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Willingness to pay for improved working conditions of nurses: Results from a factorial survey experiment in Germany

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ABSTRACT

Background: Many countries face substantial shortages of skilled nurses. With an aging population and global demographic changes, developing a skilled workforce of nurses has become one of the central challenges for public health care. The recent COVID-19 pandemic has exacerbated labor shortages, which pose a threat to the quality of publicly provided health care. Improving nurses' working conditions could be a means by which to address the global shortages of nurses. However, in countries with public health care, such improvements may come with additional costs in the form of higher taxes or social security contributions. Therefore, such improvements partly depend on people's willingness to pay (WTP) for them.
Objective: In this paper, we investigate workers' willingness to pay for improvements in the working conditions of nurses.
Design: This study is a factorial survey experiment included as part of an online survey.
Setting(s): The factorial survey experiment was implemented within the high-frequency online panel survey "Life and Employment in Times of Corona" (IAB-HOPP) conducted by the Institute for Employment Research (Germany).
Participants: We analyze data from N = 2128 survey participants; our main analysis consists of N = 6384 responses from those participants.
Methods: Our research is based on a factorial survey experiment (vignette analysis) designed to quantitatively measure the willingness to pay for various improvements in the working conditions of nurses. We use random effect models and mixed models to estimate the individual-level willingness to pay for these improvements.
Results: Our results show that the survey participants are generally willing to pay for particular policies aimed at improving the working conditions of nurses. However, the amount that respondents are willing to pay varies with the type of policy changes. Survey participants exhibit a high willingness to pay for increases in minimum wages for nurses and wage-related improvements in general. We find, however, a lower willingness to pay for the right to participate in training courses aimed at reducing work-related stress.
Conclusions: The broad support for improvements in the working conditions of nurses provides policymakers with some guidance in implementing policy measures that might address labor shortages in the nursing sector.
Registration: There was no preregistration.
Tweetable abstract: Many people are willing to pay extra to improve the working conditions of nurses. Wage-related increases for nurses show the highest willingness to pay.
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What is already known

- There is a growing body of literature that investigates whether people are willing to pay for improvements in public health care, and, if so, how much.
- These studies mostly focus on who is generally willing to pay for improvements in the health care sector using cross-sectional survey data.
- The existing literature in this context usually abstracts from the question of how increased expenditures on public health services should be financed.

What this paper adds

- We analyze the willingness to pay for concrete policy proposals aimed at improving the working conditions of nurses based on a factorial survey experiment.

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- We ask people not only whether they support increases in government spending on health care in general, but also whether they are actually willing to contribute to different policy changes aimed at improving the working conditions of workers in the health care sector themselves.
- Our results show that survey participants' willingness to pay varies across the suggested policy measures.

1. Introduction

Countries worldwide face substantial shortages of skilled nurses (Drennan and Ross, 2019). This issue has been documented at least as far back as the end of World War II (Shields, 2004) and continues to be a topic of global relevance. With an aging population and global demographic changes, developing and sustaining a skilled workforce of nurses has become one of the central challenges for public health care in many countries (Marć et al., 2019). In addition, the recent COVID-19 pandemic may even exacerbate current and future shortages of skilled labor in the nursing profession (Turale and Nantsupawat, 2021). These shortages, in turn, may pose a threat to the quality of publicly provided health care, as an insufficient supply of qualified health personnel could threaten the effectiveness of public health systems (Buchan and Aiken, 2008).

Improving the working conditions of nurses can be one potential way to alleviate shortages in nursing occupations and may therefore improve the quality of public health care. However, improvements in working conditions usually imply increased costs. In countries with publicly funded health care systems, these costs are financed by taxes, social security contributions, or both. However, despite the great relevance of this question, there is little evidence on whether people are actually willing to pay for better public health care services in general (Gugushvili, 2022) and for improvements in the working conditions of health care workers in particular.

In this paper, we investigate whether people in Germany are willing to pay for better working conditions of licensed nurses, i.e., those with a three-year vocational training degree. We address this question by using a factorial survey experiment. The survey elicited participants' willingness to pay for different improvements related to nurses' minimum wages, nighttime surcharges, statutory holiday entitlement, guaranteed number of Sundays off-duty per year, and their ability to participate in work-related training.

