


# BMJ Open What might make nurses stay? A protocol for discrete choice experiments to understand NHS nurses' preferences at early-career and late-career stages

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**To cite:** Ejebu O-Z, Turnbull J, Atherton I, *et al.* What might make nurses stay? A protocol for discrete choice experiments to understand NHS nurses' preferences at early-career and late-career stages. *BMJ Open* 2024;**14**:e075066. doi:10.1136/bmjopen-2023-075066

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2023-075066>).

Received 26 April 2023  
Accepted 28 November 2023



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## ABSTRACT

**Introduction** Like many countries, England has a national shortage of registered nurses. Employers strive to retain existing staff, to ease supply pressures. Disproportionate numbers of nurses leave the National Health Services (NHS) both early in their careers, and later, as they near retirement age. Research is needed to understand the job preferences of early-career and late-career nurses working in the NHS, so tailored policies can be developed to better retain these two groups.

**Methods and analysis** We will collect job preference data for early-career and late-career NHS nurses, respectively using two separate discrete choice experiments (DCEs). Findings from the literature, focus groups, academic experts and stakeholder discussions will be used to identify and select the DCE attributes (ie, job features) and levels. We will generate an orthogonal, fractional factorial design using the experimental software Ngene. The DCEs will be administered through online surveys distributed by the regulator Nursing and Midwifery Council. For each group, we expect to achieve a final sample of 2500 registered NHS nurses working in England. For early-career nurses, eligible participants will be registered nurses who graduated in the preceding 5 years (ie, 2019–2023). Eligible participants for the late-career survey will be registered nurses aged 55 years and above. We will use conditional and mixed logit models to analyse the data. Specifically, study 1 will estimate the job preferences of early-career nurses and the possible trade-offs. Study 2 will estimate the retirement preferences of late-career NHS nurses and the potential trade-offs.

**Ethics and dissemination** The research protocol was reviewed and approved by the host research organisation Ethics Committees Research Governance (University of Southampton, number 80610) (<https://www.southampton.ac.uk/about/governance/regulations-policies/policies/ethics>). The results will be disseminated via conference presentations, publications in peer-reviewed journals and annual reports to key stakeholders, the Department of Health and Social Care, and NHS England/Improvement retention leaders.

**Registration details** Registration on OSF <http://doi.org/10.17605/OSF.IO/RDN9G>.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ To the best of our knowledge, these studies are the first discrete choice experiments (DCEs) that will estimate the job and retirement preferences of early-career and late-career National Health Services (NHS) nurses in England.
- ⇒ The sample will be large and representative of the nurse population as it will be drawn from the Nursing and Midwifery Council—the sole independent regulator for nurses (and midwives) in the UK—making it a more comprehensive source of data than a professional body, trade union or set of employers.
- ⇒ For each study, we will use a combination of literature searches, qualitative data collection, academic experts and stakeholder consultation to identify the relevant DCE attributes and levels.
- ⇒ Some important attributes may be excluded if they are not actionable and capable of being traded.
- ⇒ Nurses who have left the NHS will not be included in these studies, which may bias the results toward the 'stayers'.

## INTRODUCTION

Shortages of nurses is a global problem projected to worsen until at least 2030.<sup>1 2</sup> Having too few registered nurses on duty can have a detrimental impact on the quality of care and patient outcomes.<sup>3 4</sup> The COVID-19 pandemic also highlighted the limitation of the National Health Services (NHS) in providing high-quality patient care due to the lack of registered nurses. Covering roster gaps with temporary staff and replacing staff who leave is costly; it is estimated that losing and replacing a nurse, costs between 0.31 and 1.3 times the annual salary of a nurse.<sup>5</sup> As an example, a large acute NHS trust with more than 3000 nurses and a typical turnover rate of 10%–12% would need to recruit 300 nurses yearly. The replacement cost of a fully trained nurse has been estimated at up to £12 000 by



NHS Workforce Analytics, this corresponds to £3.6 million every year.<sup>6</sup> In England, it was reported that 40 365 (11.5%) registered nurses left the NHS in 2022.<sup>7</sup>

