

# **REAL Centre**

## **Working paper**

### **Nurse supply model: a review of economic factors affecting nurse supply**

**December 2021**

Keith Derbyshire, Siôn Cave,  
Emma Woodham,  
Rosemary Wildblood,  
Nihar Shembavnekar



**The  
Health  
Foundation**

# About the REAL Centre

The Health Foundation's REAL Centre (research and economic analysis for the long term) provides independent analysis and research to support better long-term decision making in health and social care.

Its aim is to help health and social care leaders and policymakers look beyond the short term to understand the implications of their funding and resourcing decisions over the next 10-15 years. The Centre will work in partnership with leading experts and academics to research and model the future demand for care, and the workforce and other resources needed to respond. The Centre supports the Health Foundation's aim to create a more sustainable health and care system that better meets people's needs now and in the future.

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# About DAS



DAS is an independent management consultancy with offices in the UK and Australia. DAS has expertise in the use of simulation, systems thinking, programme management, investment modelling and data analytics in government and business domains. Coupled with extensive regulatory, operations delivery and engineering experience, this expertise underpins their ability to look deeper into issues, to provide clearer insight and foresight, and to solve critical client challenges. DAS specialises in bridging the gap between strategy and operations, creating effective solutions to uniquely complex issues faced by our clients worldwide. DAS' clients cover the public, private and third sectors who look to us for strategic and operational support for their most critical issues.

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# Nurse supply model: a review of economic factors affecting nurse supply

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## Executive summary

One of the Health Foundation's REAL Centre's major outputs will be a series of projections of the long-term trends affecting the health service in England and the resources needed to provide a high quality service in the future. In the NHS, nursing is the key area of workforce shortages, accounting for nearly half of all NHS vacancies. The REAL Centre commissioned Decision Analysis Services Ltd (DAS) to develop a nurse supply model (hereafter, NSM) representing the whole of the nurse supply system in England.

This technical paper summarises research on the economic factors that affect nurses' labour market participation decisions and discusses how this research can be applied to the NSM. It also identifies the key areas where the research evidence is lacking, or not directly applicable to England. Much of the literature reviewed in this paper comes from the United States (US) and cannot be directly applied to the English nurse labour market. The US nurse labour market is more diverse, with distinct regional variation, a lower proportion of overseas nurses and a growing workforce from a 100% increase in university places in the last 10 years.

For the purposes of this paper 'economic factors' are considered to be the subset of factors that can be usefully studied using economic theory, literature and available data to inform the scale, direction and magnitude of an effect. The focus of this research is on those economic factors that can be measured and have greatest impact on the nurse education market and the labour market for qualified nurses.

The research has been structured around the NSM conceptual framework, which is a qualitative model defining the core stocks, flows and factors describing the English nurse supply system.

First, the paper summarises evidence on how economic factors affect the nurse education market. Reviews of the economic literature on nurse labour supply have found little evidence on how to incentivise higher numbers of student nurse applicants. We use data from the OECD, UCAS and other sources to provide context and offer some insights into the extent to which different variables might affect individuals' decisions on whether to enrol on a nursing degree.

Next, we explore the evidence around the impact of economic factors on the labour market for qualified nurses. Apart from estimates of the wage elasticity of nurse labour supply, the empirical literature is relatively sparse. Some more recent studies highlight wage rates in alternative occupations and opportunities for career progression within the nursing profession as important drivers of nurse retention.

There appears to be little recent evidence of the relative importance of non-wage drivers of nurse labour supply in the empirical literature, although a recent systematic review provides strong qualitative evidence that these factors have a major impact on nurse retention. Job dissatisfaction is consistently reported as impacting on nurse turnover. Nurse workload, management style, empowerment and autonomy of nurse jobs, promotion opportunities and work schedules contribute to turnover, job

satisfaction and long-term retention. Again, we use data from NHS Digital, the Royal College of Nursing and other sources to triangulate our findings.

The evidence has been used to generate a set of 13 core economic factors that are formally defined, allocated a potential proxy measure and mapped onto the NSM conceptual framework. The 13 core economic factors were:

1. Cost of undertaking a nursing degree
2. Awareness of difficulty of a nursing degree
3. Awareness of workplace expectations
4. Nurse education quality and effectiveness
5. Quality of degree students
6. Nurse pay awards
7. Financial returns of working as a nurse
8. Nurse satisfaction
9. Role flexibility
10. Workload
11. Cost of return to practice
12. Economic conditions
13. Nurse workforce supply gap

The evidence to support the impact of each factor on nurse supply has been assessed alongside a consideration of the potential magnitude and timing of the impact. This is used to identify priorities for research around the factors' impact on nurse supply.

# 1 Introduction

**This section includes a brief background to the REAL Centre’s nurse supply model project. It explains the purpose of this review, which covers those economic factors that affect nurse supply that can be applied to the quantitative model. It describes how the rest of the document is structured.**

## 1.1 Background

The Health Foundation is an independent charity committed to bringing about a healthier population, supported by high quality health care that can be equitably accessed.

The REAL Centre ([Research and Economic Analysis for the Long term](#)) is a specialist semi-autonomous centre within the Health Foundation. The REAL Centre focuses on economic research, model development and supporting analysis in health and social care. The Centre was formally launched in October 2020. A key objective of the Centre is to ensure that decisions about the funding, design and delivery of the health and social care system are informed by the best available analysis and evidence, and with consideration of the costs and benefits over the long term.

One of the REAL Centre’s major outputs will be a series of projections of the long-term trends affecting the health service in England and the resources needed to provide a high quality service in the future. To support this the REAL Centre commissioned Decision Analysis Services Ltd (DAS) to develop a nurse supply model (NSM) representing the whole of the nurse supply system in England. DAS is an independent management consultancy with an expertise in the use of simulation, systems thinking, programme management, investment modelling and data analytics in government and business domains. The NSM is required to provide projections of future nurse supply under a range of different scenarios over a 5 to 20-year period. The quantitative simulation model is set within a conceptual framework that represents the nurse supply system.

As part of the development of the model a significant amount of research has been undertaken into the economic factors that affect the decision to become a nurse and subsequent participation in the nurse labour market. This technical paper summarises this research and discusses how the findings might be operationalised within the quantitative simulation model.

## 1.2 Purpose of this document

This report reviews the economic factors that affect registered nurse labour supply in England based upon the literature and analysis of relevant data sets. The twin purpose is to:

- provide information and insights that can be used to support the specification of potential scenarios and inform parameter ranges for the NSM

- identify those areas where there is a lack of evidence and further research is required.

### 1.2.1 Who would be interested in this report?

The report summarises the evidence and thinking on the impact of the economic factors that affect the NSM at the time of its handover to the REAL Centre.

There are potentially three audiences who might find this report useful:

- model users, as it provides an audit of the thinking on what factors affect which flows
- policymakers, as it lists the state of knowledge and level of uncertainty around the factors that affect nurse labour supply
- the research community, as it should inform key areas where more evidence is needed.

## 1.3 Overview of our research approach

We review the literature from the UK and other high-income countries on the factors that influence registered nurse labour force participation decisions. Participation decisions include whether to train to become a nurse, whether to work as a nurse and for how many hours per week; where to work as a nurse; not to work as a nurse; not to work at all; to leave the NMC register; to retrain as a nurse having left the NMC register. Whenever possible we have combined the evidence from the literature with analysis of data from the Nursing and Midwifery Council (NMC), the Higher Education Statistics Agency (HESA) and NHS Digital to test some of the expected relationships. The research has been framed by the NSM conceptual framework, a qualitative model that describes the nurse supply system.

### 1.3.1 Research scope

'Factors' are the things that influence the nurse labour market, especially the participation and education decisions of currently working qualified nurses, individuals who previously worked as nurses (hereafter, 'ex-nurses') and potential would-be nurses. We need to review the evidence on the most important factors, understand where and how they impact on nurse supply and explore if we can parameterise them in the nurse supply model. 'Economic factors' are the subset of factors that can be usefully studied using economic theory, literature and evidence to inform the scale, direction and magnitude of the effect.

The focus of the research is on the factors that can be measured. For example, it is widely reported that the partner income of nurses has a big influence on their labour force participation decision. But as we do not have access to this information, we will not discuss it in any depth.

As well as registered nurses deciding whether to work as nurses and how many hours to work, we include potential future nurses contemplating entering higher education

institutions (HEIs) to study nursing and ex-nurses deciding to retrain and rejoin the registered nurse pool.

We exclude analysis of the recruitment of internationally educated nurses (IENs) and the flow of UK trained nurses to other countries from this paper. IENs comprise 15% of registered nurses in the UK and are a significant flow into the pool of registered nurses (Buchan, 2020). But the flow into the UK is largely determined by factors outside of the nurse labour market in England, eg adherence to rules on ethical recruitment. The flow of UK trained nurses to other OECD countries is also largely determined by the nurse labour market conditions in those countries, rather than conditions in the England nurse labour market.

For similar reasons we exclude the consideration of the care hours delivered per full-time equivalent (FTE) nurse. This is not something that is determined by economic factors however, but by the combined effect of technology, policy and regulatory framework interacting on the working practices of nurses.

Finally, we exclude the new routes into nursing via apprenticeships and nursing associate roles, who currently represent a small percentage of new registrants joining the NMC register in England.\*

The NSM includes international flows into and out of the England nurse labour market (including cross border flows between countries of the UK). The truly international flows can be varied in line with expected policy changes and nurse labour market conditions in other countries relative to England. The numbers entering nursing from apprenticeships and nursing associate roles are also featured in the NSM and can be varied over time.

## 1.4 Structure of the document

This document is structured as follows:

**Section 2** briefly describes the conceptual model of the nurse supply system which is used to frame the factors that affect the supply of nurses.

**Section 3** reviews the literature and data related to nurse education to determine the evidence of the impact of pecuniary and non-pecuniary factors on the adjustment variables associated with nurse education.

**Section 4** reviews the literature and data related to the nurse labour market to determine the evidence of the impact of pecuniary and non-pecuniary factors on the adjustment variables associated with nurse labour supply.

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\* Note: although nursing associate numbers are forecast to grow rapidly, the number and timing of those who convert to fully qualified nurse remains uncertain.

**Section 5** summarises evidence for each economic factor's impact on each adjustment variable within the NSM conceptual framework.

**Appendix A** summarises the academic literature on pay elasticity over the past 30 years.

**Appendix B** describes how the evidence can be applied in the model.

## 2 The nurse supply system and nurse supply model

Underpinning our review of economic factors is the NSM conceptual framework, a qualitative model describing the nurse supply system and the architecture of the quantitative nurse supply model. Both are briefly described here with the focus of the study being to support parameterisation of the quantitative NSM. The conceptual framework can be used as a tool to support scenario development and to set research agendas for quantifying relationships in the simulation engine.

### 2.1 Conceptualising the nurse supply system in England

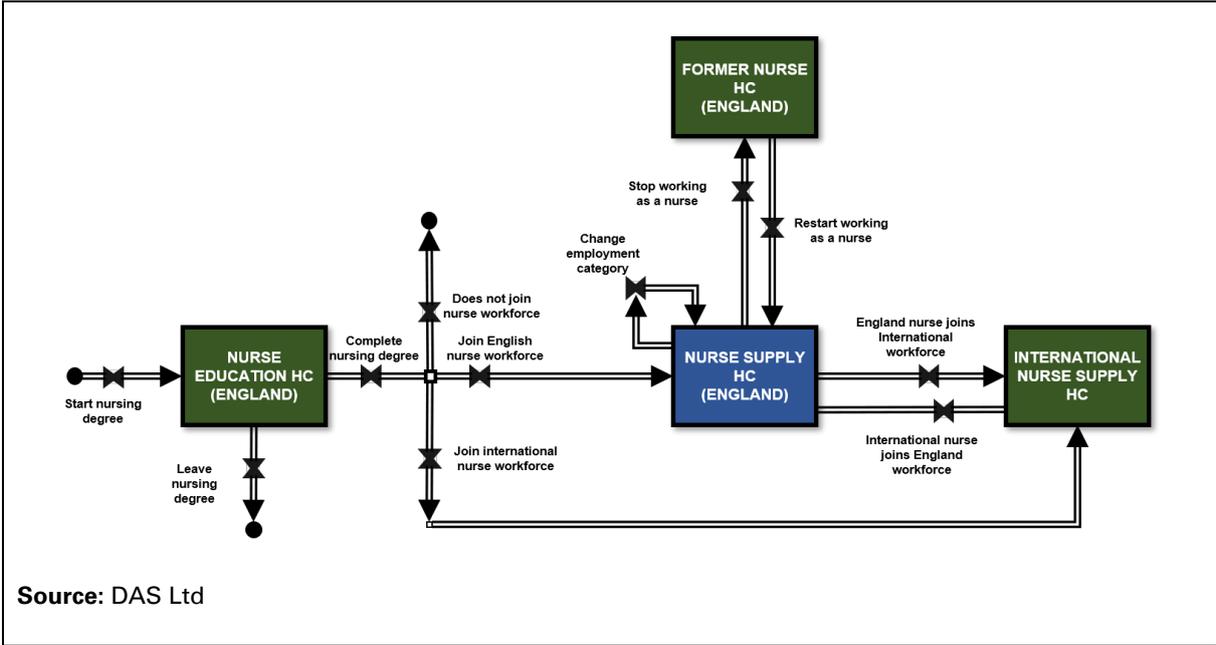
The NSM conceptual model (alternatively referred to as the NSM conceptual framework) has been developed to provide a broad representation of the nurse supply system in England. The NSM conceptual framework (DAS, 2020) integrates the economics and stock and flow perspectives on the nurse supply system. It has been developed through engagement with a variety of stakeholders from the nurse supply system and identifies the key factors that affect nurse supply. This framework can be used as a tool to support scenario development and to set research agendas for quantifying relationships in the simulation engine. The simulation engine is a system dynamics model that can be used to project future nurse supply based on the core stocks and flows in the system.

The conceptual framework considers the nurse supply system to be composed of:

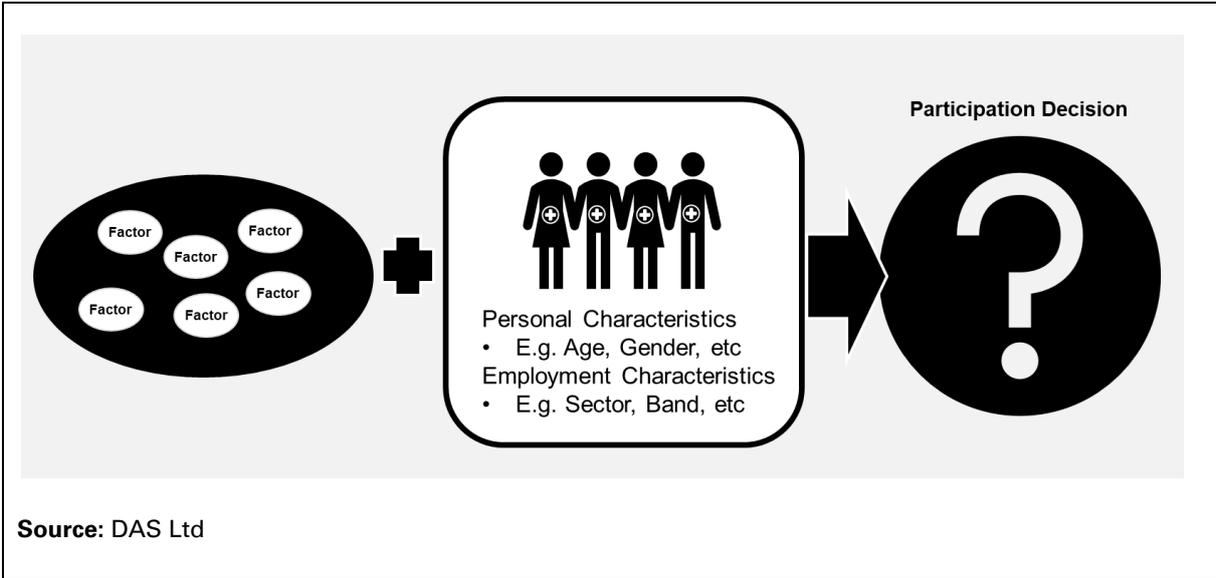
- **Student nurses:** Students, nursing associates and nurse apprentices currently enrolled in pre-registration nursing courses.
- **Qualified nurses employed as nurses:** Registered nurses working as a nurse (including those on maternity leave).
- **Former nurses with valid or lapsed registrations:** Qualified nurses who have previously worked as a nurse, but are not currently employed as a nurse, who may or may not be currently registered.
- **Non-England trained nurses:** This includes nurses registered and working as a nurse in England, but who were trained in Wales, Scotland and Northern Ireland, or the EU or the rest of the world.

The conceptual model represents the four cohorts listed above and the movement between them as four main stocks, with a series of flows entering them and exiting from them as shown in the diagram below.

**Figure 2-1: Stock and flow representation of conceptual model**

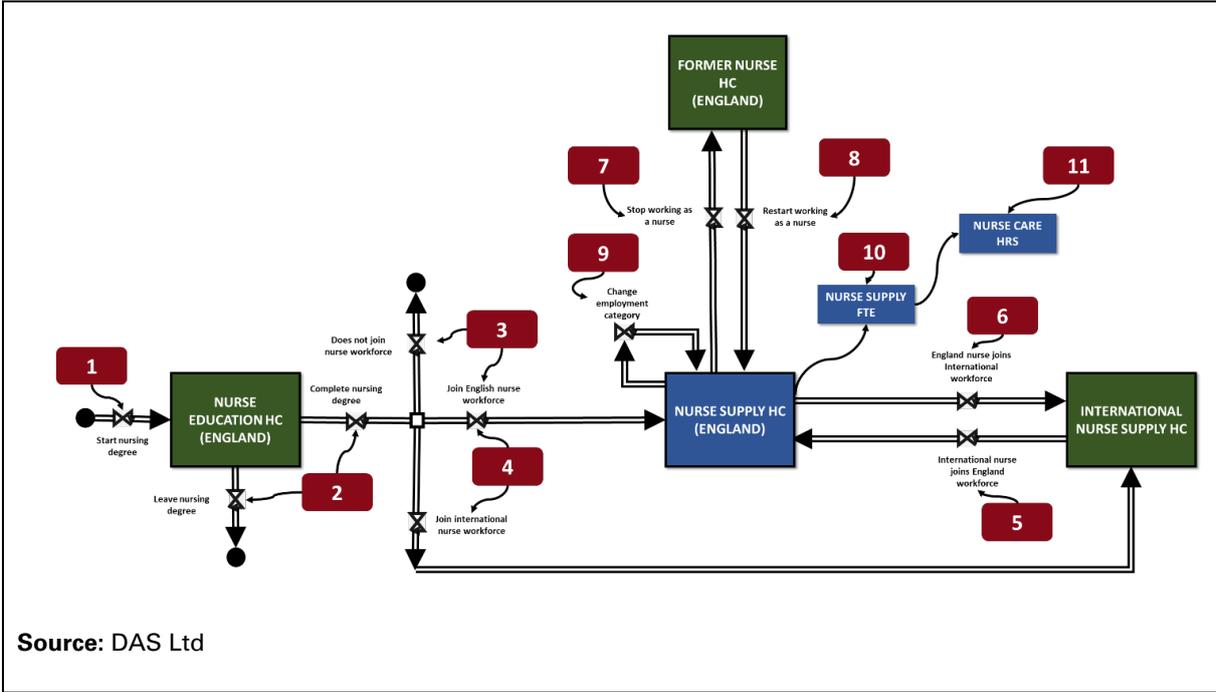


The flows between the stocks are dependent on the participation decisions made by nurses, such as whether to train to be a nurse, whether to join the English nurse workforce or to leave the register. The participation decisions of nurses will depend on a number of factors, such as nurse earnings compared to non-nursing jobs’ earnings, general unemployment and workload. These factors will have different impacts on different individuals depending on personal circumstances, such as age, gender, nationality, household composition and employment (role, sector) characteristics.



