Surveying Healthcare Workers in Nursing Roles
Analysis Plan for AEA RCT Registry

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1 Experimental Design

We employ an online randomized survey experiment to estimate (i) how nurse experience affects job efficiency and quality of patient care and (ii) how bankruptcy status affects reservation wages and willingness to work at a facility.

The first stage of the experiment estimates how nursing staff tenure and experience may affect the quality of healthcare provider care and patient outcomes. The study will elicit beliefs from real healthcare workers about the importance of on-the-job experience for delivering high-quality care. Participants are randomly assigned with equal probability into two conditions regarding the experience level of a nurse. We measure how beliefs about relative quality of care received by patients change when we exogenously vary the amount of experience a hypothetical nurse has.

The second stage estimates beliefs about how healthcare provider financial conditions affect worker departures and reservation wages. Participants are randomized into five conditions about the financial health of a hypothetical facility. We measure how required wages and willingness to work at a hypothetical facility change when we exogenously vary information about the firm's financial health.

We exclude individuals that fail attention checks. Additionally, we exclude individuals that have never worked in the healthcare industry at a skilled nursing facility as an RN, LPN, or CNA. We also exclude participants who do any of the following: (i) report a probability above 100, (ii) report a time to complete a task above 4 hours, (iii) report a historical wage greater than $100 per hour, or (iv) give answers that are self contradictory as explained below. We will continue to run the experiment until either (i) we have at least 240 completed surveys that meet these criteria or (ii) we have continuously run our survey through February 1, 2023 without reaching 240 complete surveys that meet these criteria. Because of our filters, and because of the nature of our online-survey vendor, we cannot precisely control the number of participants or end date of our experiment.

1.1 Treatment Conditions

Stage 1

The first stage of the experiment asks participants to report how long they believe it will take hypothetical nursing staff of varying levels of experience to perform tasks for a nursing home patient. There are three hypothetical patients, or three questions in this stage. All participants receive identical information about each patient's health condition.[1] The participant is asked to report how long they believe it would take him or herself to complete the task, a hypothetical nurse "Ms. Smith" with two years of experience to complete the task, and a hypothetical nurse "Ms. Williams" of either 1 year or 1 week of experience to complete the task. We **randomly vary the experience level** of Ms. Williams across these two conditions (1 year or 1 week of experience) with equal probability.

Next, participants will see a list of potential adverse outcomes that can occur with the task at hand. Example adverse outcomes include incorrect taking of vital signs or forgetting to measure or mis-measuring weight. We then ask participants to report how likely they believe it is that an adverse outcome will occur, on a scale from 0 (no chance of occurring) to 100 (certain to occur), if the task is performed by him or herself, Ms. Smith, or Ms. Williams.

Stage 2

This stage randomizes the financial health of a hypothetical skilled nursing facility, "Facility A" and asks participants to respond to questions about the hypothetical scenario. The state in which the facility is located and the baseline wage that the participant is earning at the facility will match the participant's actual most recent experience working at a skilled nursing facility. We ask participants the following questions. First, how likely is the participant to search for another job? Second, what hourly wage would Facility A have to pay to prevent the participant from leaving? Finally, the participant is asked to guess what percentage of workers they think will voluntarily leave Facility A in the next year. Before answering these questions, the participant is presented with **randomly assigned** text describing the

[1]Note, we ask for each participant's job history and show patient information reflecting their previous experience: RN, CNA, or LPN. However, conditional on a job type (e.g., RN), all participants see the same hypothetical patient information. Our randomization of Ms. William's experience is independent of this.

financial health of the facility across five conditions:

- **Control:** Facility A's revenue is large enough to pay for both its operating expenses (e.g., wages) and other financial obligations (e.g., annual debt payments).
- **Treatment 1 ("Distressed Profitable"):** Facility A's revenue is large enough to pay for its operating expenses (e.g., wages), but is not enough to also fully pay its other financial obligations (e.g., annual debt payments). Facility A has a 25% chance of filing for Chapter 11 bankruptcy in the next year.
- **Treatment 2 ("Distressed"):** Facility A has a 25% chance of filing for Chapter 11 bankruptcy in the next year.
- **Treatment 3 ("Bankrupt Profitable"):** Facility A's revenue is large enough to pay for its operating expenses (e.g., wages), but is not enough to also fully pay its other financial obligations (e.g., annual debt payments). While Facility A is currently open, it recently filed for Chapter 11 bankruptcy and is currently in bankruptcy proceedings.
- **Treatment 4 ("Bankrupt"):** While Facility A is currently open, it recently filed for Chapter 11 bankruptcy and is currently in bankruptcy proceedings.

We randomly assign one-third of participants to Control. We randomly assign the remaining participants with equal probability to one of the four treatment groups. We thus allocate participants as follows: Control, one-third; Treatment 1, one-sixth, Treatment 2, one-sixth, Treatment 3, one-sixth, Treatment 4, one-sixth.