Two groups are of particular concern to the NHS—nurses leaving in the first few years of their careers (early-career), and experienced nurses over the age of 55 or with at least 20 years of service (late-career) leaving before retirement.<sup>8–10</sup> Nurses towards the later stages of their careers are important given their rich skills and ability to mentor less experienced staff, including early-career nurses who augment the labour supply. Added to this, there is potential for employers and policy changes to be made (eg, more flexible retirement, pension changes, offering alternative less burdensome roles, altered working hours) that might encourage nurses to extend their careers—so the opportunity is there. Early-career nurses are also key as their turnover rates are among the highest in the nursing workforce.<sup>11</sup> The loss of recently qualified nurses is significant—when they leave, it causes a gap not just in the current year, but a potential 30+ years of service is removed. Identifying what might help to retain both groups is therefore a policy and employer priority.

Defining career stage and what constitutes an early or late career is complex. A career can be viewed as an 'evolving sequence of a person's work experience over time'.<sup>12</sup> This definition accounts for individual differences in career journeys and acknowledges that a career is not always linear, one-directional and directly linked with age. 'Early-careerists' face particular challenges, especially regarding their entry and socialisation; which are important cycles influencing individuals' dis/engagement with their work environment.<sup>13</sup> Entry into a new (or first) work environment can be daunting and represent a major shock, as nurses need to quickly adapt.<sup>13</sup> Socialisation is key to supporting new starters to not only acquire proficiency in their job and role, but also to build relationships and learn the behaviours, power structure and norms of their work environment.<sup>14 15</sup> 'Later-careerists' also have particular challenges that are believed to influence choices, such as the need to create a better work-life balance.<sup>16</sup> A major milestone more directly related to age is the pension threshold, a key factor likely to influence career decisions for many people. However, for nurses, the age at which pensions can be accessed varies from 50 years (for some in the NHS with protected minimum pension age) through to 66 years for state pension entitlement (due to increase to 67 years between 2026 and 2028). From 2023, the picture is more complex with a new partial retirement option becoming available, which enables staff to partially retire or enable retirees to return to work (while claiming all or part of their pension, with the ability to work and build up more pension benefits).

For this research, we use a broader definition drawn from the literature where individuals are considered to be entering a later phase of their careers from the age of 55 years as this is nearer retirement age (compared with a definition based on people aged 45 years and

over).<sup>17 18</sup> Analysis of staff records from acute Trusts in England shows that older nurses, and those who have served over 20 years, are more likely to leave the NHS.<sup>8</sup> For early-career nurses, we will use the period of graduation (2019–2023), to represent those with less than 5 years of experience.

Before the pandemic, policymakers acknowledged that the significant shortfall of registered nurses relative to societal demand required urgent intervention.<sup>19–21</sup> As an example, in December 2019, the UK Government launched the 'N50k Programme', that is, plan to increase by 50 000 the total number of registered nurses working in NHS England by 2024. One of its workstreams focuses on reducing the outflow of current staff through improved retention.<sup>22</sup> Retaining early-career nurses could ease supply challenges, while extending the working lives of late-career nurses would enable the NHS to retain valuable skills and experience. Retaining staff is key as retention problems are cyclical: shortages create workload pressures which adversely affect staff, increase absence rates and lead to more staff leaving.<sup>23 24</sup> The knock-on effect of poor retention is a work environment that is less attractive to both current and potential staff. Improving retention is thus vital to enabling workforce growth; to stem the outward flow at the same time as increasing entrants into NHS nursing.

The factors leading to retention or turnover among early and late-career nurses are multi-faceted,<sup>25</sup> but many are within the control of employers. Employers can use job factors to improve the attractiveness of nursing jobs for current and prospective employees. In England, this is even more relevant since NHS nurse wages are relatively inflexible<sup>26 27</sup> and imperative since COVID-19 has exacerbated the pressure faced by nurses.<sup>28</sup> By taking into consideration the job preferences of early-career and late-career nurses, policymakers and employers can foster a work environment conducive to their retention.