The impact of these factors and characteristics is captured in the conceptual framework as adjustment variables. The adjustment variables are represented in red in Figure 2-3.

**Figure 2-3: Adjustment variables**



The adjustment variables in the conceptual model are defined as:

1. Applications to a nursing degree
2. Percentage of students that leave nursing degrees prior to completion
3. Percentage of students that complete nursing degrees but do not join the nurse workforce
4. Percentage of students that complete nursing degrees and join the international nurse workforce
5. International nurses joining the England supply
6. Percentage of nurses joining the international supply
7. Percentage that stop working as a nurse
8. Percentage that restart working as a nurse
9. Nurses transitioning between employment categories (nurses moving care settings, region, grade or working patterns but remaining in the nurse workforce)
10. Hours worked per week (conversion of HC to FTE)
11. Care hours delivered per full-time equivalent (FTE) nurse

The factors that impact on the adjustment variables are categorised as pecuniary or non-pecuniary. Pecuniary factors relate to monetary aspects, such as the opportunity cost of nurse education and potential lifetime earnings working as a nurse. Non-pecuniary factors relate to the important non-monetary aspects of working as a nurse. These include caring for people, being part of a supportive team, professional autonomy on the upside, and poor work environment, high workload and stress on the downside.

Non-pecuniary factors are difficult to measure consistently over time and between settings. This makes it harder explore any relationships between non-pecuniary factors, such as workload, and nurse participation decisions. As a consequence, the relevant literature presents little empirical evidence with which to parameterise the NSM.

### 2.2 The nurse supply model

The quantitative nurse supply model (NSM) is a quantitative simulation set within the conceptual framework that represents the nurse supply system. The conceptual framework takes a broader view than the NSM and includes variables that are not quantified within the simulation engine.

The focus of this report is to review the economic theory and evidence from the literature and from analysis to better understand the key relationships in the nurse labour market as represented by the NSM. This is done through focusing on eight of the NSM’s 11 adjustment variables as described in Table 2-1, below.

**Table 2-1: Adjustment variables most affected by economic factors in England**

Sector	Adjustment variables		In scope? Importance
<b>Education market</b>	AV1	Start/apply to degree	✓✓✓
	AV2	Do not complete degree	✓✓
	AV3	Do not become nurse after graduation	✓
	AV4	Join international workforce after graduation	X
<b>Nurse labour market</b>	AV5	Join international workforce	X
	AV6	Join workforce from international market	X
	AV7	Stop working as a nurse	✓✓
	AV8	Restart working as a nurse	✓✓
	AV9	Change employment category	✓
	AV10	Headcount to FTE conversion	✓
	AV11	FTE to care hours conversion	X

**Note (1):** We exclude analysis of international flows and care hours per FTE to focus on the adjustment variables most affected by economic factors in England.

**Note (2):** We use the term ‘market’ to describe these two sectors because the impact of the factors on the adjustment variables is determined by the interaction of the buyers and sellers. A pay increase might increase the number of applicants to nurse degree courses, but it does nothing to incentivise HEIs to offer more places. It might encourage more ex-nurses to return to practice, but employers will be less willing to recruit them.

As noted in Section 1 we exclude adjustment variables 4, 5, 6 and 11 from this analysis as they are less influenced by the change in economic factors in England.

This report reviews the available evidence that can be used to support the parameterisation of these variables and to develop potential scenarios structured around the pre-employment and employment sectors.

### **2.2.1 Lack of empirical evidence**

It is important to note that apart from estimates of nurse pay elasticity of supply,<sup>\*</sup> the literature reviewed to date by DAS and the Health Foundation has found very little empirical evidence that can be used to quantify the impact of the factors on nurses' participation decisions, which, in aggregate determine the impact on the adjustment variables.

Even the available estimates of pay elasticity have used different methods and data sets, and cover a wide range of time periods, countries and subgroups of nurses (Shields, 2004). But they at least offer a possible range of coefficients that could be applied to changes in pay and relative pay of nurses in England, possibly for different types of nurse and region (Institute for Fiscal Studies, 2015) (Rice, 2005).

There is far less empirical evidence of the relative importance of non-wage drivers of nurse labour supply. One exception is (McHugh & Ma, 2014) which looks at the relevance of the nurse work environments and staffing levels after controlling for wages in four US states in 2006–07. But other studies tend to limit themselves to more measurable factors such as shift pattern and work setting rather than direct measures of workload and stress (Eberth, Elliott, & Skåtun, 2016).

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<sup>\*</sup> Elasticity is a measure of the responsiveness of one variable to another. Nurse pay elasticity of supply measures the size a percentage increase or decrease in pay would have on the percentage change in FTEs or total supply of nurse hours.

## 3 The impact of pecuniary and non-pecuniary factors on the nurse education market

**The nurse education market considers the applicants and acceptances to study a nursing degree at an approved higher education institution (HEI), their progress through and exit from the system, with or without a nurse qualification, and their first employment decision.**

This section reviews academic literature and available data to assess what pecuniary and non-pecuniary factors affect the adjustment variables relevant to this market, ie: (AV1) Number of applicants and acceptances to a nursing degree; (AV2) Percentage of students that leave a nursing degree before graduation; (AV3) Percentage of students that complete a nursing degree but do not join the nurse workforce.

### 3.1 Market definition

The consumers or 'buyers' in the nurse education market are applicants to study a nursing degree in order to practise as a registered nurse. The providers or 'sellers' are the approximately 100 HEIs that offer undergraduate courses, including clinical placements, that lead to the award of a nursing degree in one of four fields of nursing (Adult, Child, Learning Disability and Mental Health). The 'price' or opportunity cost paid by the student is the time spent studying compared to working or studying a different course, plus tuition fees less any subsidised student loans or bursary. The income to the HEI is the tuition fees. Their costs are the costs of teaching nursing students (including clinical placements) compared to not offering nursing degrees or teaching other students instead. The outputs of the market are newly qualified nurses (NQNs).

The following sections consider the evidence associated with the number and quality of students entering nurse education (AV1), students leaving a nursing degree without completing it (AV2) and graduates not becoming a nurse following graduation (AV3). In each case the literature is initially reviewed, followed by a discussion of available data for nurse education in England, followed by the implications for the model.

### 3.2 The number and quality of students who enter nurse education (AV1)

As highlighted in Table 2-1, AV1 is one of the most important flows into the nurse supply system. Between 2010 and 2020, an average 47,500 students applied annually to study for nursing degrees in England and 21,000 were accepted. The size, quality and commitment of the applicant pool, and how effective HEIs are at selecting and teaching the most able and committed students, is the major determinant of future nurse supply in England.

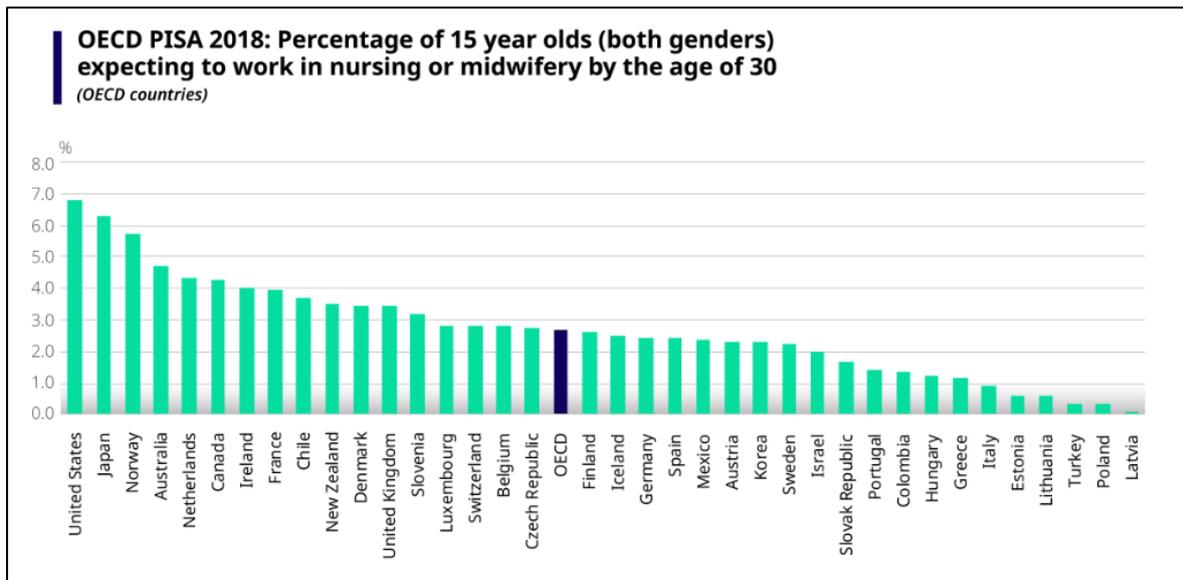
#### 3.2.1 Literature review

Reviews of the economic literature on nurse labour supply have found little evidence on how to incentivise higher numbers of student nurse applicants. This is because

problems of nurse supply are most often identified with retention of the qualified workforce and not the recruitment of students. However, the OECD presents useful international comparisons and context to what the literature does have to say.

The UK has around 20% fewer practising nurses and 30% fewer new nurse graduates relative to its population than the average of high-income OECD countries (OECD, 2020). It is, however, 25% above the OECD average for the proportion of 15-year-olds who expect to be working in nursing by age 30. This is shown in Figure 3-1, below.

**Figure 3-1: UK ranks 12th from 38 OECD countries for nursing as a career**



**Source:** OECD 2020\*. Programme for International Student Assessment (PISA) survey data

This contrast between aspiring 15-year-olds and low numbers of graduates suggests untapped potential for future recruits into the nursing profession, perhaps because the 15-year-olds do not achieve the educational qualifications?

Further analysis of OECD PISA 2018 data is in line with other research literature. Across the OECD, the interest in nursing is highly 'gendered'. Across all countries only 8% of those who expected to be working in nursing at age 15 were male (in the UK it is only 2%, though 10% of actual nurse applicants in England are male).

The report notes 'nursing is particularly attractive to girls who perform more weakly on the OECD PISA academic assessments, are drawn from lower socio-economic classes and are foreign-born'.

\* <https://www.oecd-forum.org/users/399120-anthony-mann-vanessa-denis/posts/can-nursing-thrive-in-the-age-of-the-coronavirus-what-young-people-think-about-the-profession-dce5a659-cc6d-4914-b412-42e994be8197>

## Reasons to become a nurse

A Canadian survey of student nurses (Grainger & Bolan, 2006) found new students had an idyllic view of nursing, 'seeing them as kind, compassionate people in an exciting career that would make them feel good about what they are doing'. This contrasted sharply with fourth year students who did not feel nursing was a valued profession. An earlier study in Canada (Williams, Wertenberger, & Gushuliak, 1997) found the most common reasons for choosing nursing were job security followed by helping others and working with people.

A survey of first year student nurses in Australia (Wilkes, Cowin, & Johnson, 2014) summarised previous studies' findings (from the United Kingdom, Sweden, Canada, and Korea) that the major reasons for choosing nursing were that students wanted a secure, stable and respected career that gave a wide variety of opportunities for helping people.

Wilkes highlighted the following from his survey (respondents, n = 676): the perception that 'nursing was a career' and a 'recognised profession' was prominent in the response (261 citations).<sup>\*</sup> That the nursing profession was respected and had stability and security was also seen as important. 'Nursing is lucrative, enjoyable, popular, and easy to find a job' (248 citations). Phrases such as 'so many opportunities, so many different areas to work in' (294) and 'plenty of choices' (566) were common in the survey.

The ability to help people had the same number of citations (261) as professional career. 'Not just a job' (489 citations) probably reflects the professional status attached to being a nurse and the role making a difference to people's lives. In many cases a sense of enjoyment arising from nursing was prominent. This included enjoyment of nursing from prior experience, and anticipated enjoyment of working in a team and taking care of people. The concepts of caring and care were seen in many survey responses. 'I think [the] majority of nurses are very caring and can make a positive impact on a person's life' (239).

Information about undergraduate nursing programmes and the realities of working as a nurse were found to be important factors in helping potential nursing students make informed decisions about whether a career in nursing/midwifery is what they want to do (Rodgers & Stenhouse, 2010).

There were no empirical estimates in the literature of the impact of the pecuniary factors such as nurse pay or the opportunity cost of obtaining a nurse degree and job security. The survey of first year nurse students in Australia was the richest source of

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<sup>\*</sup> Numbers in brackets identify individual respondents associated with a particular or idea illustrated with a direct quote (Wilkes, Cowin, & Johnson, 2014).

non-pecuniary factors that drew people towards nursing. These include the positive aspects arising from nursing being a 'respected profession' that involves 'working with, and taking care of, people' and being able to 'make a positive impact on a person's life'. The variety of roles in a nursing career was also seen as attractive, but there was no attempt at defining, measuring and quantifying the impacts of these factors.

Perhaps the key finding from a 2019 study (Williams, et al., 2019), however, is that high school students, the main source of nursing students, generally have a poor understanding of what nurses actually do. Unless potential students have direct experience and personal knowledge of nursing, self-selection is guided by community perceptions and stereotypes of nursing that emphasise the caring and vocational nature of the role and not the intellectual and leadership qualities that are increasingly required.

Unless HEIs are adept at filtering out students with limited awareness of the demands of a nursing degree and the reality of a nursing career, attrition will be high. Wilkes recommends universities develop relationships with high schools to assist career counsellors in promoting nursing as a career.

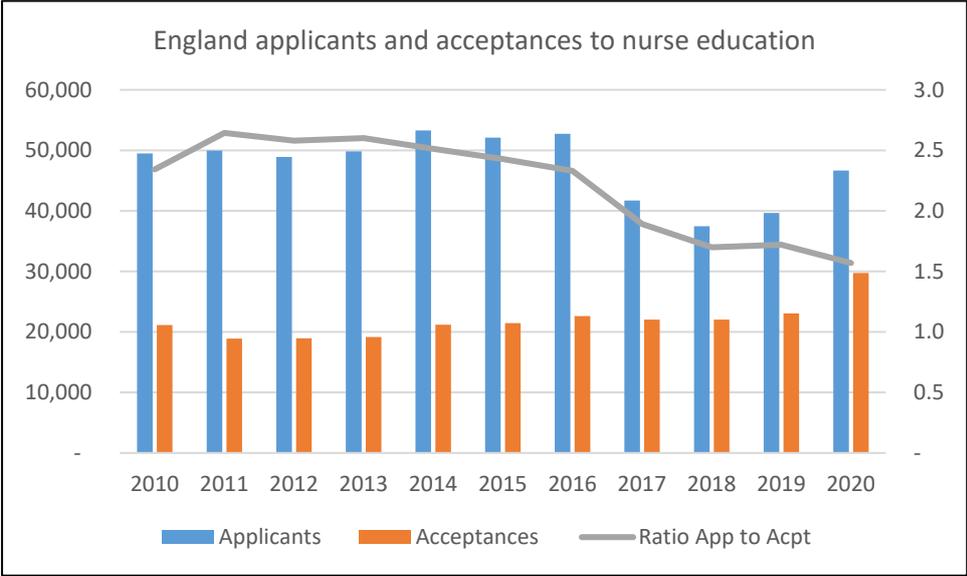
### **3.2.2 Available data**

In the literature review section, we noted that the majority of studies focus on the factors that affect the retention of the qualified workforce not the recruitment of new students. The perception that there is not a student recruitment issue may be derived from the fact that from 2010 to 2016, applications for nurse degrees in England exceeded acceptances by a ratio of 2.5 to 1.

The Department of Health Impact Assessment (IA) *Reforms to funding and financial support for nursing, midwifery students* made this point about the applicant to acceptance ratio acting as a 'cushion' when assessing the risk of a fall in the number of applicants arising from the move to student loans. The IA said, 'it is important to bear in mind that in 2015 there were almost 3 unique applicants for every place on a nursing course, therefore a drop in applications might not lead to fewer acceptances' (Department of Health, 2016).

The realisation of a nurse shortage after 2013 and that commissions would have to increase significantly for the foreseeable future led to the switch from generous bursary and free tuition fees for nurse students to a student loans system in the 2015 Spending Review (Department of Health, 2016). This led to a reduction in applicants and an increase in the acceptance rate. The restoration of the bursary and the post-Covid boost in applicants has helped recover the number of applicants, but they are still below 2010–16 levels.

**Figure 3-2: 2.5 to 1 applicants to acceptances ratio before 2017**



**Source:** UCAS Analysis and Insights - 2020 end of cycle applicant figures \*

We have useful UCAS data time series on the number of applicants and acceptances by country of UK and by region in England. This allows us to explore the impact on applications and acceptances of:

1. Demographic factors
2. The impact of changes to the opportunity cost of a nurse degree
3. Relative pay
4. Job security
5. Perceptions of a nurse career – COVID-19 effect

Each of these is discussed below.

**Demographic factors**

The pre-pandemic data on applications and acceptances confirm that nursing remains an overwhelmingly female career and that over 50% of nurse applicants are 23 years old or younger (35% of all acceptances are from school leavers who are 18–19 years old).

The England rate of applications and acceptances per thousand female population (ptfp) is shown in Table 3-1.

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\* <https://www.ucas.com/data-and-analysis/undergraduate-statistics-and-reports/ucas-undergraduate-sector-level-end-cycle-data-resources-2020>

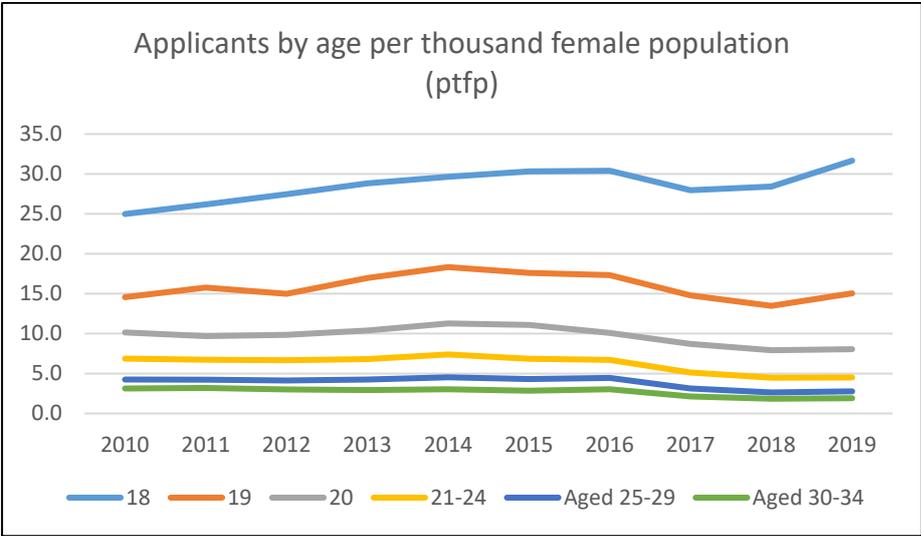
**Table 3-1: The rate of applicants and acceptances ptfp for England 2019**

Age	18	19	20	21–24	Aged 25–29	Aged 30–34	35+
<b>Applicants ptfp</b>	31.7	15.1	8.1	4.5	2.8	1.9	1.4
<b>Acceptances ptfp</b>	17.8	8.6	4.4	2.6	1.7	1.2	0.9
<b>Ratio</b>	56%	57%	55%	58%	60%	61%	60%

**Source:** UCAS Analysis and Insights – 2019 cycle applicant figures

The time series of the number of applications and acceptances by age group to 2019 is shown in Figure 3-3 below.