The question of whether people are willing to pay for (and for which kind of) improvements is important, as this information offers policymakers concrete insights into whether people support potential policy changes and whether they are willing to pay for policy measures that the government can actively influence.

This topic is also relevant to other countries for several reasons. First, similar demographic developments are underway in many European countries, which raises the question of how to meet the future demand for health care services (see, for example, England and Azzopardi-Muscat, 2017). Second, the question of funding and allocating scarce resources is central to public health and closely linked to government spending in other areas (Robinson, 2016). Third, this relationship necessitates political considerations of who pays how much for what in health systems (Liaropoulos and Goranitis, 2015).

This paper relates to the literature that investigates whether people are willing to pay for improvements in public health care (Olsen and Donaldson, 1998; Habibov et al., 2017, 2018, 2019; Gugushvili, 2022). In contrast to earlier studies that focus on the general willingness to pay for improvements in the health care sector using cross-sectional survey data, we analyze the willingness to pay for specific policy proposals aimed at improving the working conditions of nurses based on a factorial survey experiment. In addition, we provide evidence on the actual amount that individuals are willing to pay for different types of policy changes.

Finally, this paper also relates to the literature concerned with support for government involvement in health care and public spending on health care services (see, for example, Blekesaune and Quadagno, 2003; Edlund, 2006; Wendt et al., 2010, 2014; Vilhjalmsson, 2016; Busemeyer, 2021). However, this literature usually abstracts from the question of how increased expenditures on public health services should be financed and instead focuses on the determinants of general support for government spending on public health services. By explicitly asking survey participants whether they are willing to spend more of their own income on improvements in the health care sector, we add to this literature. In addition, we ask people not only whether they support increases in government spending on health care in general but also whether they are actually willing to contribute to different policy changes aimed at improving the working conditions of workers in the health care sector themselves.

2. Data

To investigate the willingness to pay for improvements in public health care and social services, we used a factorial survey experiment (for an introduction, see Auspurg and Hinz, 2015). In our case, the factorial survey consisted of vignettes that respondents were asked to evaluate. Generally, vignettes describe hypothetical situations, people or objects. The essential characteristics of the scenarios (called 'factors' or 'dimensions') are varied randomly, as they would be in an experiment. This random variation in multiple dimensions allows researchers to identify the causal effects of these dimensions on respondents' answers (compared to the use of a reference situation and a reference respondent).

Vignettes have proven to be a suitable approach in various research contexts (for an overview, see, for example, Wallander, 2009; Treischl and Wolbring, 2022). Vignette analyses follow a similar logic as conjoint experiments that have been developed in psychology (Duncan and Tukey, 1964) and discrete-choice or stated-choice experiments that are quite popular in health economics or the sociology of health (De Bekker-Grob et al., 2012; Soekhai et al., 2019).

The factorial survey experiment was implemented in the ninth and last wave of the high-frequency online person panel survey called "Life and Employment in Times of Corona" (IAB-HOPP) conducted by the Institute for Employment Research (Institut für Arbeitsmarkt- und Berufsforschung, IAB) in Germany. Originally, the panel survey was established in May 2020 to collect data on the various impacts of the COVID-19 pandemic on different dimensions related to the labor market. For this purpose, a stratified random sample of individuals from German administrative labor market records (the so-called Integrated Employment Biographies or IEB) was drawn and asked to participate in the survey.

The survey consisted of both repeating core modules and wave-specific modules on special topics. In total, the panel survey consisted of nine waves, spanning from May 2020 to June, 2022. Participants were recruited in wave 1 and again in wave 5: In the first wave, a net sample of about 10,000 individuals was realized, in wave 5 about 7000 additional panelists were recruited to address panel attrition. For detailed information on the study design, see Haas et al. (2021). The factorial survey experiment on willingness to pay for health care belonged to the category of special modules. The field phase for wave 9 lasted from April 12, 2022 to June 6, 2022.

3. Measures and sample description

At the beginning of our survey module, the respondents were presented with a short introductory text. The text presented in italics below was also highlighted visually for the respondents:

> "Reforms in the health care system comprise […] an important point. Below, we briefly describe *three different proposals* that could be discussed in a similar way, in both politics and the public.