### Retention factors among early-career nurses

Job satisfaction positively influences nurse retention.<sup>29 30</sup> The international evidence reveals that early-career nurses are more likely to stay in their profession when they benefit from preceptorship and/or mentorship at the beginning of their career,<sup>31–35</sup> when they are committed<sup>36 37</sup> and when they perceive a positive work environment,<sup>38 39</sup> including high-level of cohesion with the medical staff.<sup>36</sup> Tailored interventions to reduce transition shocks from student to nurse status<sup>40–42</sup> or to alleviate burnout<sup>43</sup> decrease the intention to leave among early-career nurses. Nurses also value authentic leadership,<sup>39 44</sup> opportunities for career advancement<sup>30 45</sup> and empowering decision-making in patient care.<sup>44–46</sup> Notably, few international studies reported wages as a pull factor for early-career nurses.<sup>47 48</sup> In contrast, job dissatisfaction<sup>49 50</sup> and poor working conditions,<sup>51 52</sup> including job stress<sup>37 53</sup> and a higher level of transition shocks<sup>40 54</sup> increase the intention to leave of early-career nurses. There is also evidence that the lack of team support,<sup>55</sup> lack of vocation<sup>55 56</sup> or

feeling of inadequacy<sup>52</sup> increase the turnover likelihood among early-career nurses. Recent international studies have also shown that male nurses report a higher level of intention to leave compared with female nurses.<sup>49 51 57</sup>

### Retention factors among late-career nurses

While there are complex reasons for nurse retirement decisions, many factors could be influenced by improved working conditions and opportunities. The UK literature suggests that nurses nearing retirement age are more inclined to stay if they can benefit from flexible working conditions, feel valued and are adequately remunerated.<sup>58</sup> In contrast, deteriorating health, job stress and desire to spend more time with family and friends are associated with attrition among late-career nurses.<sup>58</sup> The international evidence suggests that retaining late-career nurses is positively associated with having the opportunity to mentor less experienced staff,<sup>59 60</sup> receive support from colleagues and managers,<sup>25 60</sup> experience job satisfaction<sup>25 61</sup> and feel valued for their experience.<sup>62 63</sup> Adequate remuneration is also key to retaining late-career nurses<sup>59 60 62</sup> as in certain instances they are the main household provider.<sup>59 64</sup> Late-career nurses are more likely to stay beyond retirement if they can benefit from continuous professional development to keep up with technological advances.<sup>25 62</sup> They also highlighted the need to ergonomically redesign the workplace to save physical energy and prevent musculoskeletal injuries.<sup>62 65</sup> Late-career nurses expressed a desire to work after retirement for vocational and patient care reasons,<sup>59 60 62</sup> but highlighted the lack of information regarding this option in their workplace.<sup>58 59</sup>

### Knowledge gap and research contribution

While research to date has identified a range of factors associated with early-career and late-career nurse retention, these findings are largely drawn from the international literature.<sup>25 62 66</sup> There is still a knowledge gap which hampers the application of research to the NHS as evidence from England is scant.<sup>58 63</sup> Additionally, the relative importance of different factors in each group remains unclear. This study protocol aims to fill that knowledge gap. It focuses on the development and design of two discrete choice experiments (DCEs) to be conducted as part of the larger 'Evaluation of the N50k Programme'<sup>67</sup> study. This latter aims to evaluate the effectiveness of recruitment and retention initiatives deployed by the NHS to grow the nursing workforce in England by 50 000 registered nurses by 2024.<sup>68</sup>

We will use qualitative and economic methods applied in our previous research<sup>69 70</sup> to estimate the relative importance of the job and retirement factors influencing early-career and late-career nurses' decisions, respectively. DCE can be used to reveal such preferences. In a DCE, respondents are presented with a series of hypothetical job scenarios containing several attributes, each with different levels. Nurses then choose their preferred job package. Hence, the relative importance of pecuniary

and non-pecuniary job factors can be estimated. We will also estimate potential trade-offs to know whether/how to compensate them for less attractive job features. DCEs can quantify such trading behaviours.<sup>71 72</sup> This is important as nurses may engage in such trade-offs in their real jobs. The absence of trade-offs could also reflect nurses' preferences for the status quo.