Most of our analysis groups together Bankrupt and Bankrupt Profitable: we let the indicator Bankrupt_i indicate whether a participant is in either of these two groups. Likewise, most of our analysis groups together Distressed and Distressed Profitable: we let the indicator Distressed_i indicate whether a participant is in either of these two groups.

1.2 Follow-up Questions

After measuring each participant's willingness to work, reservation wage, and beliefs about voluntary separations at the facility, we ask follow-up questions. Specifically, for participants that are randomly assigned to Treatment 1,2,3, or 4, we ask how strongly various concerns

influenced their willingness to work at Facility A. We then ask brief survey questions on their beliefs about separations from bankrupt facilities and the importance of tenure at nursing homes for job efficiency and quality of care. In one question, we randomize the wording to see whether the level of experience of a departing staff member affects the extent to which quality of care changes.

After the follow-up questions, we ask for demographic information.

1.3 Summary

The procedure of this study is a survey during which participants will be asked to answer a series of questions. There will be four primary sections of the survey:

1. Section 1 will consist of attention checks and importantly, filtering participants by whether they have worked in the healthcare industry in a nursing role. Only those that meet these criteria will continue with the survey. We will also ask participants how much experience they have working at a nursing home. **Participants that do not meet our sample criteria (someone who has worked in the healthcare industry at a nursing home as an RN, LPN, or CNA) or do not pass the attention checks are dropped from the survey by our online-survey vendor.**

2. Section 2 will consist of questions about nursing experience and implications for quality of care. These questions will provide hypothetical scenarios that vary the amount of experience between two otherwise identical nurses and ask participants to share their beliefs about the relative quality of care that will be received by patients. Specifically, participants in this section consider 3 scenarios based on their prior work experience. Participants consider a hypothetical nurse Ms. Williams and a hypothetical nurse Ms. Smith. Participants are randomized into one of two conditions: Ms. Williams has either 1 week or 1 year of experience. For each participant, we average their reported time for Ms. Williams to complete tasks across the three scenarios/patients. We do the same for Ms. Smith. At the end of Section 2, we ask participants whether, on average, they think Ms. Smith is slower than Ms. Williams, faster than Ms. Williams, or the same speed. **If the answer to this question is not "same speed" and is inconsistent with the participant's reported times, we drop the participant.**

We also drop participants reporting that any task takes four hours or longer to complete. For each participant, we average their reported likelihood of a mistake or bad outcome for Ms. Williams across the three scenarios. We do the same for Ms. Smith. At the end of Section 2, we ask participants whether, on average, they think Ms. Smith makes more mistakes than Ms. Williams, fewer than Ms. Williams, or the same. **If the answer to this question is not "same number of mistakes" and is inconsistent with the participant's average reported likelihood of mistakes, we drop the participant. We also drop participants that report a likelihood of a mistake greater than 100%.**

3. Section 3 will ask participants to consider a hypothetical scenario in which a nursing home experiences financial distress (e.g., missing a debt payment or filing for bankruptcy), then pose several questions that broadly elicit preferences for working at such a facility as well as beliefs about whether other nurses would voluntarily stay or leave. Specifically, participants consider one hypothetical facility. There are five randomized conditions. In one, the facility is financially healthy. In two others, the facility is financially distressed. In the final two conditions, the facility is bankrupt. Participants answer questions about their willingness to work at this facility. **We ask for the participant's historical wage in this section and drop participants who report a wage greater than or equal to $100 per hour.**

4. Finally, Section 4 will more directly ask participants questions about the topics covered in the previous sections. An example of this type of direct question would be "How important do you think a staff member's tenure at a facility is for the quality of care that they provide to residents?" This section will also include a follow-up question for participants in the treatment group that asks whether various potential concerns affected their responses.

1.4 Sample selection

We exclude individuals that fail attention checks. Additionally, we exclude individuals that have never worked in the healthcare industry at a skilled nursing facility as an RN, LPN, or CNA. We also exclude participants who do any of the following: (i) report a probability

above 100, (ii) report a time to complete a task above 4 hours, (iii) report a historical wage greater than $100 per hour, or (iv) give answers that are self contradictory as explained below.

For each participant, we average their reported time for Ms. Williams to complete tasks across the three scenarios/patients. We do the same for Ms. Smith. At the end of Section 2, we ask participants whether, on average, they think Ms. Smith is slower than Ms. Williams, faster than Ms. Williams, or the same speed. If the answer to this question is not "same speed" and is inconsistent with the participant's reported times, we drop the participant. For example, we would drop a participant if their average reported completion time for Ms. Williams is 45 minutes, their average reported time for Ms. Smith is 20 minutes, yet they say on average Ms. Williams is faster than Ms. Smith.

Likewise, for each participant, we calculate the average reported likelihood of a mistake for Ms. Smith and Ms. Williams. At the end of Section 2, we ask participants whether, on average, they think Ms. Smith makes more mistakes than Ms. Williams, fewer mistakes than Ms. Williams, or the same number of mistakes. If the answer to this question is not "same number" and is inconsistent with the participant's reported numerical answers, we drop the participant. For example, we would drop a participant if their average reported likelihood of a mistake is 50% for Ms. Williams and 25% for Ms. Smith, yet they say that Ms. Smith makes more mistakes.