However, such reforms also entail costs in the form of higher taxes and/or social security contributions. Please indicate how much you would *personally be willing to pay additionally per month for the package of measures shown*. When doing so, bear in mind that such reforms are associated with the expectation that the quality of health care will improve, e.g., through better care or more skilled workers.These situations are *not* concerned with 'right' or 'wrong'. We are interested in your personal opinion. It is possible that the situations differ only slightly from each other. Nonetheless, we are interested in your assessments of all situations."

After the introduction, three different vignette texts were presented to each of the respondents. Each vignette combined numerous potential policy changes affecting the working conditions of nurses. An example is outlined below. Again, the text in italics was also highlighted for the respondents.

- The minimum wage for nurses with three years of training will be increased from €15.00 per hour to €18.25 per hour.
- The statutory holiday entitlement *will remain at 26 days* for nurses working a 5-day week.
- Unlike before, nurses will have a right to regular training on how to deal with stress during work.
- As before, a nurse will receive a nighttime surcharge of at least €3.50 per hour.
- In the future, nurses will have at least 18 Sundays off-duty per year instead of the previously allowed 15 Sundays.

The dimensions and levels are described in Table 1 below.

The vignette universe of the current study consisted of $3 * 3 * 2 * 3 * 3 = 162$ possible combinations of levels. We used a full-factorial design and all scenarios. We implemented complete randomization, with every dimension being independent of all other dimensions. Correlations between vignette dimensions are all very small and are not significantly different from zero.

One possible scenario contained no improvements at all. We presumed a willingness to pay of "zero" for this scenario; all other scenarios contain at least one improvement. The question presented for each scenario was as follows:

How much *more per month would you personally be willing to pay more than you are currently paying* for the following improvement in the health care system? Think of *an amount in euros* that you would be willing to pay in taxes or contributions to health and long-term care insurance.

After each scenario, the respondents were shown a response field in which they could enter any number between 0 and 99 euros.

Each respondent was shown three different vignettes. After considering the covariates and item nonresponses, the final sample for our analyses consists of n = 2128 respondents. Each of these persons rated three vignettes, resulting in n = 6384 observations available for descriptive results and multivariate estimations.

Table 2 summarizes the characteristics of the respondents participating in the factorial survey. Roughly 50 % of the participants were female. 50–64-year-old people constituted the largest age group (roughly 40 %), 65–80-year-old people constituted the smallest age group (just over 10 %). The vast majority of the sample was employed (84.5 %) and just under 12 % were not working at the time of the survey. The remainder of the participants were either in school or training (1.9 %), or unemployed (1.6 %). Almost 59 % of the participants had a bachelor's degree or higher and almost 37 % had an A-level degree or a vocational training degree. Roughly half of the participants had a household income of over 1500 euros per person, the other half less than 1500 euros per person. Table A1 in Appendix A provides a detailed description of all variables.

4. Statistical analysis

Due to the respondents rating three vignettes, the data have a multilevel structure, where observations (responses) are nested within individuals (respondents). We considered this hierarchical structure by estimating random and mixed-effects models. The statistical significance of the likelihood-ratio test indicated that random slope coefficients (also called random coefficients) should be added. Therefore, we additionally estimated mixed-effects models. We estimated all models using Stata 17.0.

In the main results section, we present three models: Model 1 only includes the vignette dimensions. Model 2 expands the baseline model by including respondents' individual characteristics. In Model 3, we further expanded the random-effects model by including random slopes for the variable minimum wage. We report robust standard errors for all models.

As the dependent variable for our multivariate analysis is the monthly amount (in euros) that respondents would be willing to pay, we can interpret the coefficients of our models as an absolute change in euros that is caused by the variation of levels within one dimension.

5. Results

A descriptive analysis of the data shows that, on average, the respondents were willing to spend an additional amount of 25.41 euros (median: 20.00 euros, standard deviation 25.8 euros) per month within the framework of the presented scenarios. This corresponds to approximately 0.6 % (median: 0.5 %) of the average gross

Table 1
Description of vignette dimensions and levels.