Existing DCEs involving nurses have focused largely on developing countries.<sup>73</sup> The exceptions are four studies from Australia and the USA which have examined the job preferences of student nurses, nurses and midwives.<sup>48 74 75</sup> In England, to our knowledge no DCE has been conducted to inform on early and late-career NHS nurses' job preferences. By quantifying early-career and late-career nurses' job preferences, we will know which job factors are most valued by each respective group at different key career stages. Such results can help inform retention strategies for different groups by prioritising the most valued job factors.

### Aims

We will conduct two separate DCEs for each nurse group, that is, early and late-career nurses in the NHS. Specifically, study 1 will estimate the job preferences of NHS nurses at the early stage of their careers and the potential trade-offs. Study 2 will estimate the retirement preferences among late-career nurses and the potential trade-offs. Specifically, our studies will explore:

1. The factors contributing to the retention of early-career NHS nurses.
2. The relative importance of these factors and the potential trade-offs.
3. The factors that contribute to the retention of late-career nurses when approaching retirement.
4. The relative importance of these factors and the potential trade-offs.
5. For each nurse group, the preference heterogeneity will be accounted for and based on the nurses' circumstances (eg, age, biological sex, country of training or pension status for late-career nurses).

## METHODS AND ANALYSIS

### Overview of the DCE

Our studies will use both qualitative (focus groups and one-to-one interviews) and quantitative methods (ie, DCE) to understand career choices among early-career and late-career NHS nurses. A DCE is a survey technique enabling nurse preferences to be elicited by presenting them with alternative job package options.<sup>72 76</sup> The DCEs can also include job attributes not yet offered to allow modelling jobs responding to nurses' preferences. Nurses then choose their preferred job package. These choices stem from Lancaster's economic theory of value<sup>77</sup> and McFadden's extended work on random utility theory.<sup>78</sup> According to Lancaster, individuals derive utility (ie, satisfaction) not from a good but from its attributes and levels.<sup>77</sup> The random utility theory further asserts that

**Table 1** Search words for the literature on push-pull factors for early-career and late-career nurses

Early-career nurses	Late-career nurses
Early career nurse	Older nurse
Early career registered nurse	End of career nurse
Graduate nurse	Late career nurse
New nurse	Early retirement
Newly hired nurse	Recruitment
Newly graduated nurse	Retention
Newly registered nurse	Return to practice
Newly licensed registered nurse	Intent to stay
Newly employed nurse	Intention to leave
Entry-level nurse	Push and pull factors
Retention	Turnover
Intent to stay	
Intention to leave	
Recruitment	
Push and pull factors	
Turnover	

utility is an additive function composed of observable and unobservable random components, such as measurement errors and therefore overall utility is latent.<sup>78</sup> Therefore, DCEs inform on the relative importance of these attributes and the trade-offs operated.<sup>72 77 78</sup>

### Qualitative research to inform the DCE

A robust qualitative approach must precede the development of the DCEs to ensure they have a strong foundation and are reliable.<sup>72</sup>

We will conduct a literature review to generate a comprehensive list of factors that influence early-career and late-career nurses' career decisions, respectively. This will entail searching the medical databases CINAHL, Medline, PsycINFO, AMED and Scopus. For each group, we will search empirical papers exploring the push-pull factors associated with nurses' decisions to leave, stay or return to nursing. We will include qualitative, quantitative and mixed-methods papers, as well as meta-analyses and systematic reviews. Discussion or opinion papers will be excluded. For each group, we will use keywords enabling us to gather evidence on the factors influencing career decisions. For instance, for early-career nurses key words will include—but are not limited to—newly graduated nurse, early-career nurses, retention, turnover, intent to stay, etc (table 1). We will use Boolean operators 'AND' and 'OR' to combine or exclude keywords in the search, allowing for more focused and productive results.