**Figure 3-3: Numbers of applicants per thousand female population (ptfp)**



**Source:** UCAS Analysis and Insights - 2019 cycle applicant figures

Note that male applicants and acceptances are less than 4% of the under 21s and only 8% of the 21–24 age group. The male applicant ratio never rises above 0.5 per thousand people for any age.

The applicants began rising in absolute terms from 2012 but fell back for all age groups after the introduction of a student loans system. The decline was greatest among older students and had not recovered to 2016 levels by 2019, except for the 18-year-old age group.

**Opportunity cost of nursing degree**

The key metric economists use to assess the financial returns of one degree and career choice over another, or no degree, is based on a calculation of the returns to education from the acquisition of a higher qualification (Becker, 1994). The economic returns to the students are measured as their increase in lifetime income, or ‘premium earnings’, accruing as a result of their investment in education. Such gains are net of the initial

costs of learning, such as tuition and opportunity costs of forgone earnings (Bhutoria, 2016).

The literature does not suggest applicants for nurse education are driven by financial reward, but the shift to a student loans-based system imposed a significant extra cost on acquiring a degree in nursing. The replacement of the bursary (worth between £3k and £5.5k per year) and 'top-up' student loan (of up to £3.2k) and free tuition (£27k over a three-year course) with a loan of £11k increased the opportunity cost of studying to be a nurse by £36k, to £40k in England. This significantly reduced the financial returns of working as a nurse, especially for older students.

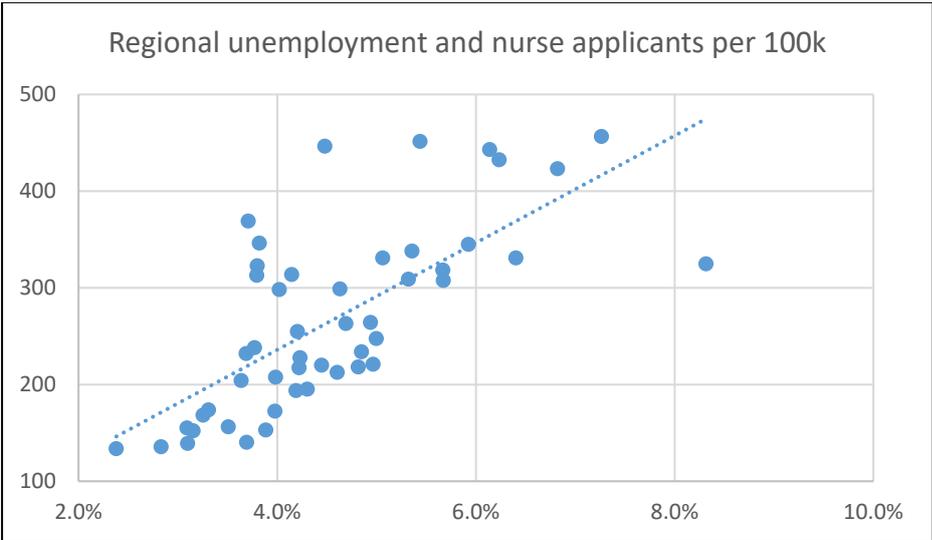
The number of applications to nursing in England fell by 30% for females and 40% for males from 2016 to 2018. The reduction was largest among the more mature students, who might have had to give up employment to study, making the opportunity cost higher.

**Job security**

The Australian study of nurse career choice (Wilkes, Cowin, & Johnson, 2014) found the most attractive pecuniary aspects of being a nurse related most to job security and job variety rather than pay. This is supported by simple analysis of regional applications data. Figure 3-5 shows a strong correlation between regions with the most applicants for nurse degrees and the level of unemployment, reinforcing the idea that a significant 'pull factor' of a nurse career is job security.

Although the job security of being a nurse will be more or less the same throughout England, its 'premium effect' will be higher in areas of higher unemployment.

**Figure 3-4: Correlation (0.77) between nurse applicants per 100,000 population and unemployment at HEE regional level between 2014 and 2020**

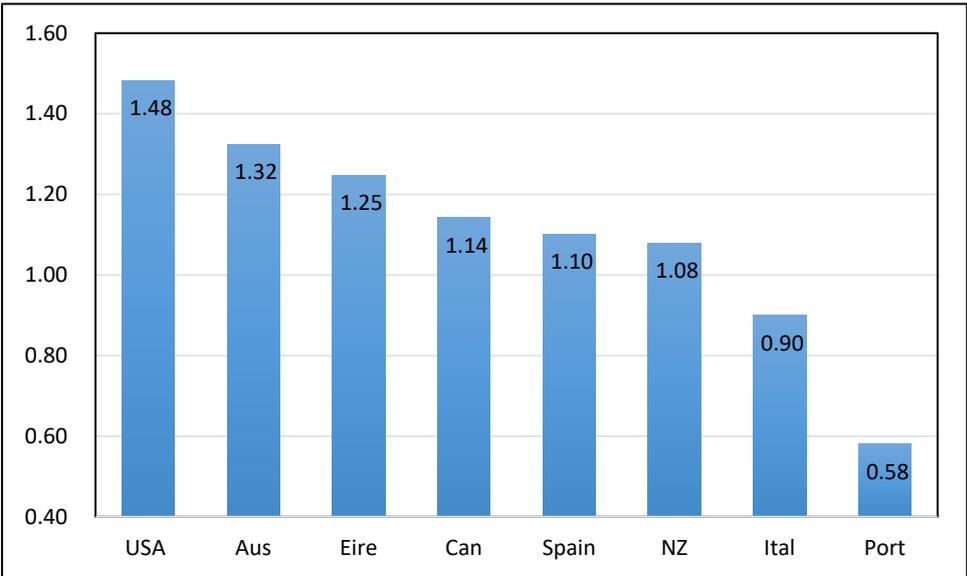


**Source:** DAS analysis of regional labour market statistics, headline indicators, December 2020; and nurse applicants per 100k population (UCAS)

### Nurse relative pay

To explore the possible relationship between nurse lifetime earnings and the attractiveness of nursing as a career between different countries we calculate 'nurse comparative standard of living'. This can be measured by per capita GDP adjusted for Purchasing Power Parity\* multiplied by the percentile, or rank, of nurse income in the national distribution of earnings. Both these data are available from the OECD (OECD, 2019). This is shown in Figure 3-5 with the UK value set at 1.

**Figure 3-5: GDP per capita multiplied by Nurse earnings as percentile of female earnings.**



**Source:** DAS Ltd; OECD Health at a Glance, 2019

**Note:** UK has a value =1

The rank among anglophone countries presents a good match with interest in nursing as a career from the OECD PISA data shown in Figure 3-1. The USA ranked the highest level of interest among 15-year-olds, Australia 4th, Canada 6th and Eire 7th. New Zealand was 10th and the UK was 12th.

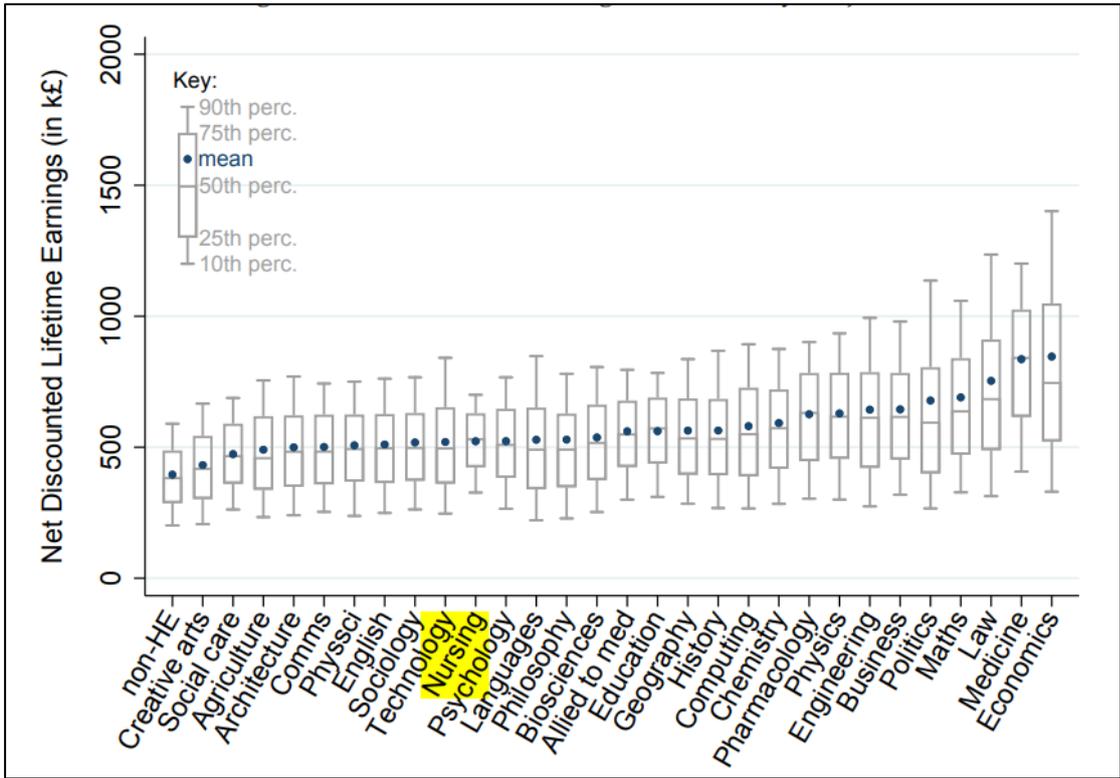
### 3.2.3 Variation in nurse pay relative to other jobs and professions

A 2018 study into the impact of undergraduate degrees on lifetime earnings (Institute for Fiscal Studies, 2018) reveals the following pattern of earnings for female nurses compared to other graduate professions.

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\* Purchasing power parity (PPP) is a measurement of prices in different countries that uses the prices of specific goods to compare the absolute purchasing power of the countries' currencies. It enables comparisons of earnings between countries to be compared on a like for like basis.

**Figure 3-6: Net lifetime earnings for women by degree subject**



**Source:** Institute for Fiscal Studies (Institute for Fiscal Studies, 2018)

The IFS chart shows female nursing graduates in the second quartile of the net lifetime returns above creative arts, social care and sociology but below sciences, humanities, law, medicine and economics. The chart also shows that nurse spread of net returns is relatively narrow compared to other subjects.

**Perception of a nurse career**

In 2019 Health Education England, NHS England and NHS Improvement collaborated on the ‘We Are The NHS’ campaign to increase awareness of NHS careers, especially nursing and among the older potential pool (NHS, 2020). Statistics released on 6 February 2020 by UCAS show that applicants to study nursing from English residents rose by 6% from 2019 to 2020, based on a 15 January deadline to apply. Applicants from those aged 35 and over have risen by 23%, and by 13% for those aged 30–34.

These percentage increase figures for England are compared with the other countries of the UK in Table 3-2.

**Table 3-2: Percentage change in number of applicants by January deadline (pre- pandemic) by age, UK residents**

	<i>Percentage change 2019 to 2020</i>		
	<i>All applicants</i>	<i>30–34</i>	<i>35+</i>
<b>England</b>	+ 6%	+ 13%	+ 23%
<b>Northern Ireland</b>	- 6%	- 21%	- 19%
<b>Scotland</b>	+ 12%	+ 26%	+ 13%
<b>Wales</b>	0%	+ 14%	- 3%

**Source:** UCAS (Feb 6) Application Deadline Jan 2020

The campaign in England was probably helped by a new undergraduate financial support package introduced in 2020 but the We Are The NHS campaign data show that more than 33,000 career switchers signed up to receive information, and over 11,000 had applied (Health Education England, 2020). No doubt some of these would have applied anyway, but it is indicative that targeted awareness campaigns can increase the number of applicants and probably also improve average quality and commitment of the applicants.

By contrast, the reduction in nurse applicants in Northern Ireland (for every age group except 18-year-olds) was no doubt adversely impacted by the NHS nurse pay dispute that involved strike action over the winter and was only suspended in mid-January 2020.

**The COVID-19 effect**

Nurse applications and acceptances increased in 2020 at end of cycle and this is widely believed to be a COVID-19 effect. It is an important area of future research to identify precisely what influenced the additional applicants and how they will progress through nurse education and into a nurse career.

**3.3 Attrition from nursing degree (AV2)**

The lack of a robust and consistent measure of attrition confounds both the literature and limits the scope for analysis using routine data. This section therefore describes what is currently known about nurse degree attrition.

**3.3.1 Literature review**

There have been numerous studies of student nurse attrition and a more or less constant set of policies and performance targets from the centre to reduce it. In 1999 the United Kingdom Central Council for Nursing Midwifery and Health Visiting published the findings of a large-scale review of nurse education and reported high levels of attrition.

In 2015 Health Education England (HEE) published *Raising the Bar*, which reported that non-completion rates within pre-registration nursing programmes were above 20%

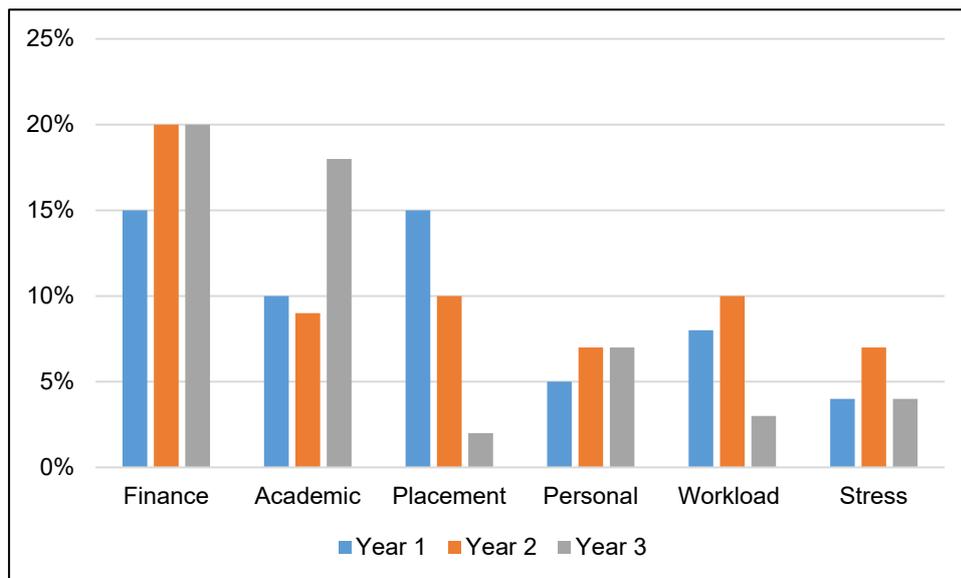
(Health Education England, 2015). In the same year the Department of Health published a refreshed mandate to Health Education England setting out actions required to improve the quality of education for health care students and reduce attrition by 50% from 2017. The Reducing Pre-registration Attrition and Improving Retention (RePAIR) project was established to address the issue.

Surveys of why nurse students leave their degree course show a combination of factors, including personal reasons, lack of support, financial difficulties, academic challenge and poor experiences with clinical placements.

The RePAIR report (Health Education England, 2018) adopted a different approach to elicit more honest and objective reasons. They asked students who had completed the course what factors led them to seriously think about leaving. The main reasons for student nurses considering leaving the programme, aside from financial reasons, strongly related to the education and training programme, most notably the lack of support in the clinical placement. The RePAIR report found most attrition occurred in year 1 after the first clinical placement.

Figure 3.7 shows the % considering leaving by year of study or different reasons.

**Figure 3-7: Nurses who completed 3-year degree course, reasons for contemplating leaving**



**Source:** The RePAIR report (Health Education England, 2018)

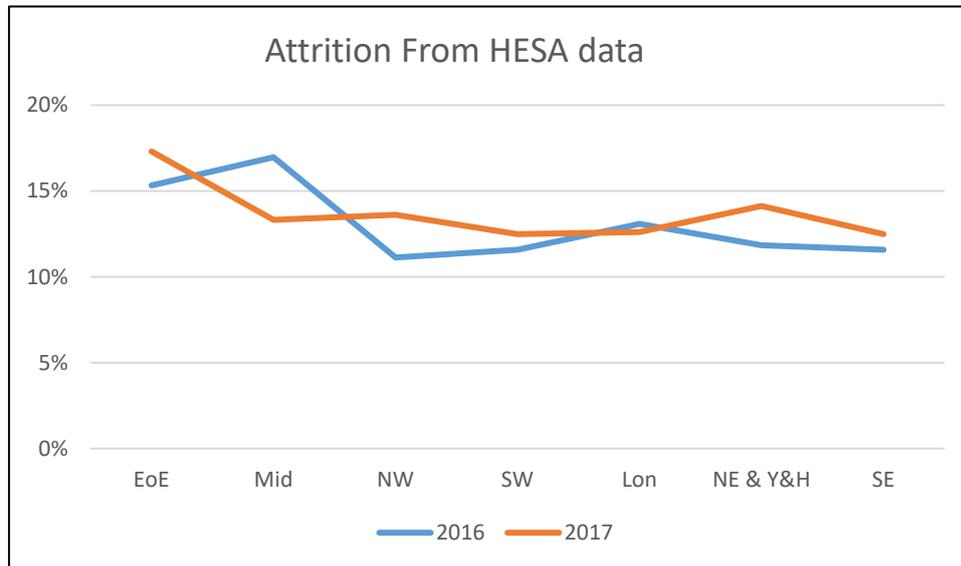
It is notable that for nurses who stayed the course workload, stress, personal and finance reasons peaked in year 2. Placements were an issue for 15% of students in year 1, but only 2% by year 3. The reverse was true for academic reasons for thinking about leaving. These were always high at 10% in years 1 and 2 but rose to 18% by year 3.

### 3.3.2 Available data

The Higher Education Statistics Agency (HESA) data of students in higher education obtained by DAS for the 2 years 2016 and 2017 has the number of students on nurse

degree courses and the number leaving without completing their studies. The number leaving each year multiplied by three gives an approximate measure of attrition in nurse education. The average for 2016 was 13.1% and for 2014 it was 13.7%.

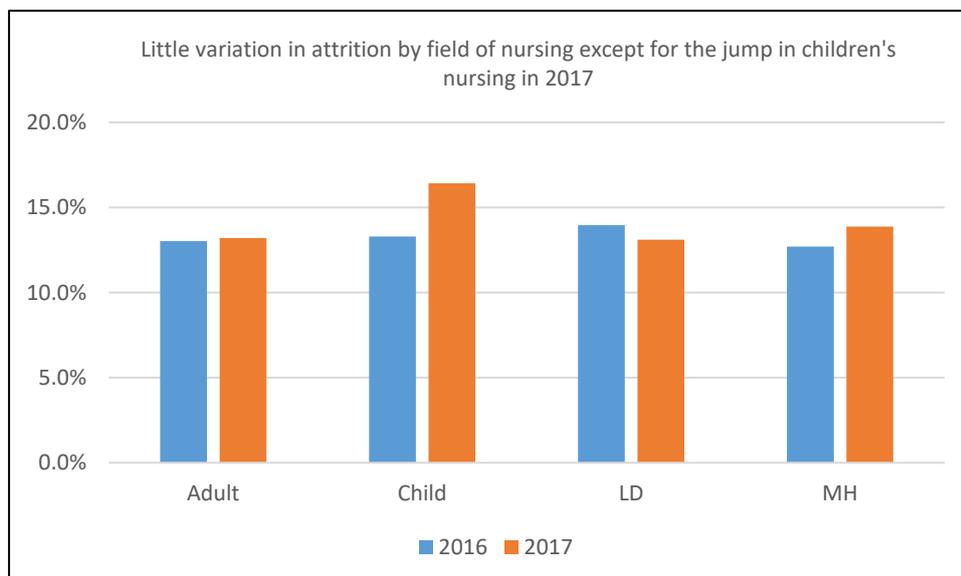
**Figure 3-8: Levels of attrition from nurse education at regional level.**



**Source:** DAS analysis of HESA Student Record 2012/13-2018/19

Figure 3-9 shows the levels of attrition for the different fields of nursing. Contrary to expectation, there is not much variation between them.

