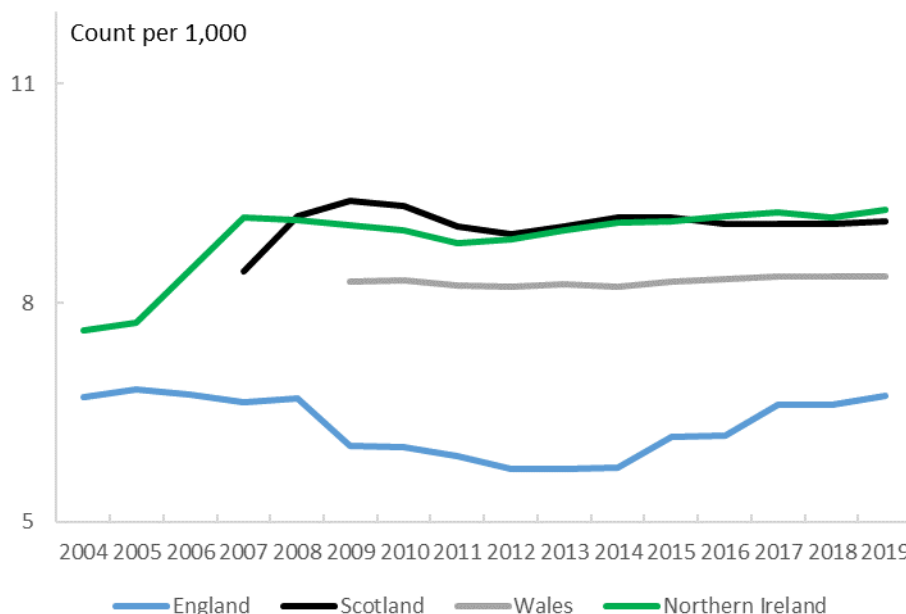
Authors based on data from NHS Digital,[7,8] ISD Scotland,[9] Stat Wales,[10] HSCNI,[11] ONS.[12]

Figure 2: Number of Psychiatry Physicians (FTE) in England between 2010 and 2020

Source: NHS Digital[7]

Figure 3: Net additions to the Nursing & Midwifery Council (NMC) by nationality of initial registration between 2010-11 and 2019-20

Source: NMC[13]

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Table 2 UK workforce strategies

Table 1: Review of supply and demand side factors in UK Workforce plans					
	Responsibility	Projection period	Coverage	Variables/measurement	
England[1]	Health Education England and Department of Health	2017-2027	Medicine, nursing and midwifery, dentistry, allied health professionals, healthcare science, pharmacy, wider workforce	Supply-side factors	Education and training: number of applicants, number of places, dropout rates, training routes
					Recruitment rates: from UK education, from overseas, returning staff
					Retention and attrition
					Volunteers, informal carers and self-care
				Demand-side factors	Population growth (long term projections)
					Changes in morbidity (long term projections)
					GDP and health spend (long term projections))
					Productivity gains (long term projections)
Northern Ireland[2]	Department of Health and Health and Social Care employers	2018-2026	All health and social care	Supply-side factors	Education and training: number of places
					Skill-mix: multidisciplinary and inter-professional working and training
					Recruitment rates
				Demand-side factors	Changes in morbidity
					Changing health and social care needs
					New and emerging treatments and technologies
Scotland[3]	National Workforce Planning Group and regional Health Boards	2017 – proposal for future planning	NHS Scotland services, adult social care services, children's social care services, mental	Supply-side factors	Increasing multidisciplinary work
					Education and training: time to qualification, number of applications, numbers in training, training routes, specialisation, drop-out rates, loss to overseas
					Recruitment rates (FTE rather than headcount)

[1]https://www.hee.nhs.uk/sites/default/files/documents/Facing%20the%20Facts%2C%20Shaping%20the%20Future%20%E2%80%93%20a%20draft%20health%20and%20care%20workforce%20strategy%20for%20England%20to%202027.pdf

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[3] https://www.gov.scot/binaries/content/documents/govscot/publications/publication/2017/06/national-health-social-care-workforce-plan-part-1-framework-improving/documents/00521803-pdf/00521803-pdf/govscot%3Adocument

			health services and primary care services including General Practice and independent contractors	Demand-side factors	Retention and attrition (FTE rather than headcount)
					Changes in morbidity
					Focus on prevention
					Changing health and social care needs
Wales[4]	Workforce, Education and Development Services (WEDS), part of Health Education and Improvement Wales	2017 – proposal for future planning		Supply-side factors	Education and training: time to qualification, numbers in training, routes to training and training a flexible non-medical workforce, training places available
					Skill-mix: multidisciplinary and inter-professional working and training
				Demand-side factors	Changing healthcare needs, including move to community care and new treatments and technologies

N.B. This table presents supply- and demand-side factors described in UK constituent country 'Workforce Plans', as specific variables included in workforce planning models are not publicly available

[4]http://www.weds.wales.nhs.uk/sitesplus/documents/1076/Design%20for%20a%20new%20and%20integrated%20approach%20to%20workforce%20planning%20for%20NHS%20Wales%20%28English%291.pdf