We will also use the Index of Grey Literature<sup>79</sup> to identify key reports, including King's Fund, the Health Foundation, Nuffield Trust and the Royal College of Nursing. We will include peer-reviewed papers and policy reports on the successful strategies to retain these nurse groups, as well as papers exploring the push and pull factors among early-career and late-career nurses, respectively. English-published literature will be included (eg, papers in other languages excluded) and focus on publications in the last 10 years (2013–) to better capture current retention issues. Earlier literature may be less relevant to nurses' current context. The comprehensive list will

guide the development of the topic guides to be used in the semi-structured focus groups and interviews.

### Focus groups

Following established DCE practice,<sup>72 76</sup> we will use both qualitative and quantitative research methods to identify and select the attributes for each nurse group. These studies will provide new insights into research questions 1 and 3 by conducting an in-depth qualitative study with early-career and late-career nurses working across different settings (acute, community and mental health NHS Trusts in England). We will follow an exploratory qualitative design<sup>80</sup> where participants within each group will have common experiences (eg, preceptorship and/or mentoring support when starting a new job, patient care and workload, work after retirement), which should generate in-depth discussions about their work experience, barriers and facilitators to retain them. These studies also expand previous qualitative research on nurse retention in England<sup>81 82</sup> by recruiting early-career and late-career nurses (a) located in different geographic areas in England (including rural areas), (b) working in different departments/specialities, (c) and having a diverse sample (eg, age, biological sex, ethnicity).

For each nurse cohort (ie, early-career and late-career NHS nurses), we will use a purposive sampling approach<sup>83</sup> by conducting focus groups with a sample of the nurse population in England. We will use various recruitment channels, including advertising on social media (eg, Twitter), and inviting eligible nurses who participated in our nurse career survey (Summer 2023) and indicated willingness to be invited to take part in future research. Nurses expressing an interest in participating in the qualitative study will be invited to complete an 'Expression of Interest in Research Participation' form. Participants' responses will ensure they fulfil the basic inclusion criteria (as above), as well as ensure our sample has a good mix, with no obvious bias in terms of demographic and career profiles. We will use data from the Nursing and Midwifery Council (NMC) to identify the characteristics of the national population and enable us to ensure we have a broadly representative mix and mitigate potential recruitment bias. Ineligible participants will be thanked but declined, explaining that they do not meet the criteria for this particular study. Nurses willing to participate but not available to attend the focus groups will be offered the opportunity to participate in a one-to-one interview.

Each focus group will comprise four to six people and will not exceed 90 min. Recruitment will continue until the research team agrees that data saturation is reached, but it is anticipated that a sample size of up to 30 individuals is likely to be sufficiently large to reach data saturation, as well as explore the diversity of experiences and views across the range of participants.<sup>84 85</sup> For early-career nurses (study 1), eligible participants will be registered nurses aged 18 years or more who graduated no more than 5 years ago (ie, 2019–2023) and are currently practising in an NHS Trust in England. Eligible participants

for the second group (study 2) will be registered nurses aged 55 years and above and currently practising in an NHS Trust in England.

We will design topic guides to stimulate discussions about career decisions for each nurse group. Topics for early-career nurses will include the job factors they value, their experiences and motivations, and questions to understand the barriers and facilitators to their retention at the start of their careers. For instance, topics will relate to the role of preceptorship and/or mentorship at the beginning of their career, the relationships with their managers and colleagues, their perceptions of the work environment, staffing levels and equipment, as well as topics on patient care, working hours and remuneration. Topics for late-career nurses relate to their motivations, experiences, understanding and plans around retirement, and what factors/issues they consider. In addition, we will discuss the strategies that could incentivise them to delay retirement.

For each nurse cohort, the focus groups will be conducted online via Microsoft Teams. It is the most reliable Voice over Internet Protocol method in terms of data security and privacy according to the Research Integrity and Governance Team (University of Southampton). Participants do not need to download the Microsoft Team software but simply click on the invitation link. It also enables us to conduct focus groups that are not based on the same locality. Should some participants not be available for the focus groups, we will conduct one-to-one interviews. Participants in the focus groups (or interviews) will be thanked for their participation with a high-street voucher (£20).