Dimension	Levels	# of levels
Minimum wage for licensed nurses with 3-year vocational training	*€15.00* as before Increase from €15.00 to *€18.50* Increase from €15.00 to *€20.00*	3
Statutory holiday entitlement	*26 days* as before Increase from 26 days to *27 days* Increase from 26 days to *29 days*	3
Opportunities for further training	Legal regulations for participation in health promotion measures *remain unchanged*. Unlike before, a right to *regular stress management training* during work.	2
Nightly surcharge	As before, a nurse receives a *nightly surcharge of €3.50*. A nurse receives a *nightly surcharge of €4.50* instead of €3.50. A nurse receives a *nightly surcharge of €5.50* instead of €3.50.	3
Sundays off-duty per year	As before, nurses have 15 Sundays off-duty per year. In the future, nurses will have *at least 18 Sundays* off-duty per year. In the future, nurses will have *at least 20 Sundays* off-duty per year.	3

Notes: This table shows the vignette dimensions and levels.
Source: Authors' own illustration.

Table 2
Summary statistics for variables used in the empirical analysis.

Variable	Mean
Monthly amount willing to pay (in euros)	25.4€
Dummy: Male respondent (ref.: female)	50.1 %
Age	
20–34 years	19.0 %
35–49 years	30.0 %
50–64 years	40.4 %
65–80 years	10.6 %
Employment status	
Working	84.5 %
Unemployed	1.6 %
Not working	11.9 %
In school or training	1.9 %
Dummy: Care work during Covid-19 pandemic (ref.: no care work)	13.7 %
Region of residence	
German Eastern States	11.7 %
German Northern States	41.9 %
German Southern States	38.0 %
German City States	8.5 %
Political party preference	
Social-democratic party	11.7 %
Christian-conservative party	24.3 %
Green party	31.4 %
Liberal-democratic party	4.1 %
Right-wing populist party	2.1 %
Left-wing party	5.7 %
Other party, none or apolitical	20.7 %
Education level	
None	1.1 %
A-levels or vocational degree	36.7 %
Bachelor-equivalent or higher	58.8 %
Other	3.3 %
Dummy: High self-selected social class position (ref.: low social class position)	25.75
Net Household income (per capita)	
Less than 500 euros	3.8 %
500 euros to less than 1000 euros	16.5 %
1000 euros to less than 1500 euros	29.0 %
1500 euros to less than 2000 euros	18.9 %
2000 euros to less than 2500 euros	16.4 %
2500 euros or more	15.6 %
Dummy: High trust in federal government (ref.: low trust)	70.6 %
Dummy: High satisfaction with personal health (ref.: low satisfaction)	81.0 %
Dummy: High satisfaction with life in general (ref.: low satisfaction)	86.8 %
Dummy: Major health concerns (ref.: no major health concerns)	4.4 %
Dummy: Major health concern of relatives (ref.: no major health concerns)	12.5 %
Dummy: Major concerns for personal finances (ref.: no major concerns)	9.1 %

Notes: This table shows the summary statistics of respondents' characteristics (N = 2128 individuals).
Source: Authors' own calculations.

monthly income of a full-time employee in Germany in 2021 (for the gross income, see Destatis, 2022). Fig. 1 shows the distribution of the monetary amounts.

In almost 12 % of the vignette scenarios, respondents indicated a willingness to pay of 0 euros, i.e., no willingness to pay more than before. In approximately 40 % of the scenarios, respondents reported a willingness to pay between 0.01 and 19.99 euros. A quarter of the responses lie in the interval between 20.00 and 39.99 euros. In approximately 10 % of the scenarios, respondents reported being willing to pay high amounts, i.e., between 60 and 99 euros (at least 2 euros extra per day).

Table 3 summarizes the point estimates and 95 % confidence intervals of random-/mixed-effects models, as described in the previous section. In the following, we focus on the results of Model 3.

In our reference scenario, nurses do not experience any improvement in working conditions. This scenario describes a situation where nurses receive a minimum wage of 15.00 euros and a nightly surcharge of 3.50 euros, while their entitlement to vacation is 26 days and 15 off-duty Sundays, without being offered any additional training.

The results show that respondents were generally willing to pay for improvements in the working conditions of nurses. However, respondents vary their judgment depending on the type of reform element, i.e., monetary and nonmonetary. Thus, they are not willing to provide equally high contributions for all potential reform proposals.