**Figure 3-9: Attrition in training by field of nursing**



**Source:** The reducing pre-registration attrition and improving retention (RePAIR) report (HEE, 2018)

The RePAIR study (Health Education England, 2018) sought to understand the factors that influence a student’s decision to leave a nurse degree and at what point during the course they decide to stay or leave.

In the absence of a standard definition of attrition, RePAIR established a new measure of 'pure attrition' – the number of students who did not complete within the standard pathway for that programme, ie within 3 years for the majority of programmes. Average pure attrition from RePAIR for 2013 and 2014 was 33.3% for Adult, 29.4% for Child, 39.1% for Learning Disability and 35.0% for Mental Health.

We can calculate an equivalent pure attrition figure from HESA by looking at the number who did not complete their degree in 3 years. This averaged 23% across all branches of nursing for the years 2015 and 2016, considerably less than the RePAIR calculation of 33% in 2013 and 2014.

Both numbers are upper bound estimates of attrition as it is known that many students do not complete in 3 years but take time out and return to complete their studies in year 4 or 5. Further analysis of 2015 and 2016 HESA data suggest that of the 23% who drop out in 3 years (pure attrition), 5% return and successfully complete the course in 4 or 5 years. This would give an attrition figure of 18%.

### **Nursing Standard freedom of information request**

It is difficult to understand why standard measurement of nurse attrition is so difficult to access. A freedom of information request by the Nursing Standard in 2018 suggests a UK nursing student attrition rate of 24%. The headline was 'One in four UK nursing students drop out of their degrees before graduation'.

This figure, however, appears to be another measure of 'pure attrition' as it compares 16,544 UK nursing students who began 3-year degrees that were due to finish in 2017 with the 4,027 who left their courses early, or suspended their studies. No doubt a significant number of those who suspended their studies would have returned to complete in year 4 or 5.

### **3.4 The number of graduate nurses who do not take up a nursing job (AV3)**

This is not a flow that is reviewed in the literature, where the focus is on newly qualified nurses (NQNs) taking up their first job as a nurse and finding it difficult to transition. Qualified nurses who do not take up a nursing post are relatively invisible to the system. If it is a significant proportion of new graduates, however, it would be a significant deadweight loss to the system and therefore warrants further investigation beyond the scope of this study.

#### **3.4.1 Literature review**

There is a lack of literature describing the factors associated with nursing graduates taking up a nursing job following graduation.

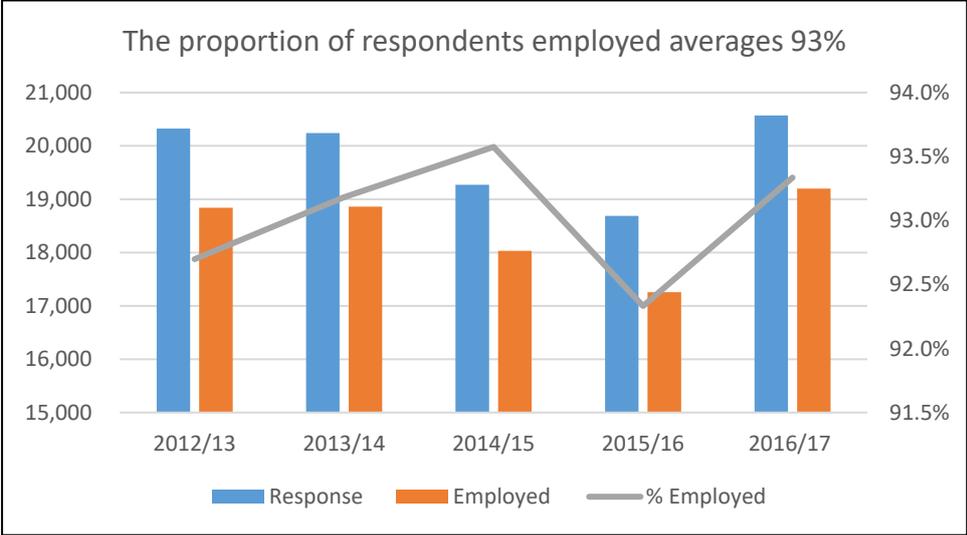
#### **3.4.2 Available data**

To understand the employment participation decisions of new nurse graduates we use the HESA Leavers Survey. This has an average response rate of around 50%, but this

varies from 60% in the North-West to 37% and 30% in the South-East and South-West respectively.

The figures for 2012/13 to 2016/17 had an average 93.3% in employment.

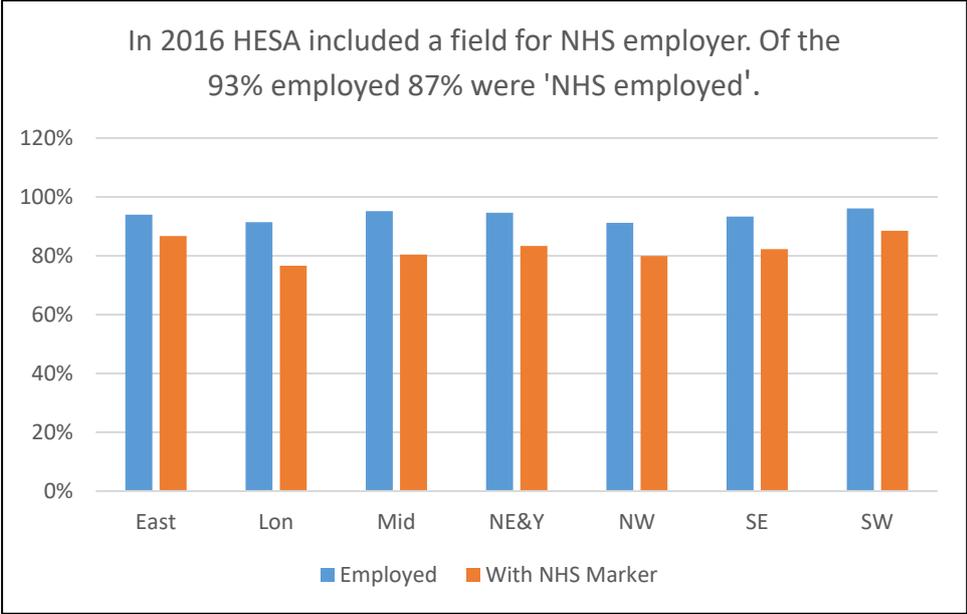
**Figure 3-10: Variation in proportion of NQNs employed over the time period**



**Source:** HESA Destinations of Leavers Survey and Student Record 2012/13-2016/17

The 2016 HESA data included a field for NHS employer and 81.6% of all respondents were flagged as working for the NHS (87.4% of all employed). This is shown in Figure 3-11, with the South-West having the highest proportion working for the NHS and London having the lowest.

**Figure 3-11: Likelihood of being employed in the NHS**



**Source:** HESA Destinations of Leavers Survey and Student Record 2012/13-2016/17

Not all nursing jobs are in the NHS however, and the same 2016 HESA Leavers Survey has up to 96% of those employed working in the nursing profession, possibly in the prison service, armed forces, primary care and social care. The breakdown is in Table 3-4.

**Table 3-4: Areas of nursing profession employment of HESA Leavers Survey respondents**

<i>Industry of employment *</i>	<i>Numbers</i>	<i>% of all employed</i>
<b>TOTAL †</b>	<b>12,580</b>	<b>96.40%</b>
<b>Hospital</b>	10,900	83.50%
<b>Other health</b>	1,125	8.60%
<b>GMS</b>	330	2.50%
<b>Residential nursing home</b>	175	1.30%
<b>Social care / Community nursing</b>	50	0.40%
<b>Prison / Police</b>	25	0.20%
<b>Education, incl HEIs</b>	25	0.20%
<b>Health management ‡</b>	15	-
<b>Temporary / Agency</b>	10	-

**Source:** HESA Destinations of Leavers Survey and Student Record 2012/13-2016/17

The HESA Leavers Survey has a 50% response rate. It shows that nurse graduates have high (93%) probability of being in employment, with 87% of those working in the NHS. The detailed breakdown of industry of employment suggests a further 9% of the employed could be working as nurses for non-NHS employers.

The employment rate of for NQNs at 93% is much higher than for other graduates and the participation rate for nurse jobs appears high, at 96%. However, if you add those employed but not working as nurses (3.2% of total) to those not working (6.7% of total), the gross figure of those not working as nurses is around 10%. This is snapshot data taken 6 months after graduation and from HESA data for 2016, so it is somewhat dated.

It may exaggerate the number not working as a nurse, as NQNs have up to 3 years to find the nursing job that is right for them before falling off the register. But it is a proportion that warrants further investigation in its own right, and if added to attrition would suggest up to 25% of nurse students either fail to graduate or to work as a nurse after graduating.

\* All counts of individuals have been rounded to the nearest multiple of 5.

† The total number does not match the sum of industries because the real sum is rounded independently of constituent parts.

‡ The percentage of individuals working in Health management and Temporary/ Agency industries has been suppressed because there are fewer than 22.5 individuals.

## 4 The impact of pecuniary and non-pecuniary factors on the nurse labour market

**This section considers the pecuniary and non-pecuniary factors that affect the adjustment variables (AVs) that determine the level of the nurse labour supply to the nurse labour market in England (excluding flows to and from overseas).**

These are AV7, the decision to leave the nurse labour market, AV8, a return to the nurse labour market, and AV10, the decision about the number of hours to work as a nurse.

AV9, a change of nursing job, does not affect the size of nurse labour supply (unless it is combined with AV10, as it often is) but it does affect its spatial and functional composition. It is considered here because many of the factors that affect AV7, AV8 and AV10 also affect AV9.

We do not consider international flows because they are largely influenced by factors outside the nurse labour market in England. Nor do we consider AV11, FTE to care hours conversion. AV11 does not affect the total nurse labour supply in terms of quantity of hours supplied, but it does affect its effectiveness and capacity to treat patients. It is not something that is determined by economic factors however, but rather by technology, policy and regulatory framework, all interacting on the working practices of nurses.

### 4.1 Market definition

In this section we consider the participation decisions of registered nurses to enter or leave the nurse labour market, how many hours to work and which job(s) to take. The nurse labour market is limited to the hire of registered nurses for work that can only be done by registered nurses. Registered nurses working in occupations other than nursing, or not working at all, are not part of the nurse labour market. Qualified nurses working as nurses are the actual supply of nurse labour. Qualified nurses not working as nurses are the 'qualified pool'. They form the potential supply of additional nurse labour in the short run.

The demand for nurse labour is a derived demand from the multiple organisations in the NHS, other public sector, charities and private sector that require nurse labour to deliver their health and care services.

### 4.2 Leaving the nurse labour market, returning to the nurse labour market and the number of hours worked (AVs 7, 8 and 10)

The sections below consider the key factors that influence qualified nurse participation decisions. AV7, the decision to leave the nurse labour market, AV8, a return to the nurse labour market, and AV10, the decision about the number of hours to work, are considered together. AV9, a change of nursing job, is considered separately.

### 4.2.1 Literature review

Aside from estimates of nurse pay elasticity of supply, the empirical literature on the supply of nurse labour is relatively sparse. In his historic, but still relevant, systematic review of the literature on nurse pay elasticity, (Shields, 2004) noted the lack of work on non-pay drivers of the supply of nurse labour.

#### **Nurse pay**

Nurse pay elasticity of supply measures the responsiveness of nurse participation decisions – to stay working as a nurse, to stop working as a nurse and how many hours to work – to changes in pay. It is defined as the % change in total hours supplied (in the NSM, made up of the combined change in AV7, AV8 and AV10) divided by the % change in pay. A number less than one means that nurse labour supply is inelastic, greater than one means that it is elastic.

Phillips (Phillips, 1995) presents one of the first theoretical models focusing on nurse labour supply in the NHS. The results suggest that a higher wage could induce higher nurse workforce participation rates, with the labour supply curve featuring discontinuities.

Subsequently some modellers have queried this result, with Heyes (Heyes, 2005) presenting a set-up in which wage increases do not lead to an increased supply of nurses because of the vocational incentive of the profession, in the sense that offering more money attracts the ‘wrong’ sort of individual. In Heyes’s model, a higher wage reduces the proportion of nurses who have a vocation, as it reduces the quality of work undertaken by the average employee. This result is driven by a self-selection constraint, where more productive (and caring) nurses tend to have a lower reservation wage. Heyes suggests that wage increases are more likely to prove effective in increasing efficiency across the NHS when vocation is better observable and care quality is more contractible. Barigozzi and Turati (Barigozzi & Turati, 2012) build on the Heyes model and distinguish between more and less qualified nurses. Their set-up visualises a ‘vocational premium’ and suggests that wage increases can negatively affect productivity and vocational motivation levels for nursing assistants but could increase average productivity when it comes to registered nurses. Coombes et al (Coombes, Elliott, & Skatun, 2010) also argue that a number of factors, including relative prices, institutions and technology, affect the skill mix in the nurse labour market.

Fedele (Fedele, 2018) argues that the findings of subsequent empirical analyses negate the predictions of Heyes (2005). Fedele presents an alternative set-up in which Heyes’s prediction is overturned, in that well-paid nurses turn out to be better nurses, principally because Fedele’s model distinguishes between intrinsic and extrinsic motivation. Intrinsic motivation, which Heyes largely focuses on, refers to enjoyment arising from undertaking a job. Extrinsic motivation is reflected in nurses’ wanting to care for other people, so that alternative jobs which allow them to do this (such as counselling and teaching) attract good nurses if decent pay levels are on offer.

In terms of empirical evidence, (Shields, 2004) concludes that most studies point to nurses' labour supply being fairly inelastic, with an average elasticity of approximately 0.3 (applying primarily to the USA, which was the focus of most studies at that time). Further review by DAS and the Health Foundation of eight studies not included in Shields (four of them for the UK) found an average elasticity of 0.48.

Only one of these estimates was above 1, however. This was an Australian study (Hanel, Kalb, & Scott, 2014) using panel data comprising waves 1–9 of the Household, Income and Labour Dynamics in Australia (HILDA) survey. The data set had 4,933 observations of 788 individuals with a nursing qualification. The paper presented three relevant estimates of elasticity of supply.

- First, if 'other income' (unearned or partner income) increases, fewer nurse hours are supplied, but this is a small effect ( $>0.1$ ). The majority arises from nurses ceasing to work as nurses entirely, rather than reducing their hours.
- Second, if nurse wages increase by 1% relative to other occupations, the work hours of existing nurses increase by 0.24%, but the return to working by nurses currently not working as nurses boosts this effect to 1.35%.
- Finally, if non-nurse wages rise by 1%, nurses' total hours supplied fall by 0.93% (combined effect of reduced hours and nurses exiting the profession).

The fact that the majority of the increase and decrease in supply arising from increases and decreases in nurses' relative wages arises from returns to work of nurses either not working at all or working in a non-nursing job suggests this is a long run rather than a short run estimate of elasticity of supply. Labour supply is generally more elastic in the long run than in the short because it not only allows for people to switch occupations but also to acquire qualifications. In the case of nursing, we might define long run as more than 3 years, allowing for more people to choose to train as a nurse in response to a change in nurse relative wages.

The authors of the Australian study highlight a small sample size and measurement error in wage data as reasons for caution but are confident that 'while the magnitude of the point estimate may not be precise, it appears that the number of supplied working hours is fairly unresponsive to wages, yet the decision to enter the occupation, from non-employment or from other occupations, is far more responsive'.

However, perhaps a third reason for caution over their results is the setting. The Australian nurse labour market at the time of the study had much more spare capacity than is typical in England. The number of qualified nurses either not working (21% of the sample) or working in another occupation (27%) represented a large pool of potential returners to the nurse labour market.

If we exclude the Hanel study, the estimate of elasticity of nurse supply to nurse wages is 0.34 to 0.38. The average of the four UK studies is 0.28 on the low side and 0.35 on the high side. The high and low estimates for the eight studies are shown in Table 4-1. Appendix B gives a fuller description of each of them.

**Table 4-1: The eight studies of nurse pay elasticity reviewed for this paper**

Author	Country	Year of data	Low	High
B Eberth	UK	2007	0.255	0.357
R Crawford	GB	2004	0.045	0.1
B Hanel	Aus	2006	1.37	1.37
T Kankaanranta	Finland	2005	0.48	0.48
D Skåtun	UK	2000	0.55	0.55
JP Burkett	USA	1995	0.59	0.59
N Rice	UK	1995	0.29	0.4
J Askildsen	Norway	1996	0.2	0.2
<b>Average</b>			<b>0.47</b>	<b>0.50</b>

**Source:** DAS analysis - See Appendix A

**Note:** year is the year of the data used in the study not the year of publication.

**Other pecuniary factors**

A review of the nurse supply literature (Antonazzo, Scott, Skatun, & Elliott, 2003) points to insufficient knowledge of the non-pecuniary drivers of labour supply including job satisfaction, career advancement or training opportunities, labour supply discontinuities (due to married nurses’ labour supply choices, for instance), workforce compositional shifts, changes in worker preferences, and policies around childcare, taxes and benefits. Further, they suggest more analysis exploring the interaction with policies focusing on demand and the possibility of a backward-bending labour supply curve for nurses.

In addition to nurse supply elasticity in respect to pay, several of the more recent studies highlight wage rates in alternative occupations and opportunities for career progression within the nursing profession as important drivers of retention. The first point is supported by (Hanel, Kalb, & Scott, 2014) and the second by (Eberth, Elliott, & Skåtun, 2016). A more recent study (IFS, 2020) found that trusts in high cost of living areas have higher promotion rates. In fact, their study found that the vast majority of ‘pay increases’ in areas with above average increase in cost of living (and consequent pressure on retention) result from an increased probability of promotion. An increase of 1% in house prices is associated with a 0.5 percentage point increase in the probability of promotion.

It appears promotion is one of the few pay flexibilities NHS trusts are prepared to use, even when operating in a very tight nurse labour market. This monopsonistic\* behaviour by large employers of nurses has been studied in the earlier literature, see for example Sullivan (Sullivan, 1989), Manning (Manning, 2005) and Staiger et al (Staiger, Spetz, & Phibbs, 2010).

### **Non-pecuniary factors**

The majority of studies mention non-pecuniary factors. Eberth (2016) emphasises the non-pecuniary factors and worker characteristics as fundamental determinants of nurses' labour supply choices. Preferences around flexibility at work, the number of children and whether a nurse's partner earns significantly more, all play a vital role in shaping nurses' labour supply choices.' This is in line with the findings of Carter and Tourangeau (Carter & Tourangeau, 2012), who suggest that nurse retention rates are largely driven by the supportiveness and comfort of the work environment and the perceived degree of autonomy at work.