They will be recorded, transcribed by the research team and then stored as deidentified documents. Data will be deidentified using identification numbers for the participants to ensure the confidentiality of nurses. Video recordings will be deleted immediately after the transcription. Data will be analysed thematically, drawing on Braun and Clarke's<sup>86</sup> approach and stages of analysis. Transcripts will be coded inductively, using the thematic qualitative analysis software NVivo to facilitate data management. A draft coding framework will be developed and revised involving members of the wider research team, as undertaken in

our previous research.<sup>69</sup> Themes will be identified and refined by grouping related codes and concepts together and using matrices/charts to explore and map comparisons and facilitate the analysis.

### Creating the choice tasks and developing the experimental design

For each nurse cohort, the DCE attributes will be informed by the findings from the literature review where the results will be incorporated into an overview table where potential attributes will be described. We will also use the results from the focus groups (and interviews), discussions with academic experts and key stakeholders, including the Department of Health and Social Care (DHSC) and NHS England/Improvement (NHSEI). Characteristics that are plausible, actionable and capable of being traded will be included as attributes.<sup>87 88</sup> We will not exceed 10 attributes<sup>89</sup> and limit the number of choice tasks to a maximum of 16–20 per participant to avoid respondents' cognitive fatigue.<sup>72 90</sup> Levels assigned to the attributes will be decided by a combination of relevant findings from the literature review and piloting of the DCEs.

Attributes will be quantitative (eg, reduction of working hours) and qualitative (eg, work intensity). The DCE will also include a salary attribute to estimate how much money should be offered to early-career nurses to compensate them for less preferred options. Similarly, we will include a 'year' attribute to estimate how many years late-career nurses are willing to trade for less preferred options. The alternatives will be generic (eg, job A or job B) to avoid influencing the respondents, while the attributes and levels will be context-specific to early-career and late-career nurses reducing the cognitive burden and suggesting realistic decisions<sup>72</sup> (see figure 1 and figure 2, for example of the DCE choice tasks).

Using the experimental design software Ngene,<sup>91</sup> we will identify the DCE choice tasks. The attributes and levels will be incorporated into scenarios in a statistically efficient experimental design, meeting the required criteria of orthogonality, level balance with minimum overlap and utility balance.<sup>90 92</sup> Level balance implies that the attribute's levels will appear the same number of times,

	Job A	Job B
Mentoring support	Not available	Readily available
Leadership	Manager not available, unresponsive	Manager easily available, responsive
Scheduling	Flexible	Assigned
Relationship with colleagues	Strong cohesion and frequent interaction	Weak cohesion and limited interaction
Career opportunities	Excellent opportunities	Limited opportunities
Salary	20% more than current annual salary	No change

Which job would you choose? Job A  Job B

**Figure 1** Example of a discrete choice experiment choice task for early-career nurses.

	Job A	Job B
Mentoring opportunities	Opportunities to mentor less experienced nurses	No opportunities to mentor less experienced nurses
Working hours	10% reduction in working hours	10% increase in working hours
Relationship with colleagues	Fragmented team with limited interaction	Cohesive team with regular interaction
Working environment	Adapted to late-career nurses' physiognomy	Not suitable for late-career nurses' physiognomy
Recognition from managers	Limited, infrequent recognition	Frequent recognition
Extra years	3 years	7 years

Which job would you choose? Job A  Job B

**Figure 2** Example of a discrete choice experiment choice task for late-career nurses.

and orthogonality entails that attributes will be independent of each other. The minimum overlap will ensure that any two alternatives will not have the same level, which enables to capture more implicit trade-offs. Finally, the utility balance will guarantee that alternatives within a choice task are of comparable appeal to the participants.