While Model 3 is our preferred model, it is notable that the effects of the vignette levels are quite stable for all three models. Across all dimensions, we find that out of all reforms, increasing the minimum wage for nurses is associated with the highest willingness to pay. For a minimum wage adjustment from 15.00 euros per hour to 18.50 (20.00) euros per hour, respondents would be willing to accept higher monthly contributions of 6.12 (7.37) euros on average. Furthermore, respondents' willingness to pay is also statistically significant for different levels of nightly surcharges. Increasing surcharges from 3.50 euros to 4.50 (5.50) euros results in a higher willingness to pay amounting to 1.74 (2.85) euros. Both effects are statistically significant at the 0.1 % level.

In addition to contributions with direct monetary implications, we also observe the following positive effects for nonmonetary reforms aiming at reducing workload and individual stress: reduced number of working days, better conditions to help free up weekends, and support to help nurses cope better with work-related stress. A more generous vacation entitlement of one additional day is associated with an increase of 1.70 euros, while that of three additional days is associated with an increase of 3.58 euros. Increasing the guaranteed number of off-duty Sundays from 15 to 18 (20) translates to a positive effect of 1.39 (2.09) euros. These effects are also statistically significant at the 0.1 % level. Offering regular training courses to help nurses deal with work-related stress has only a very small positive effect of 0.68 euros, with a level of statistical significance of 1 %.

Some of the covariates are also associated with willingness to pay. Male respondents are willing to pay about 3 euros per months more than females, (significant at the 1 % level). Compared to the reference category of sympathizers for the Green party, all other groups of respondents are less willing to pay. In terms of magnitude, sympathizers for the liberal-democratic party and the right-wing populist party show the lowest willingness to pay. In terms of significance, only the effect of the Christian conservative parties who pay about 3 euros less than the reference group, is significant in all models (at the 5 % level), while the effect of the Social-democratic party is paying about 3.5 euros less (only significant at the 5 % level in Model 2). People who assign themselves a comparatively high social status are willing to pay about 5 euros more (significant at the 0.1 % level). Compared to the reference group with a household income between 1000 and 1500 euros, respondents with a household income between 500 and 1000 euros are willing to pay about 3 euros less (significant at the 5 % level in both models 2 and 3), while a higher household income is associated with a (not significantly) higher willingness to pay. Further analyses

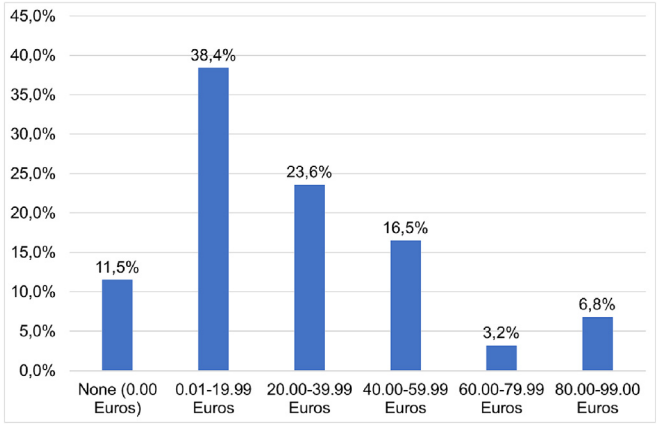


Fig. 1. Willingness to pay in euros per month.
N (responses) = 6384.
Notes: This graph shows the frequency of a response category. It adds up to 100 % (with rounding errors).
Source: Authors' own calculations.

Table 3
Regression results – effects of dimensions on willingness to pay.