There appears to be little recent evidence of the relative importance of such non-wage drivers of nurse labour supply in the empirical literature, although a recent systematic review by Drennan et al (Drennan, et al., 2015) provides strong qualitative evidence that these factors have a major impact on nurse retention rates. A study by McHugh and Ma (2014) looked at the relevance of nurse work environments and staffing levels after controlling for wage rates in four US states in 2006–07. Unsurprisingly, better work environments and staffing levels are associated with nurses reporting less job dissatisfaction. More interestingly, this finding held even after wage changes were controlled for. Further, higher wages were associated with less self-reported job dissatisfaction, but with no significant change in burnout rates (defined using an emotional exhaustion measure). This suggests that at least in some settings, wage increases could promote nurses' job satisfaction levels, but may be less effective in reducing burnout rates, which has clear implications for nurse retention strategies. In a related study, White et al (White, Aiken, & McHugh, 2019) found that nurses with burnout and job dissatisfaction were more likely to provide substandard care (by failing to complete essential tasks), with burnout having a stronger negative impact than dissatisfaction.

Ulph (Ulph, 2020) explores the factors which influence nurse staffing shortfalls through the lens of a labour supply model. Ulph includes the quality of care nurses can provide as a key component of the supply function and assumes quality can be proxied by nurse hours per patient. When the quality of care nurses can provide is 'high', nurses

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\* A monopsony is a market condition in which there is only one dominant buyer, the monopsonist. In England the NHS is the dominant buyer of nurse labour and it can set wages below the market clearing rate. The fact that some monopsony characteristics are also found in American hospitals is probably the result of cartel behaviours by employers of nurse labour.

will have a higher participation in the nurse workforce for any given wage. When it is low, they will supply fewer hours, reducing the quality of care further. This set-up brings together wage and non-wage drivers of shortages in the nursing workforce, using NHS nurse shortages as a real-world point of focus. It concludes that while pay increases are likely to help mitigate these shortages, multiple equilibria are possible, with some leading to unstable outcomes. It also highlights that what matters is not just whether shortages exist in nurse labour markets but also how large those shortages are and suggests that this remains fertile ground for further modelling and empirical research.

### **Part-time working**

The nature and extent of part-time working will be determined by the interaction of worker and employer preferences for full vs part-time working and their relative bargaining power. It is notable from the IFS 2015 study that qualified nurses working in non-qualified jobs work fewer hours than nurses still working as nurses. (Eberth, Elliott, & Skåtun, 2016) found that where nurses had some control over their hours of work, they worked fewer hours. (Hanel, Kalb, & Scott, 2014) on the other hand found that 74% of nurses' actual hours of work matched their expressed preferences for hours worked. This compared with 72% for all female workers taken from the HILDA survey. The authors say this is some indication that nursing qualification holders may be slightly better able to optimise their hours than individuals in other professions, and certainly no worse, possibly due to the shortage of nurses' supply.

#### **4.2.2 Available data**

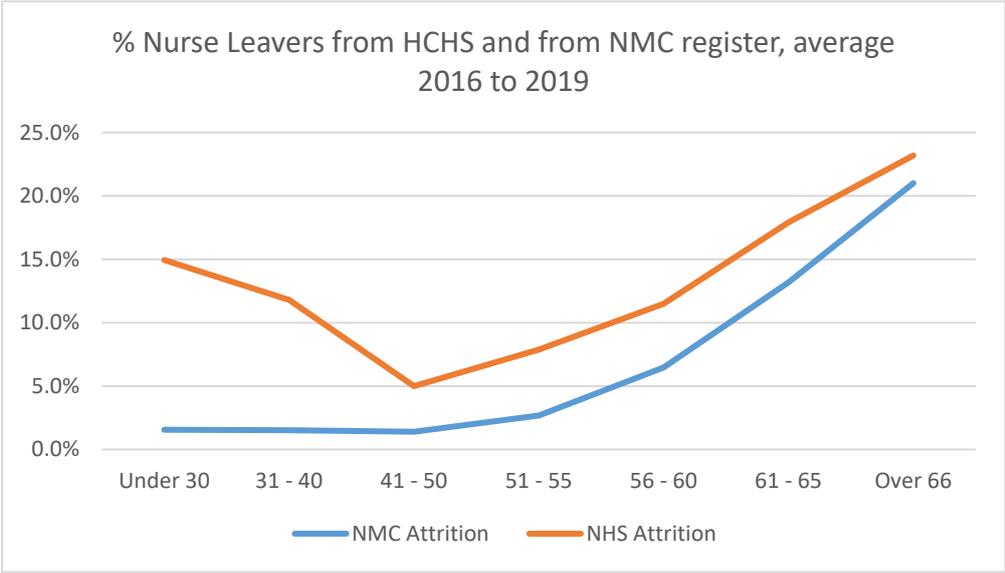
### **Leavers**

Nurses who leave to work in another role, setting or region, but still within the NHS, are not a loss to the nurse labour supply in England, nor are the nurses who leave the NHS to work as nurses in other parts of the nurse labour market. But those who leave\* the NMC register are a loss.

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\* A person can choose to leave the register at any point by letting the NMC know that they wish to do so. People have to pay their fee annually, regardless of whether it is a revalidation year, so if they have stopped practising and do not intend to practise again (at least for some time), they can leave the register, either by telling the NMC they wish to do so, or 'lapsing' automatically if they do not pay their annual fee.

**Figure 4-1: Age profile of female nurses who leave the Hospital and Community Health Service (HCHS) from NHS Digital [NHS Attrition] and people that leave the NMC register [NMC Attrition] by age**



**Source:** NHS Digital, NMC data 2016 to 2019

**Note:** The NMC data cover the number of NMC nurse registrations. This does not cover individuals who are registered as a midwife or those with dual registration in nursing and midwifery.

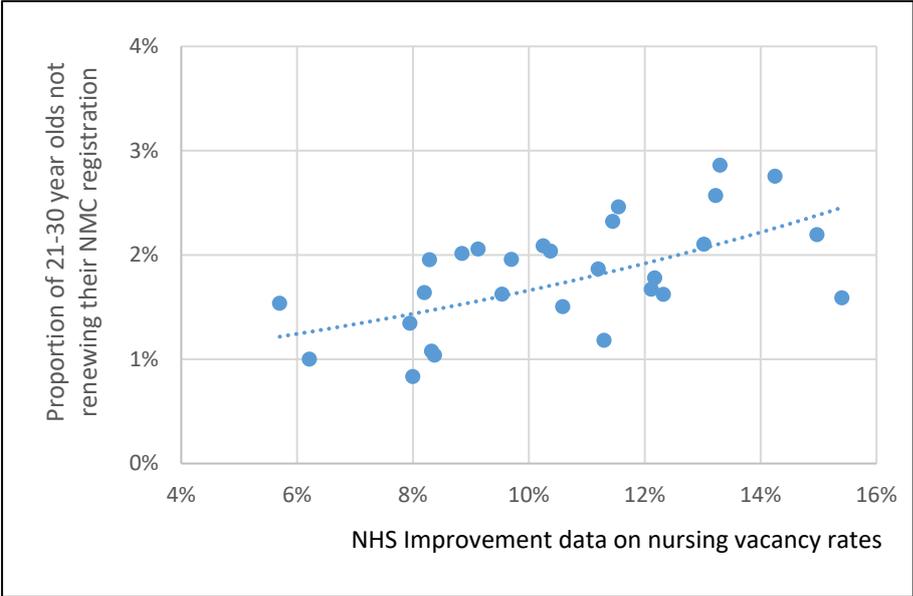
It can be seen that far more nurses leave the HCHS in their 20s and 30s than leave nursing altogether. Some of this will be maternity leave but it does chime with the literature on NQNs struggling to cope in the hospital sector that has high vacancies and high workload as posited by David Ulph’s 2020 paper. Ulph cites evidence from NHS Digital in support of his theoretical model:

- of those leaving the nursing profession voluntarily, and for reasons other than retirement, 44% cite workload pressures and 27% cite disillusionment with the quality of care provided to patients
- work-life balance in particular has increased as a reported driver, with more than two-and-a-half times as many people citing it as a reason for leaving the NHS in 2018/19 than in 2011/12.

To test the theory, we have looked at the association between regional level variation in the proportion of 21-30 year old nurses who do not renew their NMC registration and regional nursing vacancy rates.

**There is a positive (0.6) correlation between these two variables.**

**Figure 4-2: NHS Improvement vacancy data by region, 2017–20, on x axis compared to proportion of 21–30-year-old people leaving the NMC register, 2017-20, on y axis**



**Source:** NHS Improvement, NMC register data (2017-2020)

**Note:** The NMC data cover the number of NMC nurse registrations. This does not cover individuals who are registered as a midwife or those with dual registration in nursing and midwifery.

The variation in regional non-renewal of registration rates persists in older age groups, and after adjusting for the proportions in the regional workforce from the EU and overseas.

These proportions leaving the register by age cohort allow us to construct a pseudo age-group specific labour market participation curve for each region for EU trained, overseas trained and UK trained nurses. Table 4-2 shows the estimated ‘participation’ (or time on the register) in each age band for London, based on 2019 data.

**Table 4-2: Estimated number of years worked in each age band given the number of nurses not renewing their NMC registration**

	EU	OS	UK	All
1.2 Age between 21–30	3.74	7.74	8.54	7.14
1.3 Age between 31–40	1.82	6.55	7.08	5.56
1.4 Age between 41–50	1.01	5.91	5.93	4.71
1.5 Age between 51–55	0.43	2.70	2.71	2.14
1.6 Age between 56–60	0.27	2.41	2.17	1.73
1.7 Age between 61–65	0.20	1.84	1.44	1.15
<b>Total</b>	<b>7.46</b>	<b>27.14</b>	<b>27.88</b>	<b>22.44</b>

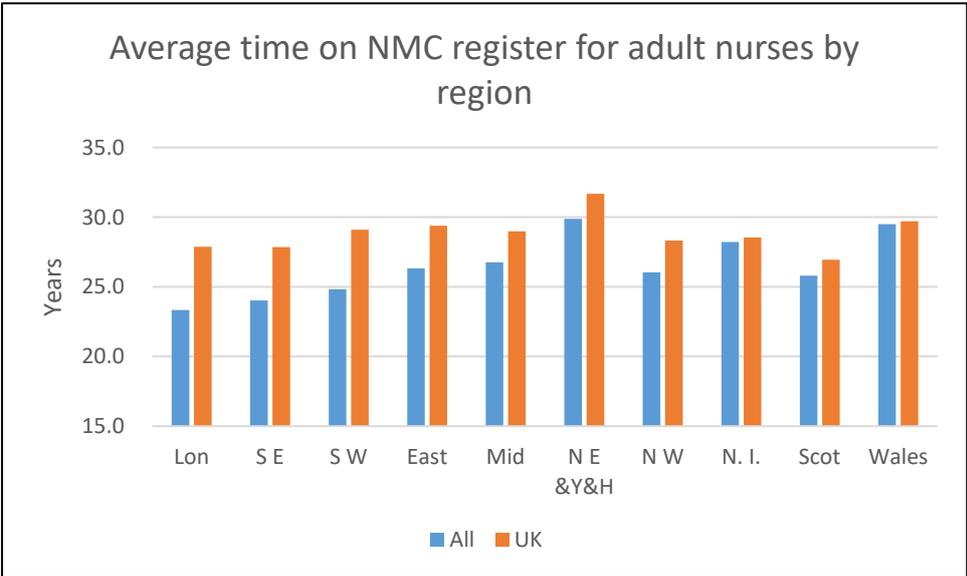
**Source:** DAS analysis based on NMC data (2019)

**Note:** The NMC data cover the number of NMC nurse registrations. This does not cover individuals who are registered as a midwife or those with dual registration in nursing and

midwifery. The average working life for all age groups **will be less than the figures shown here because of the delay between stopping working as a nurse and NMC registration expiring**, and time spent on the register but not working as a nurse.

In all regions EU trained nurses’ average working life in England is below 10 years. This includes those who leave the UK or took alternative jobs to nursing, which unlike overseas trained nurses, they were allowed to do. Figure 4-3 presents the data for regions and Northern Ireland, Scotland and Wales. The figure for ‘All’ is the weighted average. Overseas trained nurses tend to have longer working lives in England than UK trained nurses, except in London.

**Figure 4-3: Average time on the NMC register for UK trained nurses and for all nurses working by region**



**Source:** DAS based on NMC data (2019)

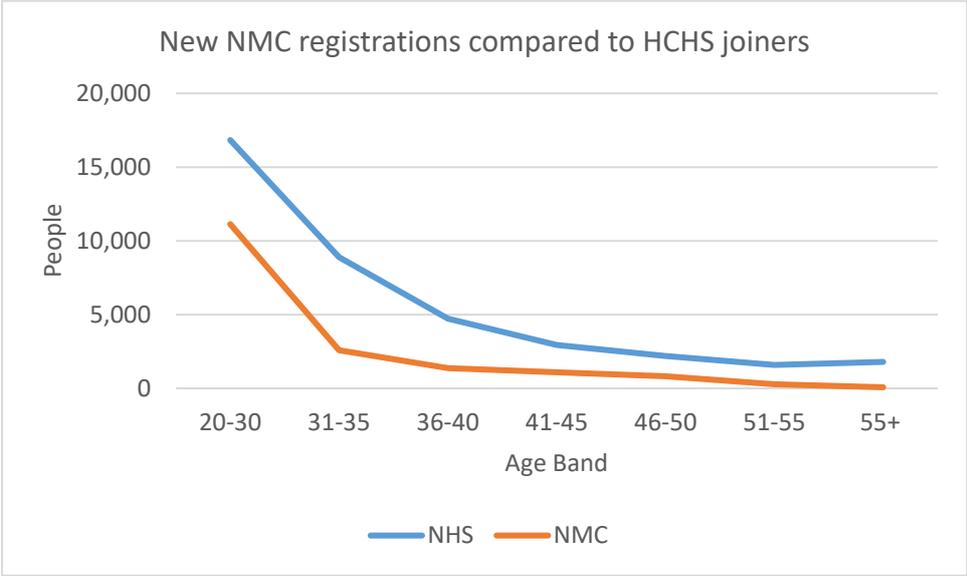
**Note:** The NMC data cover the number of NMC nurse registrations. This does not cover individuals who are registered as a midwife or those with dual registration in nursing and midwifery.

**Nurse joiners**

The number of acceptances to nurse degree courses in England began to rise in 2013 and had increased by 18% by 2016. The number of first registrations to the NMC by domestically trained graduates (with a three year lag) actually rose faster, by 25% from 2016 to 2019, suggesting lower attrition and possibly more graduates registering because of the large number of nursing jobs available.

The figure below shows that more than 63% of these graduates are under 30 and a further 24% are in their 30s. Figure 4-4 compares the number of NMC new registrations with the number of nurse joiners to the NHS HCHS in 2019.

**Figure 4-4: New NMC registrations compared with nurse joiners to the NHS (HCHS)**



**Source:** NHS Digital, NMC 2019

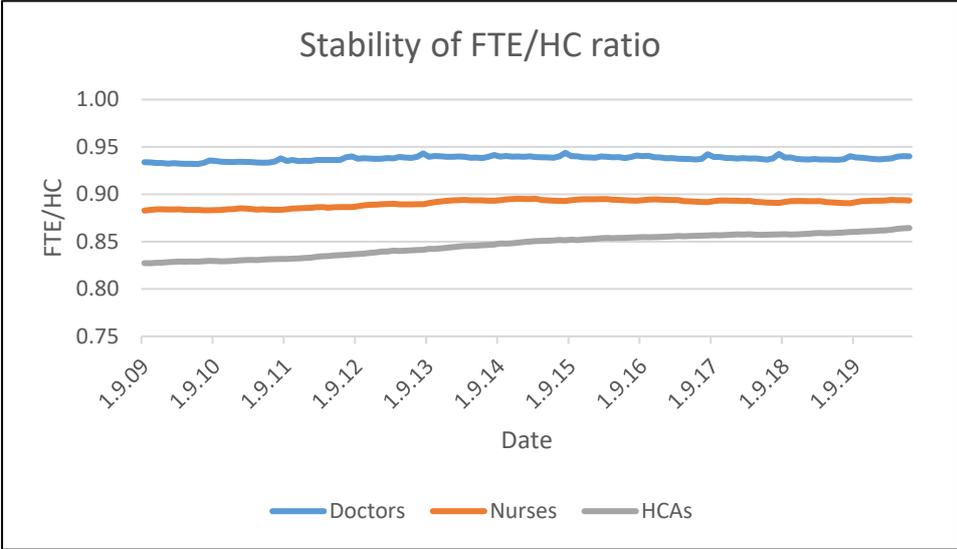
**Note:** The NMC data cover the number of NMC nurse registrations. This does not cover individuals who are registered as a midwife or those with dual registration in nursing and midwifery.

The number of joiners to the NHS is larger than the number of NMC new registrations because the joiners will include returners from maternity or extended sick leave, plus nurses attracted back to a job in the HCHS from other sectors. However, we know from the admittedly older HESA Leavers Survey data that the majority of NQNs (83%) go to work in the hospital sector which is mainly in the NHS. This suggests the majority of joiners to the NHS in the younger age groups are NQNs who also have higher leaver rates than the older and more experienced nurses. The danger of nurses exiting the NHS and the nursing profession in the early stages of their career because of a lack of support is often remarked on in the literature.

**Part-time work**

Figure 4-5 below shows a remarkable stability of FTE to headcount (HC) ratio for nurses working in the HCHS despite nurse vacancies rising from 2% to 12% over the period.

**Figure 4-5: FTE to HC ratio for doctors, nurses and health care assistants working in the HCHS**



**Source:** NHS Digital

In 2010 the FTE to HC ratio for nurses was 0.883; it rose to 0.894 in 2015 and has fallen back slightly since then. This follows the pattern for doctors with a very slight increase to 2015. Health care assistants on the other hand increased their FTE to HC ratio from 0.83 to 0.86, at the same time as the number of vacancies was falling, suggesting professional staff in short supply can resist employers’ preferences for longer hours.

Although small, the equivalent increase in nurse numbers arising from the small increase in FTE to HC ratio was significant at more than 2,000 additional FTEs.

In a tight labour market, nurses will have more bargaining power. Nurses who wish to reduce their hours, including dropping unsocial hours, may be able to do so by threatening to, or actually changing jobs.

Increased unemployment in the general labour market is likely to increase nurse willingness to work longer hours to bolster their own/family income. Falling unemployment would have the opposite effect.

**4.3 Nurses moving between employment categories (AV9)**

**4.3.1 Literature review**

We define turnover in the nurse labour market as a nurse changing from one nursing job to another. The new job could be in a different location, setting, grade or role. A comprehensive review of the literature on nurse turnover by (Hayes, et al., 2006) found that job dissatisfaction is consistently reported as impacting on nurse turnover. Nurse workload, management style, empowerment and autonomy of nurse jobs, promotional opportunities and work schedules contribute to turnover, job satisfaction and long-term retention.

A more recent systematic review of studies of nurse turnover in adult nursing (Halter, et al., 2017) found the quality of the studies was moderate, ‘leading to a rather

disjointed body of evidence in which the outcome of actual turnover as opposed to intention to leave is poorly addressed’.

The most strongly supported determinants of turnover in the literature reviewed by Halter were at the individual level: stress and burnout, and job dissatisfaction. Supervisor support was the most important determinant for retention.

Findings relating to the impact of remuneration on turnover are varied, and there is little evidence that alternative employment opportunities (the ‘pull’ of the general labour market) are a determinant of nurse turnover (Hayes, et al., 2006) as opposed to (the ‘push’ of) dissatisfaction with the current job.