The full factorial design  $L^A$  with L levels and A attributes can provide the maximum number of combinations. However, the use of a fractional factorial design (ie, a subset of all possible combinations) will be more practical and reduce the number of choice tasks presented to each respondent, as well as the cognitive complexity.<sup>72 76</sup> In this latter, the DCE choice tasks will be blocked into several versions with an identical number of choice tasks that the respondent will receive only once. We will incorporate a repeated choice set to check for consistency and rationality,<sup>93</sup> but it will be excluded from the final analysis.<sup>72</sup> Each DCE survey will include sections that are relevant to the respective nurse group, such as working conditions, intention to leave, the role of mentorship, retirement intentions. Additional questions will be incorporated into each survey to collect demographic data.

The DCEs will be tested using a think-aloud approach during interviews with six to eight early-career and late-career nurses, respectively, conducted online or in person, as preferred by the participants. Then, a pilot phase will be conducted with selected nurses to refine the attributes and levels if necessary. These steps will be key to ensuring the questionnaires (including the DCE) are reliable, verify and reduce any cognitive burden the survey could generate. Nurses will be identified via the professional network of the research team<sup>94</sup> and/or the NMC.

### Sample size, recruitment channels and data management

We will use Louviere's formula accounting for the number of DCEs choice tasks, alternatives and levels to estimate the minimum sample size.<sup>95 96</sup> The NMC will send an invitation—on our behalf—to a random sample of at least 50 000 nurse registrants for each NHS nurse group. Estimating a minimum response rate of 5% (as confirmed in a 2023 survey administered by the NMC) will yield 2500 respondents in each group. (We have reached a similar response rate with our current cross-sectional survey on

employers' job offers and nurse retention.)<sup>97</sup> Using Qualtrics<sup>98</sup> (ie, comprehensive survey software), the DCEs will be administered as part of the more extensive questionnaires. The survey will be available for at least 8 weeks, during which the NMC will send at least three reminder emails to maximise the response rate. There will be no compensation to participants for their time in completing the survey. We will however offer 'thank you' vouchers to focus group participants (given the time commitment involved).

The DCEs and other survey data will be transferred into Stata<sup>99</sup> (or equivalent software) for analysis. We will prepare each dataset separately in the format required for the data analysis. The data preparation includes (but is not limited to) the creation of dummy variables, the verification of missing values and counting the number of responses per respondent.

### Theoretical model for the DCE, data analysis and results

We will provide descriptive statistics—including frequencies and central measures of tendency—to compare the respondents with the nurse population using the most recent data from the NMC.<sup>100</sup> Descriptive statistics and numerical summaries will be reported in tables and/or in narrative form.

As with our previous research,<sup>70</sup> we will use the random utility model, which is the theoretical basis for DCE data analysis.<sup>78</sup> Individuals choose the option with the highest utility (ie, preference) level. The utility of a given job, (ie, the dependent variable) is a combination of the deterministic and random components. The deterministic component corresponds to the observable job attributes, while the random component (ie, error term) corresponds to the individual-level variations in unobserved job attributes. Hence, we will estimate nurses' preferences based on the job package on offer. The effect of each characteristic on the probability of the job package being chosen is measured by the ratio of the alternative in relation to every other job choice on offer. It is a formula accounting for individuals' utility and the associated regression coefficients.

The conditional logit model will be used as a base model to estimate early-career and late-career nurses'

preferences. The coefficients will determine the importance of job attributes through statistical significance, direction and size of the estimated parameters. The direction of the coefficients will be used as internal validity to verify whether the results align with previous research findings. The salary and year attributes will be used to estimate the trade-offs early-career and late-career nurses make with the job attributes, respectively.

A mixed logit model will also be used to determine whether there is unobserved preference heterogeneity across each sample. The distribution of the random coefficients will be estimated with two parameters: the mean of the coefficients distribution and the SD which represents the distribution of individuals' coefficients relative to the average in the population. This SD indicates the extent to which preferences vary across individuals. The parameters will be estimated using a simulated maximum likelihood estimator, such as Halton draws. The mixed logit model also relaxes the independence of irrelevant alternatives property.<sup>76</sup> This property implies that the OR between the choice probabilities of two alternatives remains the same regardless of other alternatives. This property may be difficult to justify when some alternatives are more similar to each other than another (eg, choice between two jobs and an opt-out option measuring preferences for the status quo).<sup>75</sup>

We will summarise and explain the major findings, which will also be discussed in the context of England and international retention of early-career and late-career nurse retention, respectively. Research gaps and opportunities for further research will also be identified and summarised.