Vignette characteristics	Dimension		
	Model 1 (no controls, RE)	Model 2 (controls, RE)	Model 3 (controls, Mixed)
	Coef. [95 %-CI]	Coef. [95 %-CI]	Coef. [95 %-CI]
Minimum wage for nurses			
15.00 euros (Ref.)	–	–	–
18.25 euros	6.32*** [5.46; 7.17]	6.18*** [5.35; 7.01]	6.12*** [5.31; 6.94]
20.00 euros	7.49*** [6.70; 8.28]	7.38*** [6.61; 8.15]	7.37*** [6.60; 8.13]
Nightly surcharge			
3.50 euros (Ref.)	–	–	–
4.50 euros	2.02*** [1.23; 2.80]	1.98*** [1.21; 2.75]	1.74*** [1.10; 2.38]
5.50 euros	2.80*** [2.11; 3.48]	2.85*** [2.18; 3.52]	2.85*** [2.25; 3.45]
Vacation entitlement			
26 days (Ref.)	–	–	–
27 days	1.94*** [1.30; 2.57]	2.00*** [1.37; 2.62]	1.70*** [1.14; 2.25]
29 days	3.58*** [2.91; 4.25]	3.59*** [2.93; 4.25]	3.58*** [2.97; 4.19]
Sundays off-duty per year			
15 Sundays (Ref.)	–	–	–
18 Sundays	1.33*** [0.66; 2.00]	1.44*** [0.78; 2.10]	1.39*** [0.77; 2.01]
20 Sundays	1.93*** [1.22; 2.63]	1.99*** [1.30; 2.68]	2.09*** [1.49; 2.69]
Right to regular stress management training during work			
No (Ref.)	–	–	–
Yes	0.86** [0.32; 1.39]	0.87** [0.35; 1.40]	0.68** [0.20; 1.17]
Dummy: Male respondent (Ref.: female)		2.92** [0.84; 5.01]	2.86** [0.79; 4.92]
Age			
20–34 years		−3.97** [−6.94; −1.00]	−3.92** [−6.84; −1.00]
35–49 years		−2.09 [−4.64; 0.46]	−2.31 [−4.84; 0.21]
50–64 years (Ref.)		–	–
65–80 years		−0.53 [−4.71; 3.64]	−0.33 [−4.51; 3.85]
Employment status			
Working (Ref.)		–	–
Unemployed		0.37 [−7.02; 7.76]	0.84 [−6.72; 8.39]
Not working		−1.13 [−4.85; 2.59]	−1.09 [−4.82; 2.64]
School or training		−5.79 [−12.41; 0.83]	−6.13 [−12.44; 0.17]
Dummy: Care work during Covid-19 pandemic (ref.: no care work)		1.11 [−2.01; 4.23]	1.11 [−2.02; 4.24]
Region of residence			
German Eastern States (Ref.)		–	–
German Northern States		1.22 [−2.10; 4.54]	1.32 [−1.92; 4.57]
German Southern States		2.80 [−0.59; 6.20]	2.89 [−0.43; 6.21]
German City States		−0.47 [−5.01; 4.07]	−0.07 [−4.48; 4.34]
Political party preferences			
Social-democratic party		−3.45* [−6.81; −0.08]	−2.77 [−6.06; 0.52]
Christian-conservative parties		−3.65* [−6.47; −0.83]	−2.84* [−5.65; −0.34]
Green party (Ref.)		–	
Liberal-democratic party		−5.62 [−11.25; 0.01]	−4.55 [−10.16; 1.06]
Right-wing populist party		−6.24 [−13.90; 1.42]	−5.33 [−12.75; 2.09]
Left-wing party		−1.03 [−5.52; 3.45]	−0.73 [−5.13; 3.67]
Other party, none or apolitical		−3.15 [−6.30; 0.00]	−2.60 [−5.70; 0.50]
Education level			
None		−1.76 [−10.27; 6.75]	−1.22 [−9.60; 7.16]
A-levels or vocational degree		0.57 [−1.67; 2.82]	0.96 [−1.22; 3.20]
Bachelor-equivalent or higher (Ref.)		–	
Other		−2.00 [−8.01; 4.01]	−0.92 [−6.95; 5.11]
Upper quartile in social class, self-assigned (ref.: not upper quartile)		5.13*** [2.57; 7.69]	4.72*** [2.21; 7.23]
Household income (per capita)			
Less than 500 euros		−4.16 [−9.15; 0.84]	−4.09 [−9.09; 0.90]
500 euros to less than 1000 euros		−3.19* [−6.16; −0.23]	−3.20* [−6.12; −0.29]
1000 euros to less than 1500 euros (Ref.)		–	
1500 euros to less than 2000 euros		0.16 [−2.83; 3.15]	0.31 [−2.65; 3.26]
2000 euros to less than 2500 euros		0.58 [−2.75; 3.91]	0.57 [−2.74; 3.89]
2500 euros or more		3.34 [−0.17; 6.86]	3.20 [−0.25; 6.65]
Dummy: High trust in federal government (ref.: low trust in federal government)		3.48** [0.88; 6.09]	2.87* [0.28; 5.47]
Dummy: High satisfaction with personal health (ref.: low satisfaction)		−2.62 [−5.55; 0.29]	−2.35 [−5.25; 0.54]
Dummy: High satisfaction with life in general (ref.: low satisfaction)		1.47 [−1.92; 4.86]	1.80 [−1.58; 5.18]
Dummy: Major health concerns (ref.: no major health concerns)		−2.37 [−7.39; 2.65]	−2.42 [−7.32; 2.47]
Dummy: Major health concerns for relatives (ref.: no major health concerns)		2.83 [−0.65; 6.32]	2.721 [−0.72; 6.16]
Dummy: Major concerns for personal finances (ref.: no major concerns)		−4.74** [−8.20; −1.28]	−4.00* [−7.50; −0.50]
Constant	15.88*** [14.51; 17.25]	15.98*** [10.32; 21.64]	15.24*** [9.68; 20.80]
AIC	53,076.29	52,852.50	52,355.54
Snijders/Bosker R^2: Level 1	0.021324	0.0770963	
(Level 2)	(0.004975)	(0.0859635)	
N (respondents)	2128		
N (observations)	6384		