The most useful study reviewed is *Adult nurse turnover and retention: South London project report* (Drennan, et al., 2015). This combines a review of the literature with some analysis of actual NHS nurse turnover data in London and interviews with staff.

Like Halter and Hayes, Drennan found large numbers of reviews of the determinants and consequences of adult nurse turnover, and interventions to reduce it. But Drennan also states that the vast majority of the studies were of moderate or low quality.

Drennan examined electronic staff record (ESR) data on reasons for leaving and classified the reasons as either ‘happy’ (such as promotion) or unhappy (such as work-life balance). There were 5,589 ‘happy’ respondents out of 12,668 (44%), 2,578 ‘unhappy’ (20%) and 4,501 who could not be classified. The ‘unhappy reasons’ sometimes defined as churn, could in theory be avoided or reduced, but Drennan found few programmes within organisations to reduce it despite its recognised high cost.

Drennan interviewed trust managers, and nurse managers and nurses, to obtain their view of the reasons for turnover.

Trust management were unanimous that the overarching cause for higher rates of turnover was the increased demand for adult nurses in hospital trusts in London and England: ‘Nurses have many choices in what job they do and where they work at the moment.’ They cited the ‘vicious cycle’ or downward spiral of vacancies impacting on retention by ramping up workload, as per the David Ulph model. When asked what they could do to reduce turnover they mentioned:

- progressing a nursing career and movement across the different types of nursing work
- the work environment.

Adult nurses and their immediate ward managers reported that there were positive and negative reasons why nurses leave their jobs. The positive reasons included to gain more experience, more development, more money, promotion and/or live in a more affordable setting. They suggested trusts could offer some of the experience and development from within their organisations.

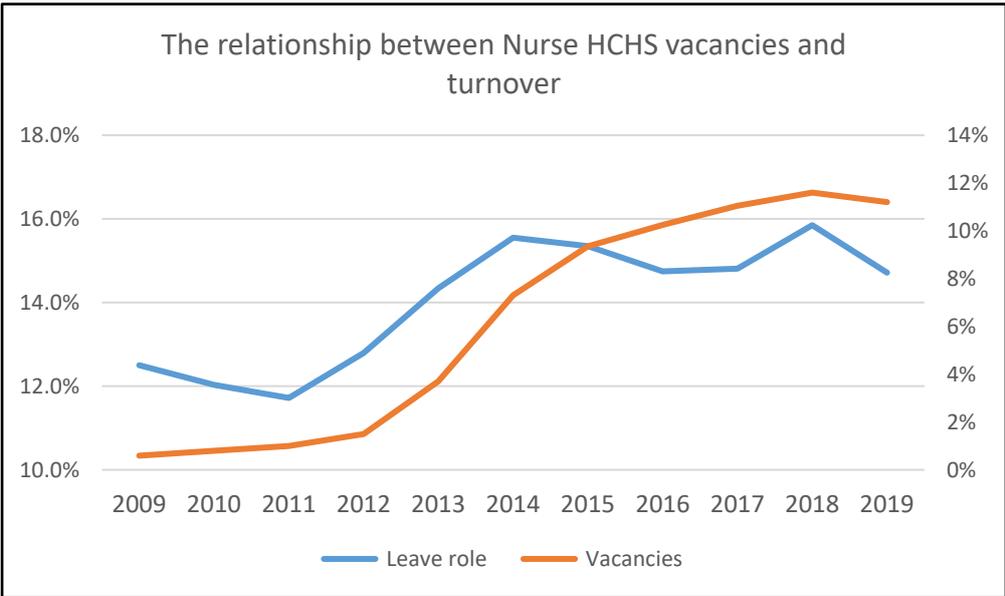
The negative reasons that made a job/setting less attractive overlapped with trust managers’ thinking, but also included the build-up of these factors over time eventually pushing nurses from their posts. They offered potential solutions:

- higher remuneration
- more supportive management practices
- mitigating the impact of nurse vacancies
- more flexible working patterns.

**4.3.2 Available data**

The Drennan study was in 2013, when the increased demand for nurses was beginning to drive higher turnover in south London NHS Trusts. Figure 4-6 shows the number of nurses who leave their role from NHS Digital data rising in line with vacancy rate and quickly plateauing at around 15%. This reflects the fact that there are more opportunities but also more stresses with fewer nurses resulting in higher workload that leads to turnover.

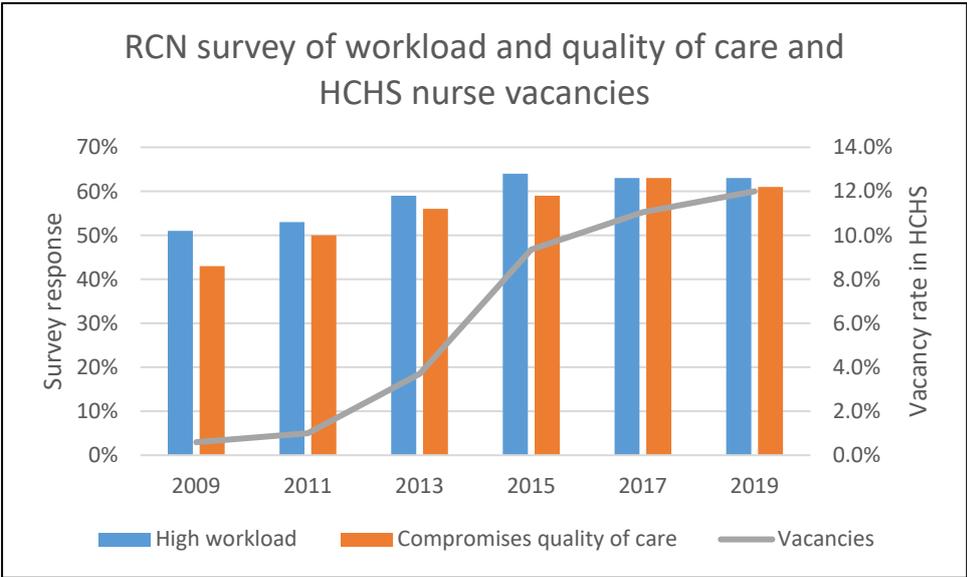
**Figure 4-6: Nurse HCHS vacancy and turnover**



**Source:** NHS Digital for % of nurses leaving their role in the HCHS.  
**Note:** Vacancy data combine official NHS vacancies, as % of establishment 2004/05 to 2010/11, imputed figures for 2011/12 to 2014/15 (derived from analysis of ‘NHS Professionals’ temporary nursing hours requested); ‘experimental’ vacancy data from NHS Jobs 2015/16 to 2016/17, published by NHS Digital; and NHS Improvement figures published by NHS Digital from 2017–18.

Nurses’ assessment of workload and inability to provide the quality of care they aspire to deliver has been on an upward trend since 2009.

**Figure 4-7: Nurse self-reported view of workload and quality of care plotted alongside nurse vacancies**

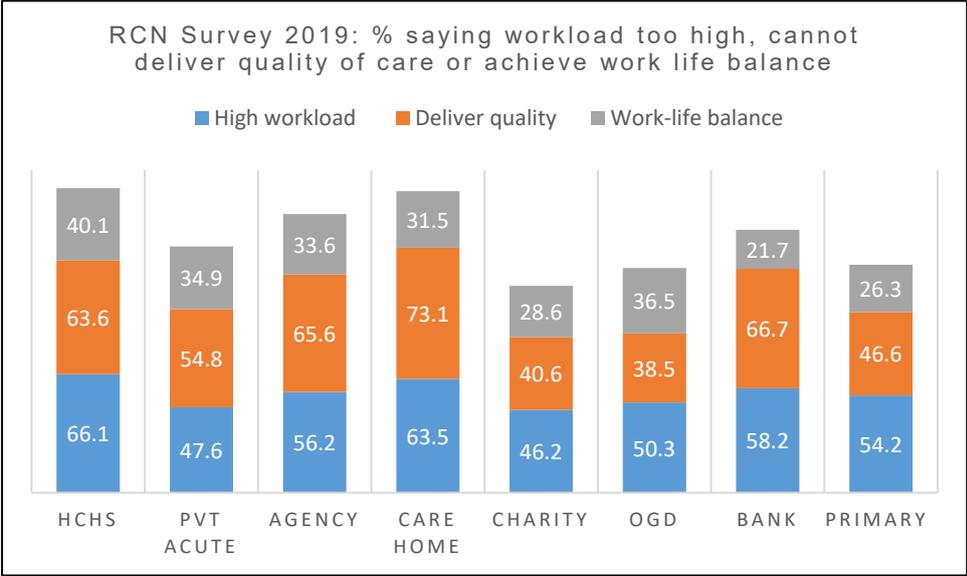


**Source:** Vacancy data as previous. Workload and quality of care data from RCN nurse survey

Self-assessed workload pressure and compromises to quality of care are known to drive job dissatisfaction and turnover as nurses seek to find a job with less work pressure.

The nurse labour market offers many different opportunities in different sectors and they, in turn, have different self-assessed average scores on workload, quality of care and work-life balance.

**Figure 4-8: Different aspects of a nurse job in different sectors**



**Source:** Workload and quality of care from RCN nurse survey, 2019

From the RCN staff survey data for 2019 we see that the HCHS and nursing home jobs have the highest self-reported workload, difficulties in delivering good quality care and poor work-life balance. Working for charities and other government departments have the lowest self-reported values for these aspects. Unless the pay and earnings opportunities in the different sectors fully compensate for these variations, vacancies will be high and persistent in some sectors and within particularly challenged organisations.

## 5 Evidence synthesis and linking to the nurse supply model conceptual framework

**This section summarises the evidence on the measurable economic factors that drive nurse supply. The factors have been summarised to 13 separate factors and related to the NSM conceptual framework. Finally, each of the factors has been scored according to its impact on nurse supply and the extent of the evidence associated with this impact.**

Sections 3 and 4 have reviewed the economic factors that affect nurse supply, focusing on the education and labour markets respectively. The research has revealed that the identified factors may affect the nurse supply system in multiple ways at the same time. For example, nurse pay may affect the desirability of undertaking a nursing degree and also whether an employed nurse leaves the nursing workforce and/or works longer hours. Sections 3 and 4 also demonstrate that there is a lack of evidence to support quantifying the extent of the impact for each factor.

This section synthesises the evidence reported in Sections 3 and 4 through:

1. Combining the identified factors into a set of 13 named factors, including potential proxy measures.
2. Undertaking an assessment of the extent of the evidence base associated with their effect on the adjustment variables in the NSM conceptual framework.
3. Undertaking a qualitative assessment of the potential impact of each named factor on the adjustment variables.
4. Updating the NSM conceptual framework to include the identified factors and the potential impact.

This analysis supports the twin aims of this report, which are to provide information and insights that can be used to support the specification of potential scenarios and inform parameter ranges for the NSM and to identify those areas where there is a lack of evidence and further research is required.

### 5.1 Combining, naming and measurement of economic factors

Sections 3 and 4 identified a series of economic factors that impact on nurse supply. These factors have been combined into a set of separate high-level factors. These have been compared with previous factor analysis carried out with the wider stakeholder community (DAS, 2020). Table 5-1 names and defines each of these high-level factors and suggests a measure or proxy for each.

**Table 5-1: Economic factors**

<i>Factor ID</i>	<i>Type</i>	<i>Short name</i>	<i>Description</i>	<i>Measure/proxy</i>
F1	£	<b>Cost of undertaking a nursing degree</b>	Cost of undertaking a nursing degree. Incorporates elements such as tuition fees, living expenses, opportunity costs less bursary or other support.	Discounted tuition plus loans, interest, less bursary
F2	Non £	<b>Awareness of difficulty of a nursing degree</b>	The level of understanding that undergraduates have of the difficulties, stresses and strains associated with undertaking a nursing degree.	Applicants/ Acceptances
F3	Non £	<b>Awareness of workplace expectations</b>	Perceptions and awareness of nurses' role/responsibilities. This will be revealed to students during their studies, especially placements.	Applicants/ Acceptances
F4	Non £	<b>Nurse education quality and effectiveness</b>	Quality and effectiveness of nurse education, including effectiveness of teaching and institution, preceptorship *and placements.	Change in acceptances
F5	Non £	<b>Quality of degree students</b>	Quality and commitment of students undertaking a nursing degree.	Applicants/ Acceptances
F6	£	<b>Nurse pay awards</b>	Nurse pay is set by the NHS Pay Review Body. Most sectors follow this market setting rate. The impact of awards in the short term (1–5 years) can be modelled from short run pay elasticities.	% real terms pay award
F7	£	<b>Financial returns of working as a nurse</b>	Financial benefit of working as a nurse. Incorporates salary, remuneration other financial returns and difference between other comparable jobs.	Change in nurse earnings percentile rank
F8	Non £	<b>Nurse satisfaction</b>	Nurse satisfaction including workplace culture, development/training opportunities, management and preceptorship quality	Training spend, preceptor spend
F9	Non £	<b>Role flexibility</b>	Workplace flexibility and earnings opportunities, for example availability of overtime and shifts. Influence on shift patterns.	Nurse vacancies NHS I
F10	Non £	<b>Workload</b>	Workload associated with working as a nurse, which is a proxy for workplace stress. Can be deduced from the difference between calculated demand and supply.	Nurse vacancies NHS I
F11	£	<b>Cost of return to practice</b>	Cost of undertaking a return to practice course, including education costs and opportunity costs, length of course.	Full economic cost to student
F12	£	<b>Economic conditions</b>	Economic conditions in England including national employment rates. The value for this parameter goes up if economic conditions improve.	Unemployment or earnings growth
F13	£	<b>Nurse workforce supply gap</b>	Can be measured by NHS Improvement vacancy data for HCHS; also a good indicator for other sectors.	Nurse vacancies NHS I

\* The Nursing and Midwifery Council (NMC) defines a preceptorship as 'a period to guide and support all newly qualified practitioners to make the transition from student to develop their practice further'.

**Note:** £ = pecuniary factor; Non £ = non-pecuniary factor

**Source:** DAS analysis

## 5.2 The evidence base for the economic factors

Sections 3 and 4 demonstrate that each of the factors identified in Table 5-1 may impact on multiple adjustment variables within the NSM conceptual framework to a lesser or greater extent. It was also shown that the evidence required to quantify this impact is sparse.

Table 5-2 maps which factors influence which AVs and summarises the strength of the evidence for an effect as no evidence, low, medium or strong evidence. This is done on a scale from 0 to 3. A zero indicates no evidence was found as part of this study. A score of 1 indicates that evidence is relatively weak but aligns with economic theory and is plausible. A score of 2 signals there are multiple sources for an effect but without quantification, and a score of 3 indicates there are multiple sources including some quantification. N/A indicates that the economic factor is not expected to influence the AV.

Note also that the strength of evidence for an effect is not the same as the strength, or size of, the effect.

**Table 5-2: Strength of the evidence**

ID	Short name	AV1	AV2	AV3	AV7	AV8	AV9	AV10
		Start/apply to degree	Do not complete degree	Not become nurse after graduation	Stop working as a nurse	Restart working as a nurse	Change employment category	Headcount to FTE conversion
F1	Cost of undertaking a nursing degree	3	0	0	N/A	N/A	N/A	0
F2	Awareness of difficulty of a nursing degree	2	2	N/A	N/A	N/A	N/A	N/A
F3	Awareness of workplace expectations	0	1	0	1	N/A	1	0
F4	Nurse education quality and effectiveness	0	1	0	0	0	N/A	N/A
F5	Quality/commitment of degree students	N/A	1	1	0	N/A	0	0
F6a	Nurse pay awards	1	0	0	3	2	N/A	3
F6b	Financial returns of working as a nurse	2	0	0	3	2	N/A	3
F7	Nurse satisfaction	N/A	0	0	2	0	3	2
F8	Role flexibility	N/A	N/A	0	1	0	1	1
F9	Workload	N/A	N/A	0	2	N/A	3	2
F11	Cost of return to practice	N/A	N/A	N/A	N/A	2	N/A	N/A
F12	Economic conditions	3	1	0	2	2	1	2
F13	Nurse workforce supply gap	N/A	N/A	0	1	1	3	1

Source: DAS analysis

### 5.3 The impact of the economic factors on the adjustment variables

As stated previously the literature does not support the quantification of the impact of the factors on the AVs, however it is possible to undertake a qualitative assessment based on the available evidence. This helps to indicate which factors should be the focus for subsequent research. Table 5-3 scores each of the named factors on the AV in terms of the magnitude of the impact and the time it takes for the impact to manifest. The scoring criteria are as follows:

- **Direction:** The sign indicates the direction of the effect. A negative (-) means an increase in the factor will have a reducing effect on the AV. This is best understood by looking at F1, the cost of undertaking a nurse degree. The sign on AV1 is negative because increasing F1 will reduce applicants and acceptances to study nursing. The impact of F1 on AV2 is also negative, but as AV2 is expressed as 'do not complete degree' this means more undergraduates will complete the course.
- Where direction of the effect is uncertain the sign is replaced with a '?'. Note the effect of many factors on AV10 is uncertain. Higher pay could lead to more or fewer hours supplied per working nurse.
- **Magnitude:** The size of the effect is also assessed using a 1–3 scale. Note the assessment of the effects is informed by the extent of the available evidence but remains largely subjective. The scaling is also best thought of as 'relative' by row and column. For example, the cost of a nurse degree (F1) has a major effect on the number of applicants to a nurse degree (AV1) but will have less of an effect on attrition (AV2). It also has a bigger and more immediate effect on AV1 than does the financial returns of working as a nurse (F7).
- **Time:** **I** for immediate and **L** for lagged. Immediate would be in-year or next year. Lagged would be growing awareness over perhaps 3 years so the effect would build up over that time.