### Consultation with stakeholders in the nursing workforce

Throughout the study, we will engage with relevant stakeholders, including N50k Programme leaders, the DHSC and NHSEI, to contribute towards the interpretation of the results and the policy implications for nurse retention. We have already held a meeting in November 2022 to discuss the format and purpose of the DCEs and related surveys. We will also seek opportunities to disseminate our findings with other key stakeholders (eg, Unison, Royal College of Nursing, Advisory Research Groups) to optimise knowledge exchange and policy impact.

### Patient and public involvement

Patients and the public (including nurses currently practising) have been involved in the design and development of each study. We will continue to meet at different stages of each study to ensure patient and public involvement contribute to the research being conducted.

### ETHICS AND DISSEMINATION

The research protocol, including the consent form, participation information sheet, recruitment emails/advert and semi-structured forms for the focus groups/interviews were reviewed and approved by the host research

organisation Ethics Committees Research Governance (University of Southampton, number 80610). Approvals from the Integrated Research Application System and the Health Research Authority (HRA) will not be required as the research is not directly involving NHS Trusts (<https://www.hra.nhs.uk/approvals-amendments/what-approvals-do-i-need/hra-approval/>).

Participation will be based on informed consent. Participants will be informed of the voluntary nature of the focus groups/interviews and the online DCEs. They will be able to withdraw from the study at any time without providing a reason.

Results will be summarised and published in relevant peer-reviewed journals in the field of Health Economics or Health Services. Additionally, the results of each study will be communicated to the leaders of the N50k Programme through annual progress reports and a final report within 6 months after the completion of the overall study.

### DISCUSSION

To the best of our knowledge, our studies will be the first to design two separate DCEs analysing the preferences of early-career and late-career NHS nurses' job/retirement decisions in England.

A strength of the studies is that the identification of the relevant attributes will not only be based on the literature review, but it will incorporate the views and opinions of early and late-career nurses via the focus group and interviews, as well as academic experts and key stakeholders including leaders of the N50k Programme<sup>67</sup> and DHSC. However, the final list of attributes will account for the evidence from the literature review, the results from the focus groups (and interviews) and the recommended guidelines to find the optimal number of attributes.<sup>72</sup> Since only plausible, actionable and characteristics that have the capacity of being traded can be included, it is possible that attributes of high importance cannot be considered. The "think-aloud" sessions and piloting may indicate whether important attributes are missing.

Another strength is the recruitment channel for the survey which will allow us to recruit early-career and late-career nurses from the NMC, which is the only registration body for all nurses in the UK. To optimise the response rate, we will design an appealing, clear and concise survey not exceeding 20 min to complete. In addition, the understanding of the DCE will be tested during the think-aloud sessions. Since the NMC will be the gatekeeper, we will not be able to conduct a non-responder analysis. However, we will compare our sample to that of the nurse population using the most recent NMC data.<sup>100</sup>

We expect the results of each study to help inform retention strategies by (a) providing the relative importance of the factors influencing early-career nurses to stay in nursing and the possible trade-offs, and (b) eliciting the preferences of late-career nurses to delay their retirement decisions and possible trade-offs.

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**Contributors** Conceptualisation: OE and JB. Funding acquisition: JB, BP, IA, OE, JPh, AMR, JPr, MJ and MW. Methodology: OE, JT and JB. Project administration: OE and JB. Supervision: OE and JB. Writing – original draft: OE. Writing – review and editing: OE, JB, JT, IA, BP, JPh, AMR, JPr, LR, MJ and MW. All authors have reviewed, edited and approved the final version.

**Funding** This work is supported by the National Institute for Health and Care Research Policy Research Programme (NIHR-PRP) (grant number NIHR203842).

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

**Patient consent for publication** Not applicable.

**Provenance and peer review** Not commissioned; externally peer reviewed.

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