for a split of the sample at the median household income did not reveal any additional heterogeneity with respect to this variable (results available upon request). Higher trust in the federal government is associated with a higher willingness to pay (about 3.5 euros in Model 2; 3 euros in Model 3), which is also significant (at the 1 % level/5 % level). As expected, respondents with major financial concerns have a lower willingness to pay for improved conditions (about 5 euros in Model 2; 4 euros in Model 3, also significant at the 1 %/5 % level).

6. Discussion

Recent literature suggests that working conditions in the health care sector may substantially influence worker retention (Squires et al., 2022) and that better conditions may help nurses to cope better with their workload or even expand working hours. Improving working conditions may thus also help to prevent migration to other sectors while attracting workers from other areas (Becka et al., 2023). We investigated whether people are willing to pay for improvements in different dimensions of working conditions of nurses and found that many are willing to do so.

In particular, we studied the question of whether people are willing to pay for improvements that can be actively influenced by government policies. These factors mostly relate to increasing both wages and time off from work, as well as guaranteed access to stress management training. All these factors could potentially contribute to better working conditions for nurses and thereby reduce the attrition rate of the nursing workforce.

Our study differs from previous studies in terms of method and content. We used data from a German panel survey that was not previously available for the analysis of such questions and we used a factorial survey experiment, a method that is suitable for the identification of causal effects on respondents' evaluations. Moreover, previous studies set somewhat different theoretical accents, e.g., influence of trust on willingness to pay (Habibov et al., 2017), or willingness to pay for specific forms of medical treatment (Olsen and Donaldson, 1998) and often make cross-country comparisons (Habibov et al., 2018, 2019; Gugushvili, 2022). We, however, identified the causal effect of different policy measures on willingness to pay. We think that the application of our method could be an interesting avenue for future research in other countries and contexts.

While previous studies have found that "soft factors", such as the atmosphere within the team or better management, can have a large impact on the likelihood of nurses staying in their profession, higher wages have also been found to have a positive impact on the likelihood of job retention (Kroczek and Späth, 2022). Furthermore, improved nurse-to-patient ratios may contribute to lessening stress levels (and thereby reduce levels of both, burnout and intention to leave) among nurses (Bruyneel et al., 2023). Thus, if higher wages attract more workers to the health care sector, this may improve the job satisfaction of nurses, which in turn may contribute to higher retention. Indeed, there is growing evidence that higher wages in the nursing sector and an increasing awareness thereof can lead to greater interest among young teens in becoming nurses (Kugler, 2022).

A related strand of literature discusses the high prevalence of stress-related problems and mental health issues among nurses, such as burnout, depression, anxiety, and posttraumatic stress disorder, and how these factors relate to nurses' intention to leave their profession (see, for example, Bruyneel et al., 2023, Dragioti et al., 2022; Flinkman et al., 2008; Leiter and Maslach, 2009; Saragih et al., 2021). The gravity of these issues could be cushioned by, for example, improving nurses' work-life balance and by offering them more recovery time. As our study showed the survey respondents reported being willing to pay for improvements in these dimensions, although they did so to a lesser extent than for wage increases.

Finally, there is increasing evidence that different types of interventions can help nurses deal with the stressors of everyday work life (Dumarkaite et al., 2023) and improve the quality of the relationships and the culture found within the workplace (Ooms et al., 2022). Similar to other improvements, people are willing to pay for the implementation of such training measures.