**Table 5-3: Impact of economic factors on the adjustment variables (1 = high impact, 2 = medium impact, 3 = low impact, + and - signs represent direction of change)**

INDIRECT FACTORS INFLUENCING NURSE SUPPLY	ID	Short name	AV1		AV2		AV3		AV7		AV8		AV9		AV10	
			Start/apply to degree		Do not complete degree		Not become nurse after graduation		Stop working as a nurse		Restart working as a nurse		Change employment category		Headcount to FTE conversion	
			magn	time	magn	time	magn	time	magn	time	magn	time	magn	time	magn	time
F1	Cost of undertaking a nursing degree	-3	In yr	-1	Lag	-1	Lag	-1	Lag	0		0		0		
F2	Awareness of difficulty of a nursing degree	-1	In yr	-1	Lag	0		0		0		0		0		
F3	Awareness of workplace expectations	0		-2	Lag	-1	Lag	0		0		0		0		
F4	Nurse education quality and effectiveness	0		-1	In yr	-1	In yr	-1	Lag	0		-1	Lag	0		
F5	Quality and commitment of degree students	0		-1	Lag	-1	In yr	0		0		0		0		
F6	Nurse pay awards	1	Lag	0		-1	In yr	-1	In yr	1	In yr	0		?	In yr	
F7	Financial returns of working as a nurse	2	Lag	-1	Lag	-1	Lag	-1	Lag	1	Lag	0		?	Lag	
F8	Nurse satisfaction	1	Lag	0		0		-2	Lag	1	Lag	0		-1	Lag	
F9	Role flexibility	0		-1	In yr	-1	In yr	-1	Lag	1	Lag	0		?	Lag	
F10	Workload	0		0		0		2	Lag	-1	Lag	0		+1	Lag	
F11	Cost of return to practice	0		0		0		0		-1	Lag	0		0		
F12	Economic conditions	-2	In yr	-2	In yr	-2	In yr	+1	Lag	-1		0		1	In yr	
F13	Nurse workforce supply gap	1	Lag	-1	I	-1	In yr	-1	Lag	1		3	In yr	?	In yr	

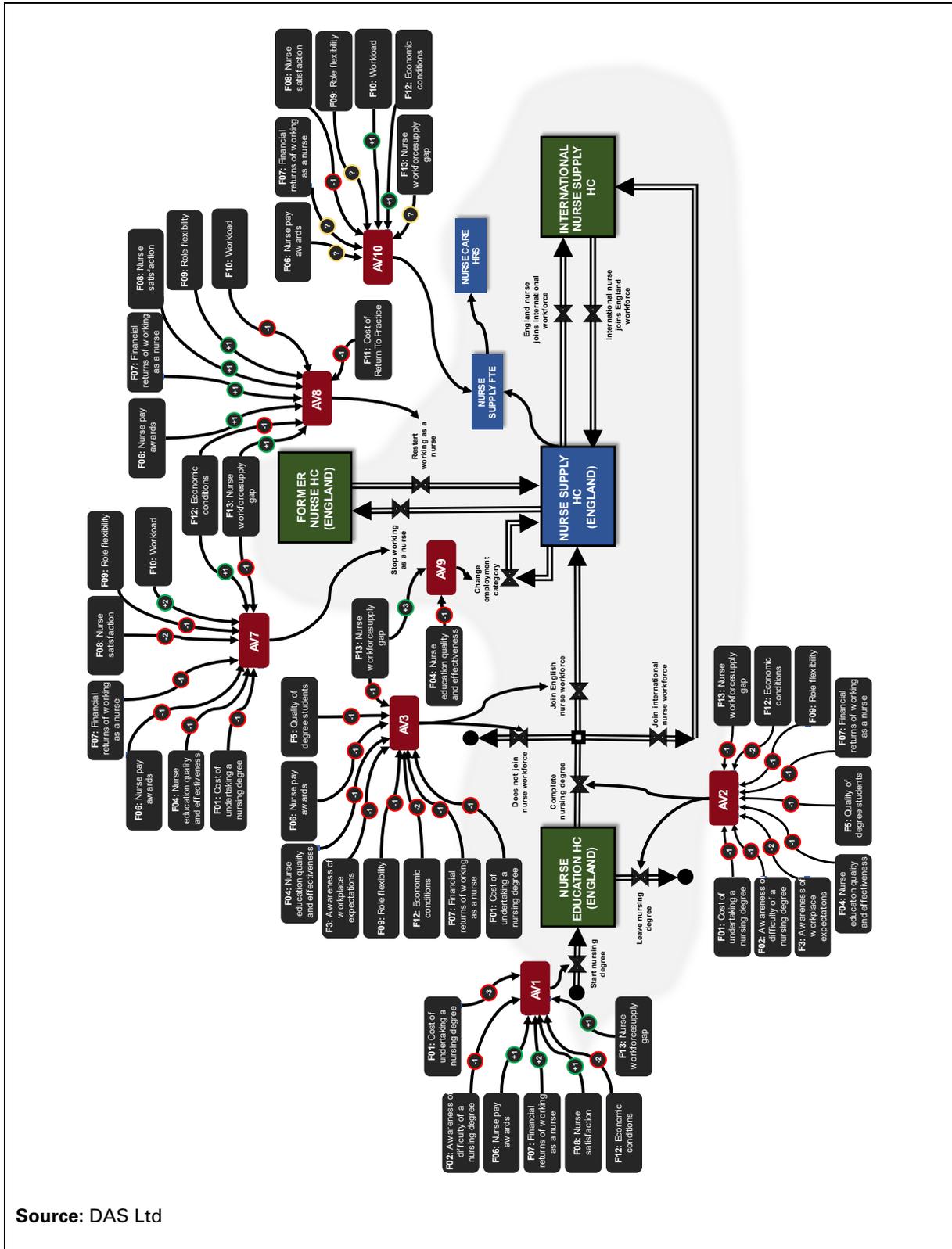
Note: The assessment of the effects is subjective and informed by the extent of the available evidence.

Source: DAS assessment.

## 5.4 Mapping the economic factors onto the NSM conceptual framework

Figure 5-1 updates the conceptual framework to include the economic factors and the potential magnitude of their impact on the AVs.

Figure 5-1: Integrating the factors into the conceptual model



## 6 Conclusions

**The research presented in this report reviews the available evidence for the impact of economic factors on domestic nurse supply, relates these factors to the NSM conceptual framework and makes a qualitative assessment of their impact on nurse supply in terms of direction, magnitude and lags. The research revealed that there is a lack of evidence to support quantification, and this section considers the priorities for future research and the outputs required from the research to support quantification in the NSM. The possible impact of international recruitment and the COVID-19 pandemic are also discussed briefly.**

Aside from pay elasticity and the clear evidence of an effect from the increase in the cost of studying for a nurse degree on the number of applicants, the evidence does not support any attempt at quantification. This is consistent with the findings of Ulph (2020). As such, there is a clear requirement for a research agenda that provides greater evidence so that effective policies can be better created, modelled and implemented. Section 5 assesses where the evidence is most sparse and based on the evidence that is available, which economic factors are likely to have most impact. This has been used to propose the most important areas for future research.

We can use the scores in Tables 5-2 and 5-3 to prioritize the areas for further research according to the strength of the evidence and scale of impacts. We adopt the simple procedure of dividing the magnitude of the impact by the available evidence score (putting zero or no evidence to = 0.5).

When we do this for each AV we find that the scores are highest for:

- stop working as a nurse (AV7)
- not become a nurse after graduation (AV3)
- restart working as a nurse (AV8), and
- not complete degree (AV2).

If we adopt a similar procedure for each factor, we find that economic conditions (F12), role flexibility (F9) and nurse workload (F10) score highest. These are all in the literature but with little quantification or even consistent definition. The next highest are the linked financial returns of working as a nurse (F7) and cost of undertaking a nursing degree (F1).

The single highest score for an interaction between a factor and an adjustment variable is the impact of workload (F10) on stop working as a nurse (AV7). This is complicated by the interaction of a nurse workforce supply gap (F13) and AV7.

A gap between demand and supply increases workload but also increases opportunities for nurses to move into new areas and increase earnings. There is no doubt a 'tipping point' in this individual cost-benefit calculation for each nurse:

- Should I continue working as a nurse because the financial rewards are high even though the workload is stretching?

- Should I stop working as a nurse because the workload is intolerable, even though the potential rewards and job opportunities are high?

This is the basic premise of David Ulph’s theoretical framework for understanding nurse participation (Ulph, 2020) and may be pertinent to the ‘Covid effect’ (see below).

## 6.1 Outstanding research questions on domestic supply pre-COVID-19 pandemic

We summarise our review of the evidence by listing questions and possible policy interventions for each AV in Tables 6-1 and 6-2.

**Table 6-1 Outstanding research questions and some policy interventions in the nurse education market**

	Research questions	Policy interventions
<b>AV1</b>	<p>Q1 How ‘competitive’ is entry to a nursing degree? Before 2017 the acceptance rate was below 40%. How many of the rejected applicants would have qualified and worked as nurses? When applications decline do HEIs lower the threshold?</p> <p>Q2 In 2017, 2018 and 2019, applicant numbers declined and acceptance rates increased. Did the quality of applicants rise or the threshold for acceptance fall?</p> <p>Q3 How much scrutiny do HEIs give to applicants’ motivations and knowledge of the realities of a nurse career. Is a lower acceptance rate likely to deliver lower attrition in training and longer working life as a nurse?</p> <p>Q4 What is a realistic target for the number of applications and acceptances in England? Could acceptances be increased to the levels in the devolved administrations?</p> <p>Q5 Is the higher number of applicants and acceptances in NI, Scotland and Wales related to higher status of nurses in these countries or is it linked to job security and relative nurse earnings?</p> <p>Q6 Similarly, is the low number of applicants in London and the south-east partly explained by more job opportunities outside nursing and higher wages in those regions?</p> <p>Q7 Is the number of nurse students accepted in 2020 sustainable on the supply side?</p> <p>Q8 It is often said that any shortage of nurses could be quickly resolved if more males could view it objectively as a professional career. Is it realistic to assume more males will train to become nurses in the next two decades?</p>	<ul style="list-style-type: none"> <li>• The cost of acquiring a nursing degree could be adjusted compared to other degree courses. Bursary could be offered with or without targeting and means test. Tuition could be subsidised especially for shortage fields.</li> <li>• Forgivable loans reduce costs while proving an incentive to work as a nurse in the NHS.</li> <li>• Raising realistic awareness of advantages and challenges of nurse career should reduce attrition even if it does not increase applicant numbers.</li> <li>• Expanding entry routes is already in train.</li> <li>• A long-term nurse pay policy that grew real earnings in line with the rest of the economy would give more planning certainty and avoid the bad publicity that comes from cyclical pay restraint and encourage more applicants.</li> </ul>
<b>AV2</b>	<p>Q1 Is a historic average of 13% attrition for nurse students from HESA data realistic?</p> <p>Q2 Is it possible to reduce attrition or is it a more or less fixed overhead of the system of selecting and then teaching and training students to be nurses?</p> <p>Q3 Is attrition high in all HEIs or concentrated in a few?</p>	<ul style="list-style-type: none"> <li>• Better selection of students, more weight given to relevant experience.</li> <li>• Reward low attrition at HEIs.</li> <li>• Change curriculum, fewer, higher quality clinical placements?</li> </ul>

	Research questions	Policy interventions
<b>AV3</b>	<p>Q1 Is the figure of 82% NQNs working for the NHS plausible?</p> <p>Q2 Are the figures for a further 14% of NQNS in employment working in social care and 'other health' realistic?</p> <p>Q3 How reliable and complete a picture is this? If 7% are not working and 4% are not working as a nurse, this would be an 11% deadweight loss to the system.</p>	<ul style="list-style-type: none"> <li>• Deadweight loss to the system, but little policymakers can do to prevent it.</li> <li>• Seeking repayment of any subsidised tuition/bursary would be an extreme intervention.</li> </ul>

Source: DAS analysis

**Table 6-2 Outstanding research questions and possible policy interventions nurse labour market.**

	Research questions	Policy interventions
<b>AV7</b>	<p>Q1 What is the expected ('average') working life of a male/female nurse who qualifies age N?</p> <p>Q2 What are the factors that affect that average that can be influenced by the Government and by individual employers?</p> <p>Q3 What is the role and effectiveness of preceptorship in helping NQNs transition into the workforce?</p> <p>Q4 Do we understand the countervailing forces operating on nurses' participation decisions when there is a static shortage? We would expect both workload and opportunities to be higher than in an 'equilibrium position'. What is the net effect and how stable is it?</p> <p>Q5 What is the 'loss' of nurse labour arising from maternity leave compared to other professions, ie how many nurses go on maternity leave planning to return but do not do so and drop off the register? How does this compare?</p> <p>Q6 What factors would encourage nurses with children to stay in the workforce?</p> <p>Q7 What is the reduction in nurse labour for the over 50s? Would more flexible roles and shift patterns encourage more to stay in nursing longer?</p> <p>Q8 What proportion of nurses who do retire, continue to do some work on the bank? How can this be increased?</p>	<ul style="list-style-type: none"> <li>• Nurse pay can be adjusted to improve retention, but it is very expensive to give all nurses a pay award.</li> <li>• Experienced nurses approaching retirement could be offered financial bonuses to work more years; less expensive than a general pay award, but of uncertain effect.</li> <li>• Alternatively older nurses could be offered more flexibility over their hours and shift patterns, but difficult to accommodate such flexibility during times of shortage.</li> <li>• Preceptorships give support to NQNs, but is there an evidence-based standard model that could be adopted?</li> </ul>
<b>AV8</b>	<p>Q1 Aside from maternity leave, do nurses take a career break? Eg not work as a nurse, but stay on the register, either through resuming work within 3 years or doing sufficient bank shifts to stay registered?</p>	<ul style="list-style-type: none"> <li>• Reducing the cost (length) of RTP courses.</li> <li>• Making them more tailored to individual circumstances, eg why</li> </ul>

	Research questions	Policy interventions
	Q2 For those who fall off the register, what proportion return via RTP by age and length of time off the register?	<p>did the nurse leave, what areas does he/she feel less confident about.</p> <ul style="list-style-type: none"> <li>• Could the RTP course be linked with a particular job or organisation and clinical placements be linked to that job or organisation?</li> </ul>
<b>AV9</b>	Q1 Can turnover be broken down into 'pull' (opportunities elsewhere) and 'push' components? Are some organisations/sectors finding it more difficult to retain staff and others attracting staff?	<ul style="list-style-type: none"> <li>• Organisations that struggle to retain staff could use some of their pay flexibilities to pay higher wages to stabilize the situation, but the higher wages would tend to get 'locked-in' to their baseline costs.</li> <li>• They could also offer non-pecuniary benefits.</li> <li>• In both cases the organisation might need financial support from the centre.</li> </ul>
<b>AV10</b>	<p>Q1 What factors, aside from personal characteristics, drive the level and pattern of P/T working?</p> <p>Q2 Over the long run of a nurse career, does flexibility of offer over hours give higher lifetime participation or lower?</p> <p>Q3 Even if flexibility gives higher participation overall, how implementable is greater flexibility in times of shortage?</p>	<ul style="list-style-type: none"> <li>• Shift patterns and total hours of work are known to be areas that concern working nurses, but difficult to envisage how greater flexibility can be offered at times of acute shortages.</li> </ul>

Source: DAS analysis

In terms of the research outputs they should be focused on producing parameters that can be readily included within the quantitative NSM. To support the representation of the impact of these factors the NSM includes a generic structure (described in Appendix B) that enables the impact to be calculated following parameterisation based on:

- Multiplicative impact that changes to factor has on the AV. The relationship between the change and impact can be represented as a non-linear curve.
- The time between change in the factor and the multiplicative impact.
- The form of the delay between change and impact.

## 6.2 International recruitment

This paper has focused on domestic supply. We know that the government target (Manifesto 2019) of 49,000 new nurses originally included 12,500 more from international recruitment (net of any outflow). The remainder would come from increased graduates and apprenticeships (18,000) and improved retention (18,500). The

government no doubt regards the target as the 'must do' and the various components as flexible. If international recruitment is used to make up the shortfall in other areas, the system needs to balance the size and duration of an increased intake from overseas with the steps it is taking on domestic supply.

As unlikely as it seems in current circumstances, if international recruitment is not effectively aligned with domestic planning, there may be surpluses in some areas of nursing in the medium term.

### **6.3 The impact of the COVID-19 pandemic**

As noted in a [previous publication](#) it is too early, and beyond the scope of this report, to make an assessment of the impact of the pandemic on the potential applicant pool for nursing.

It is notable that the UK, especially England, trains fewer nurses per thousand population than other high-income countries. This may be because relative pay is not as high (and the perception of nurse pay is probably lower still). Or it may be the case that, pre-pandemic, nursing was not seen as a high-status profession, with multiple senior and responsible roles.

The pandemic will have changed those perceptions and might as a consequence have increased positive awareness of nursing as a career among many who had previously discounted it. Or it may be that the pandemic simply triggered an emotional response and that the increase in applications will be short-lived.

Two leading indicators will be the level of attrition among the intake of 2020 and the numbers that take up offers in 2021.

# Appendix A: Economics literature recent studies of nurse pay elasticity

This note reviews the most recent academic literature on nurse pay elasticity\* to aid understanding of the potential impact of pay rate changes for nurses on their participation decisions. It proposes some baseline parameters for the impact of pay on the nurse supply model (NSM) and illustrates how this would work.

A previous joint review of literature by the Health Foundation and DAS concluded that:

- nurse labour supply is relatively inelastic to pay, at least in the short run, with an elasticity estimate of 0.3 on average
- non-pecuniary drivers of labour supply, such as job satisfaction, stress and workload, managerial and peer group support, the degree of autonomy, are important drivers of participation, but are difficult to measure and attach coefficients to
- nurse-specific characteristics such as age, gender, whether overseas trained, the number of children and spouse earnings will also impact on employment decisions.

This paper has reviewed nine recent studies, eight of which have attempted to estimate nurse pay elasticity of supply. They are summarised in Table A-1. The next section describes how they can be used to help parameterise the short and long run effects of pay in the NSM.

## Building the 'straw man'

To parameterise the nurse supply model for pay effects, we need to combine this empirical evidence with our knowledge of the nurse labour market and the data we have acquired from NHS Digital, Skills for Care, NMC etc.

## Simplified structure of the nurse labour market

The nurse labour market in England is complex and comprises different regions, different sectors, different fields of nursing and multiple competing organisations seeking to employ nurse labour.

It can be simplified however, by assuming the Hospital and Community Health Services (HCHS) sector of the NHS (which employs 75% of all nurses working as nurses) is the market leader. It sets the going pay rate via the AfC Pay Review Body

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\* Elasticity is the proportionate (%) change in the dependent variable divided by the proportionate change in the independent variable (at a given value of the independent variable). Pay elasticity is % increase in total hours of work over % change in pay. If greater than 1, it is elastic, if less than 1, inelastic.

and we assume all other sectors respond to this by adjusting their relative wages according to the different non-pecuniary advantages/disadvantage of that sector/job type.

If this assumption is correct, the impact of a Pay Review Body pay increase would not pull workers from other sectors but only impact on the existing stock of nurses working for the NHS or having recently left the NHS. (Note we do not assume zero flows between the sectors but just 'business as normal' churn between jobs and sectors as workers explore different opportunities and 'test the market'.)

### **Short run**

What then, would be the effect of a 1% pay rise in the HCHS in the year of its implementation?

- If we take the average of recent UK estimates of wage elasticity, we would expect baseline nurse participation, subject to ageing effects etc, to rise by 0.3% (in the range 0 to 0.5%).
- If we take the limited evidence of the split between participation and hours of work from the recent studies, we would expect participation to be the biggest driver, contributing 72% of the increase.

The impact of a 1% real terms pay rise would be to reduce leavers by 0.22 percentage points and increase average hours by 0.18%. For example, instead of 10% leaving annually we would expect 9.8% to leave; the average FTE/HC ratio would rise from 0.89 to 0.8915, from 33 hours to 33.06 hours.

### **How long would the boost to participation last?**

The impact on participation would not be instantaneous. The full effect would probably only be felt at the end of the 12 months. The question is what would happen in the following years if nothing else changed? Would participation fall back to the previous level?

The participation effect of this 1% standard of living increase or decrease should last into future years, so long as nurses' leisure vs income preference remains unchanged.

We propose that a 1% real terms pay increase is a short run effect that is felt in-year and sets the new baseline participation. Next year's participation will be affected by what happens to next year's real terms pay award.

Note, a real terms pay cut will increase the number of leavers and reduce average hours.

### **What about long run elasticity?**

Regular real terms increases of nurse pay in the NHS above the level of inflation could soon result in nursing becoming a higher paid profession relative to other jobs.

The baseline of nurse participation comprising average number of leavers and hours worked would ideally be calculated against a long run average of nurse wage relative to other occupations, say the upper quartile earnings for female workers.

A persistent move of nursing earnings above or below this level would result in existing nurses switching into or out of nurse employment and encourage more applications to qualify as a nurse. It is because, over a longer time frame, there is more time for supply to adjust and for the pool of qualified nurses to grow, that long run nurse supply is higher than in the short run.

If we assume each percentage point difference between nurse wage and say, upper quartile female earnings, will boost the nurse supply by 1% within 3 years we are assuming a neutral unitary elasticity of supply in the long run.