1.5 Randomization

We conduct our experiment using a Qualtrics study. Qualtrics features a computerized randomization method, which we use to randomize participants into the treatment conditions described in Section 1.1.

2 Analysis

Throughout all of the analysis, to control for nurse roles (whether participant i worked as an RN, LPN, or CNA) we will explore specifications that include nurse-role fixed effects and estimations in nurse-role subsamples. We may also add demographic controls in some specifications.

Stage 1

For each participant i in each of $j = 1, 2, 3$ questions (reflecting the three patients each participant considers), we measure the participant's beliefs about how nurse experience affects time to complete tasks and adverse event rates. In each question, we describe a patient and tell the participant that Ms. Smith has two years of experience, and that Ms. Williams has length of experience randomized over {one year, one week}. We define mutually exclusive binary indicator variables for the two experience-level groups.

NOTE: WE TRUNCATE ADVERSE OUTCOME BELOW AT 1 AND TIME-COMPLETE AT 1. We define the scaled variable TimeComplete_{ij} as the ratio of the task completion time for Ms. Williams to the task completion time for Ms. Smith reported by participant i in question j. We similarly define the scaled variable $\text{AdverseOutcome}_{ij}$ as the ratio of the adverse event rate for Ms. Williams to the adverse event rate for Ms. Smith reported by participant i in question j.

For both outcome variables $Y_{ij} \in \{\text{TimeComplete}_{ij}, \text{AdverseOutcome}_{ij}\}$, we estimate the following regression:

$$Y_{ij} = \alpha + \delta \text{OneWeek}_i + \epsilon_{ij}. \tag{1}$$

where One Year is the omitted group in the specification. Additionally, we run another specification with a question-specific fixed effect:

$$Y_{ij} = \alpha_j + \delta \text{OneWeek}_i + \epsilon_{ij}. \tag{2}$$

Standard errors will be clustered at the participant level for all regressions in this stage. As a control for participant heterogeneity, we will also explore specifications that control for participant i's response to question j about their own ability to perform the tasks. We will also explore specifications controlling for demographic characteristics.

Equations 1 and 2 are solely identified on across-participant variation. We will also explore a specification that exploits within-participant differences in beliefs about Ms. Smith and Ms. Williams. Specifically, for each participant i and question j, we let $n \in \{Williams, Smith\}$ index responses for Ms. Williams and Ms. Smith. We will estimate the following regression

model:

$$Y_{ijn} = \alpha_i + \beta_0 \text{Williams}_n + \beta_1 \text{Williams}_n \times \text{OneWeek}_i + \epsilon_{ijn}. \tag{3}$$

where α_i are participant fixed effects and Williams_n is an indicator equal to one for Ms. Williams and zero for Ms. Smith. This regression will allow us to identify average differences from Ms. Smith for participants in each of the two treatment conditions. We can analogously explore estimations in treatment condition subsamples.

Stage 2

For each participant i, we measure how bankruptcy status affects willingness to work at a facility and worker reservation wages. In each question, we ask the participant about their last experience working at a skilled nursing facility. From this we obtain their "current" wage, which will be used in the analysis as a baseline for their reservation wage. We then tell the participant that Facility A has a financial-health status randomized over {Control, Distressed, Bankrupt}. We define mutually exclusive binary indicator variables for the three treatment conditions. In some specifications, we may explore separate indicators for the two variations of the bankrupt treatment and the two variations of the distressed treatment. The specific information presented in each treatment condition is outlined in Section 1.1.

We use robust standard errors for the regressions in this stage, as there is no reasonable variable on which to cluster and we see no reason that clustering is necessary. The regression specification is as follows:

$$Y_i = \alpha + \beta \text{Distressed}_i + \delta \text{Bankrupt}_i + \epsilon_i. \tag{4}$$

Let W_R denote the reservation wage, and W_0 denote the current wage. Also let F_0 denote the participant's baseline belief of what percentage of workers voluntarily leave the facility each year, and F_1 the worker's belief after receiving the randomly assigned information about the facility. We will study three outcome variables in this analysis. First, the likelihood that the participant searches for another job normalized by the pre-treatment belief of voluntary separation rates, $Search/F_0$. Second, the reservation wage normalized by the current wage, W_R/W_0. Lastly, the post-treatment belief of voluntary separation rates normalized by the pre-treatment belief, F_1/F_0. We will also explore non-normalized versions of these outcome variables.

As a proxy for individual propensity to separate from a facility, we will also explore specifications that control for the number of jobs the participant has left in the last two years. This information is reported by the participant prior to the treatment.

3 Additional Analysis

In addition to the key regressions described above, we will look at which follow-up question responses best predict the Stage 2 analysis outcomes. This will help inform the mechanisms by which financial distress affects employee beliefs.

We will also examine the empirical tenure distribution of our participants, as well as the distribution of adverse event rates that participants self report in response to the three questions in Stage 1.