7. Limitations

Although we asked individuals how much they are willing to contribute in addition to what they already pay with regard to certain health care services, we cannot say to what extent factors related to free-riding or the distinction between individual and general contributions may have impacted the respondents' assessments. While we were interested in individual-level willingness to pay, some respondents may have assumed that such an additional amount should be paid by all contributors to an equal extent.

A second limitation is that, for respondents as well as researchers, it is difficult to weigh the costs of each single improvement and its specific benefits. While Kanya et al. (2019) show that stated willingness to pay is only a mediocre predictor of actual willingness to pay, Quaife et al. (2018) argue that discrete-choice experiments—which are quite similar to factorial survey experiments—can yield reasonable predictions of willingness to pay in the health care sector. Furthermore, as with any factorial survey experiment, Smith (2003) argues that the validity of the results depends on the scenarios presented and necessitates that researchers pay attention to the realism of these scenarios.

Moreover, the proposed policy measures to improve the working conditions of nurses come with varying costs. For example, offering stress management training is more abstract and without clear numerical costs or benefits, although it would certainly be less expensive than an increase in minimum wages or in nightly surcharges. Thus, the amount survey respondents are willing to pay for a certain type of improvement may be, at least partially, influenced by the amount they expect certain improvements to cost. This may be part of the explanation why the survey participants stated a comparatively low willingness to pay for the stress management training compared to the other proposed improvements. However, unfortunately, with our data, it is not possible to test whether varying (perceived) costs of different measures are a factor influencing the willingness to pay among the survey respondents. Similarly, our data do not allow us to test whether survey participants are willing to pay more for improvements in working conditions that they themselves expect to benefit from.

Another potential limitation is that our results may only be generalizable to some extent, as the political and cultural environment, policies related to the organization of work in the health sector, and the renumeration of healthcare workers differ between Germany and other countries. Consequently, cross-country comparisons of the willingness to pay for improved working conditions of healthcare staff could be an interesting avenue to pursue for future research.

Finally, our survey was conducted during a time when the pandemic was still quite acute and during which the discussion of the systemic relevance of the nursing profession was still very present. This may have influenced the willingness to pay among the survey respondents

Notes to Table 3:

Notes: This table shows the results from random-effects ("RE") and mixed-effects models ("Mixed"). We additionally controlled for vignette order to address order effects.
The random slope for the vignette variable "minimum wage" provides a massive increase in AIC, whereas using additional random slopes for the other vignette variables does not yield further improvements of the model and are therefore not used.
Source: Authors' own calculations.

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

positively. Whether these findings are generalizable to non-pandemic times and whether peoples' willingness to pay will remain similarly high as time since the pandemic increases is also an interesting question for future research.

8. Conclusions

In this paper, we investigated people's willingness to pay for improvements in the working conditions of nurses. The amount that the respondents were willing to pay varied with the type of proposed policy measure. The highest willingness to pay was found for policies that would increase the remuneration of nurses, most importantly an increase in minimum wages for nurses and, to a lesser degree, an increase in nightly surcharges. Smaller, but still important, effects were found for increased vacation times, more Sundays off-duty and stress management training (in this general order). Thus, despite the variation in willingness to pay, our results showed that people are willing to pay for all proposed policy measures. This broad level of support for improvements in the working conditions of nurses can give policymakers some guidance in implementing different policy measures that can potentially contribute to developing and sustaining an adequate nursing workforce.

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CRediT authorship contribution statement

Richard Wolff: Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization. **Anna Heusler:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Conceptualization. **Max Kunaschk:** Writing – review & editing, Writing – original draft, Investigation, Conceptualization. **Christopher Osiander:** Writing – review & editing, Writing – original draft, Project administration, Investigation, Conceptualization.

Data availability

We use data from wave 9 of the panel study "Living and Working in Times of Corona." The data are available as a scientific use file via the Research Data Center of the Institute for Employment Research. The data can be linked to process data from the Federal Employment Agency in Germany. The latter involves compliance with specific data protection regulations. Access to process data must be clarified with the Research Data Center on a case-by-case basis.

Declaration of Competing Interest

The authors have no conflicts of interest to declare.

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Appendix A

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