Author Title Journal Year	Country Data Years Data	Description of study, interesting findings	Quantified results on pay elasticity
<p>Barbara Eberth</p> <p>Pay or conditions? The role of workplace characteristics in nurses' labour supply</p> <p>EUR J HEALTH ECON</p> <p>2016</p> <p>(Eberth, Elliott, &amp; Skåtun, 2016)</p>	<p><b>UK</b></p> <p>2007–08</p> <p>Self-selected postal survey N = 2,549 n =1,473</p>	<p>The starting point of this study is that the rigid wage structures of the UK nursing profession (dominated by NHS terms and conditions) do not fully adjust to compensate for differences in job characteristics. (This has implications for where vacancies will emerge in times of nurse shortages.)</p> <p>The study therefore uses bespoke data collection to explore how non-pecuniary job and workplace characteristics impact on hours supplied in general and how they contribute to changes in the estimates of nurse pay elasticity. Their primary data collection allows them to explore the relevance of a wide range of job and worker characteristics in terms of modelling nurses' labour supply choices, emphasising non-pecuniary factors.</p> <p>Their model confirms previous studies that preferences around flexibility at work and promotion prospects, the number of children a nurse has and whether a nurse's partner earns significantly more, are all significant determinants of nurses' labour supply choices. Other interesting coefficients from their model are that ethnicity has a strong positive effect on total hours worked, as does working in a nursing home or a mental hospital.</p>	<p>The elasticity is expressed as total hours worked and three statistically significant figures are derived.</p> <p>Ignoring workplace and worker heterogeneity the elasticity of hours worked with respect to the own wage of 0.255.</p> <p>This rises to 0.357 when they account for non-pecuniary job aspects and to 0.364 when they add in worker heterogeneity.</p>
<p>Rowena Crawford</p> <p>The short run elasticity of</p>	<p><b>GB</b></p> <p>15 years of ASHE data are employed, 1997–98 to</p>	<p>Utilising the panel data aspect of the ASHE the paper investigates the short run responsiveness of National Health Service (NHS) nurses' labour supply to changes in wages of NHS nurses relative to wages in occupations taken by all those who were once qualified as a nurse.</p>	<p>The study found the short run responsiveness of NHS nurses' labour supply to the relative wage of NHS nurses is positive and statistically significant, albeit very small in regions outside the London</p>

Author Title Journal Year	Country Data Years Data	Description of study, interesting findings	Quantified results on pay elasticity
<p>National Health Service nurses' labour supply in Great Britain</p> <p>INSTITUTE FOR FISCAL STUDIES WP 15/04/ 2015</p> <p>(Institute for Fiscal Studies, 2015)</p>	<p>2011–12 (an individual panel data set of 1% of employees)</p> <p>N = There are 64,458 observations of potential NHS nurses, comprising 44,059 observations of NHS nurses and 20,399 (32%) observations of individuals not currently working in the NHS (arising from the repeated observation of 9,683 individuals)</p>	<p>The paper shows that across all regions of Great Britain (including London) the average pay (and hours worked by potential NHS nurses) is lower than the average pay (and hours worked by NHS nurses). This suggests that those who leave nursing do not do so for higher pay but for an alternative pay-hours-amenities package that better meets their preferences.</p> <p>This does not mean that pay is unimportant however, since it is the bundle of pay and non-pay attributes of different job opportunities that determine which job qualified nurses will take.</p> <p>Note that the low elasticity estimates outside London are short run 1-year effects. Over several years a sustained increase in nurse pay compared to comparator occupations would reduce the number of NHS nurses who leave in the first place and increase the number of individuals who want to train to become nurses.</p>	<p>area. Outside London the elasticity is 0.045. In London it is 10 times bigger at 0.5, suggesting that a 10% increase in wages would increase supply by 5%.</p> <p>Outside London, alternative options to working for the NHS are less attractive and the NHS is the dominant employer. The elasticity of nurses' labour supply to NHS pay is low. Conversely, where the outside options are more attractive (such as in London), a higher proportion of potential NHS nurses work outside the NHS and the elasticity of supply of nurses to the NHS is correspondingly greater.</p>
<p>McHugh &amp; Ma 2014</p> <p>Wage, Work Environment, and Staffing: Effects on Nurse Outcomes</p>	<p>Policy Politics and Nursing Practice</p> <p>Postal survey n=100,000 in 4 states with checks to ensure representativeness.</p>	<p>The survey collected information on individual nurses' demographic characteristics, work status, setting, role; alongside work environment, staffing, wage, job satisfaction and burnout. This allowed exploration of nurse work environments, staffing levels and wage rates on job dissatisfaction (an indicator of probability of leaving the post or leaving the profession) and burnout. Work environment, staffing levels and wages all had positive association with staff satisfaction.</p> <p>The significant association between more favourable nurse work environments and nurse outcomes, net of wage effects, implies that</p>	<p>The modelling on job satisfaction suggests that a one standard deviation change in either average wage or average staffing was associated with 9% lower odds of nurses reporting job dissatisfaction.</p> <p>The results related to burnout were similar to job dissatisfaction except there was no statistically significant</p>

Author Title Journal Year	Country Data Years Data	Description of study, interesting findings	Quantified results on pay elasticity
POLICY, POLITICS and NURSING PRACTICE  2014  (McHugh & Ma, 2014)	In 2006–07.	wages are important, but they do not account for the better outcomes associated with the work environment and nurse staffing. However, wages do little to compensate for the workload and staff conditions that lead to burnout.	relationship between wage and burnout, suggesting that higher wages could compensate for higher workload but had no compensatory effect against burnout.
Barbara Hanel  Nurses' labour supply elasticities: The importance of accounting for extensive margins  JOURNAL OF HEALTH ECONOMICS  2013  (Hanel, Kalb, & Scott, 2014)	Australia  (2001–2009) of the Household, Income and Labour Dynamics in Australia Survey  (4,933 observations of 788 individuals with a nursing qualification are available in HILDA across waves 1– 9)	<p>This study is significant because it models nursing qualification holders' labour supply in different occupations. They model the labour force participation decision, the occupational and shift-type choice, and the decision about hours worked. Results suggest that average wage elasticities might be higher than previous research has found due to the effect of wages on the decision to enter or exit the profession, not included in the previous literature.</p> <p>This is an important result and the authors highlight small sample size and measurement error in wages as reasons for caution but are confident that: 'while the magnitude of the point estimate may not be precise, it appears that the number of supplied working hours is fairly unresponsive to wages, yet the decision to enter the occupation, from non-employment or from other occupations, is far more responsive'.</p> <p>Perhaps a third reason for caution is the setting. It is possible that Australian labour markets are more dynamic than in England. It also appears that the number of qualified nurses either not working (21% of</p>	<p>The paper presents four separate elasticities.</p> <ul style="list-style-type: none"> <li>•First, if 'other income' increases fewer nurse hours are supplied. This is a very small effect, (&gt;0.1) and the majority arises from nurses stopping work, rather than reducing their hours.</li> <li>•Second, if wages from all employment increase 1% nurse hours increase by 0.24, but the impact of returns to nursing work increases this to 0.44.</li> <li>•Third, if nurse wages increase by 1% relative to other occupations hours of existing nurses increase by 0.24 but returns to nursing boost this effect to 1.35.</li> <li>•Finally, if non-nurse wages rise by 1% nurse hours fall by -0.93</li> </ul>

Author Title Journal Year	Country Data Years Data	Description of study, interesting findings	Quantified results on pay elasticity
		the sample) or working in another occupation (27%) represent a much larger pool of potential returners than in England.	(combined reduced hours and exit the profession).
<p>T Kankaanranta</p> <p>The labour supply of registered nurses in Finland: The effect of wages and working conditions</p> <p>EU JOURNAL OF HEALTH ECON</p> <p>2009</p> <p>(Kankaanranta &amp; Rissanen, 2009)</p>	<p>Finland</p> <p>Survey data 2005</p> <p>(N = 5,000; n = 1,486)</p>	<p>Male, retired and working outside nursing excluded from analysis. Main dependent variable was on hours worked (less than 1% of sample respondents used in analysis were not working).</p> <p>Many of the results from previous studies confirmed for Finnish nurses. Children and partner income has a negative effect on hours worked, higher qualifications and experience has positive effect.</p>	<p>The elasticity of hours worked was 0.48.</p> <p>The figure for participation was 0.01, but authors have reservations about this figure because of the very small number of nurses not working in their sample.</p>
<p>Diane Skåtun et al</p>	<p><b>UK</b></p> <p>1999–2000 Labour Force Survey, married women with nurse qualification</p>	<p>The need to ensure adequate numbers of nurses is a key requirement of the NHS Plan but it is unclear how effective wages are as an instrument to maintain or increase the nursing workforce, both in terms of absolute numbers and in the number of whole-time equivalents.</p>	<p>The own-wage elasticity of participation is positive and inelastic at 0.55.</p> <p>Partner wage and other income were found to have negative impact on</p>

Author Title Journal Year	Country Data Years Data	Description of study, interesting findings	Quantified results on pay elasticity
<p>The supply of qualified nurses: a classical model of labour supply</p> <p>APPLIED ECONOMICS</p> <p>2005</p> <p>(Skåtun, Antonazzo, Scott, &amp; Elliott, 2005)</p>	<p>N = 1,248. (1,043 [83%] working)</p>	<p>Data are from the Quarterly Labour Force Survey over the years 1999–2000.</p>	<p>participation as did the presence of children.</p> <p>There was a weak positive effect on hours of work, but analysis of a split private and public sector sample suggests that hours supplied are completely inelastic with respect to wages in the public sector.</p>
<p>JP Burkett</p> <p>The Labor Supply of Nurses and Nursing Assistants in the United States</p> <p>EASTERN ECONOMIC JOURNAL</p> <p>2005</p>	<p>USA</p> <p>1988–2002 national time series of employment and earnings</p>	<p>Examines reasons for current shortages of nurses and nursing assistants. These include monopsony wage setting, relative wage rigidity and incomplete contracts.</p> <p>Adopts a pragmatic and simple approach to estimating pay elasticity based on 15 years' data of employment and nurse wages compared to wages in the rest of the economy. This generates plausible short run elasticity for nurses that is consistent with previous studies.</p> <p>To produce an estimate of long run elasticity and generate a plausible range for both the short run and long run Burkett supplements the regression equation with supplementary evidence from economic theory and previous empirical studies.</p>	<p>The simple elasticity estimate in the short run is 0.59.</p> <p>Supplementary estimates for the short run elasticity are 0.65 with a 90% confidence interval that it lies in the range 0.2 to 1.2.</p> <p>The point estimate for long run elasticity is 1, with a 90% confidence interval of 0.25 to 3.3.</p>

Author Title Journal Year	Country Data Years Data	Description of study, interesting findings	Quantified results on pay elasticity
(Burkett, 2005)		These estimates are described as Bayesian and basically impose restrictions on the sign and magnitude of the coefficients in the equation.	
<p>Nigel Rice</p> <p>The labour supply of nurses in the UK: evidence from the British Household Panel Survey</p> <p>HEALTH ECONOMICS DATA GROUP – WORKING PAPER 05/10</p> <p>2005</p> <p>(Rice, 2005)</p>	<p><b>UK</b></p> <p>British Household Survey</p> <p>1991–99 Longitudinal (Panel, individual level)</p> <p>835 observations on 160 female nurses</p>	<p>Uses nine waves of data from the British Household Panel Survey which helps control for individual unobserved heterogeneity. Account is taken of the endogenous nature of wages by using 2-stage least squares. Nurses work shorter hours as they become older but to a diminishing degree, children imply fewer hours (younger children bigger effect). Spouse and other household income has negative effect on hours of work.</p>	<p>Elasticity in respect of hours from 2-SLS in range = 0.29 to 0.4.</p>
J Askildsen	Norway	Emphasises the complexity of nurse working arrangements, with different types of job, organisational setting and shift patterns.	10% increase in wages leads to 2% increase in hours = elasticity of 0.2.

Author Title Journal Year	Country Data Years Data	Description of study, interesting findings	Quantified results on pay elasticity
<p>Will increased wages reduce shortage of nurses? A panel data analysis of nurses' labour supply</p> <p>CESIFO WORKING PAPER NO. 794</p> <p>2002</p> <p>(Askildsen, Baltagi, &amp; Holmas, 2002)</p>	<p>1993–98 matched Longitudinal data</p> <p>(N = 19,638 individuals over five years, totalling 69,122 observations)</p>	<p>Individual and institutional features are statistically significant and important for working hours. Controlling for these effects, labour supply from existing stock of qualified nurses is relatively unresponsive to pay.</p> <p>Being married and having children significantly reduced the number of working hours, as did spouse and non-labour household income.</p> <p>Working hours were also found to be highest in psychiatric institutions and lowest for home nursing and nursing homes.</p>	<p>The robustness of the estimates was shown across a number of specifications: OLS, 2SLS, Fixed-effects and Fixed-effects 2SLS controlling for sample selection.</p>

# Appendix B: Representing the impact of factors on the adjustment variables in the NSM simulation engine

The nurse supply model (hereafter, NSM) is a quantitative simulation set within a conceptual framework that represents the nursing supply system. This conceptual framework is described in Section 2.2 of this technical paper. As previously described, the conceptual framework takes a broader view of the nursing supply system and includes variables that are not quantified within the simulation engine. This framework can be used as a tool to support scenario development and to set research agendas for quantifying relationships in the simulation engine.

The simulation model is composed of two key components, a projection engine and a data visualisation tool. The NSM projection engine produces projections of nurse supply for England with a time horizon of up to 5–20 years. The projection engine adopts the system dynamics approach and represents the training and workforce pathways and incorporates actionable and meaningful segmentation. The data visualisation tool enables the analysis and visualisation of the supply projections produced using the NSM projection engine.

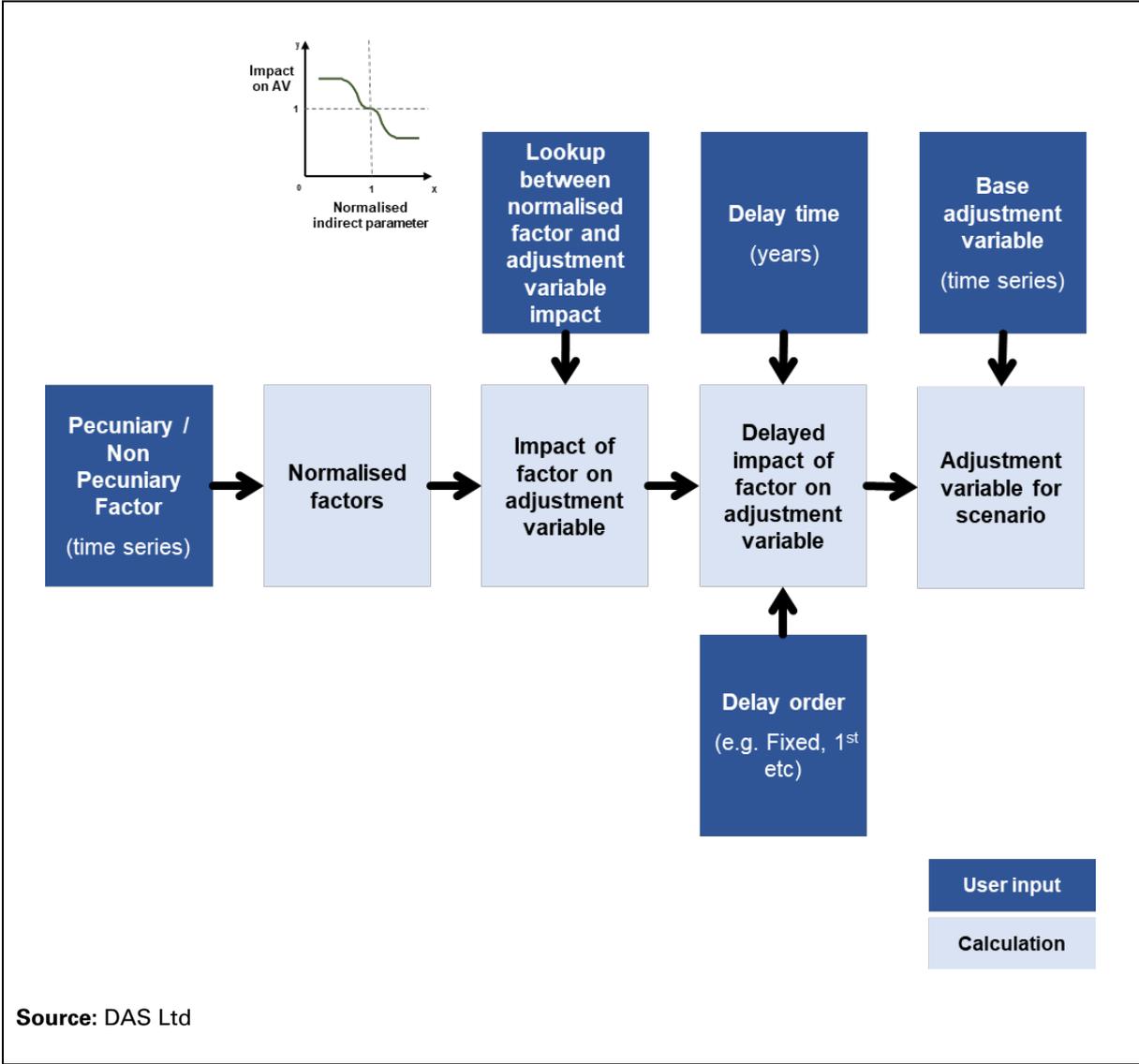
The projection engine has been developed using Vensim DSS.\* The model includes a generic calculation structure that allows the potential non-linear impact of the pecuniary and non-pecuniary factors on the adjustment variables to be parameterised. This structure provides a great deal of flexibility in terms of which adjustment variables are affected by each factor and the extent of the impact.

The calculation structure is as follows. Each of the 13 identified high-level factors (see Section 5) can be entered as a user defined time series. These time series are then normalised from the start of the simulation (ie they have a value of 1 at Time = 0). The user is also able to define the impact that the normalised time series has on any of the 11 identified adjustment variables (see Section 2). Each relationship is defined using a Lookup that relates the value of the normalised variable to a multiplicative change to the adjustment variable. This enables non-linear and positive and negative impacts to be specified. A user defined delay is then applied to determine when the impact occurs. This generic structure is summarised in the diagram below.

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\* <https://vensim.com/>

**Figure B-1: Generic structure used to represent impact of factors on the adjustment variables**



This generic structure provides a large degree of flexibility in terms of defining how the various factors impact upon the model adjustment parameters.

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## About the Health Foundation

The Health Foundation is an independent charity committed to bringing about better health and health care for people in the UK.

Our aim is a healthier population, supported by high quality health care that can be equitably accessed. We learn what works to make people's lives healthier and improve the health care system. From giving grants to those working at the front line to carrying out research and policy analysis, we shine a light on how to make successful change happen.

We make links between the knowledge we gain from working with those delivering health and health care and our research and analysis. Our aspiration is to create a virtuous circle, using what we know works on the ground to inform effective policymaking and vice versa.

We believe good health and health care are key to a flourishing society. Through sharing what we learn, collaborating with others and building people's skills and knowledge, we aim to make a difference and contribute to a healthier population.

**The Health Foundation**  
8 Salisbury Square, London, EC4Y 8AP  
+44 (0)20 7257 8000  
e [info@health.org.uk](mailto:info@health.org.uk)  
🐦 [@HealthFdn](https://twitter.com/HealthFdn)  
[www.health.org.uk](http://www.health.org.uk)