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To cite this article: Nicola Belle & Paola Cantarelli (25 Jan 2024): *Cui prodest?* Nudging prosocial behavior among healthcare professionals, International Public Management Journal, DOI: [10.1080/10967494.2023.2294766](https://doi.org/10.1080/10967494.2023.2294766)

To link to this article: <https://doi.org/10.1080/10967494.2023.2294766>



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Published online: 25 Jan 2024.



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ABSTRACT

Combining insights from nudge theory and research into prosocial behavior, we study how messages emphasizing the positive impact of flu vaccination may increase vaccination intentions among professionals in a public healthcare setting. Using an online randomized controlled trial with 13,785 healthcare professionals in Italy, we demonstrate that the intention to vaccinate and to promote vaccination in the workplace are higher when subjects are nudged (with a brief message) to reflect on the positive impact on others, namely their family and friends and especially their patients. In contrast, a nudge emphasizing personal benefits does not have a significant impact on the intention to vaccinate and only marginally increases intentions to promote vaccination in the workplace. But these patterns of results also varied across job types. We discuss how our study contributes to behavioral public administration theory and practice by demonstrating the potential of nudges to influence prosocial workplace behaviors.

ARTICLE HISTORY

Received 21 December 2022
Accepted 10 December 2023

Introduction

Public authorities around the globe seek interventions to overcome resistance to vaccination among their workforce in order to reach adequate immunization coverage to protect their employees and the public. Health workers in particular face a higher risk of contracting influenza compared to the general population. This increased risk not only affects their health but also leads to more absences from work, reduced productivity, and disruptions in services. Furthermore, infected health workers can potentially transmit the infection to their already vulnerable patients. Given these concerns, the World Health Organization (WHO) encourage governments and public institutions to prioritize health workers as a key group for receiving seasonal influenza vaccination. This approach not only enhances their protection but also contributes to preparedness for potential pandemics (World Health Organization 2019).

Previous research into vaccination behavior has identified a broad range of determinants, which include mandates, guidelines, education, perceptions about efficacy and side-effects, and ease of access (Lytras et al. 2015; To et al. 2016). However, studies that explore the impact of prosocial nudges on vaccination intentions are limited (Milkman et al. 2021, 2022), especially when the focus is on public workers (Belle and Cantarelli 2021). This might be problematic in light of evidence that the vision of an organization is especially relevant for human resources management in people-processing organizations (Høstrup and Andersen 2022). To help fill this gap, we combine insights from nudge theory (Thaler and Sunstein 2008, 2021) and research on prosociality at work (Bolino and Grant 2016) to experimentally investigate how emphasizing the

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positive impact of flu vaccination on oneself and on others may alter vaccination intentions among healthcare professionals.

We focus on influenza because it “is a common infectious disease responsible for 3-5 million severe cases worldwide, along with up to 650,000 deaths” (Organization for Economic Cooperation and Development 2019, 144). The Advisory Committee on Immunization Practices recommends that all healthcare personnel receive an annual influenza vaccination to reduce influenza-related morbidity and mortality among health care providers and their patients and to reduce absenteeism among healthcare personnel (Black et al. 2018; World Health Organization 2019). In an online survey experiment involving 13,785 public healthcare professionals, we randomly assign messages that emphasize the positive impact of influenza vaccination on three categories of potential beneficiaries: oneself, family and friends, or patients. Subsequently, we measure workers’ intention to receive a flu shot and to advocate immunization among their colleagues. We chose this research design in light of evidence indicating that “vaccination intention was the strongest predictor of subsequent vaccination, explaining over 60% of the seasonal influenza vaccination uptake among healthcare professionals” (Ng et al. 2020:695).

Our study has the potential to make several contributions to public administration theory and practice. In particular, we contribute to recent behavioral public administration scholarship (Battaglio et al. 2019; Grimmelikhuisen et al. 2017; James, Jilke, and Van Ryzin 2017) on nudging public servants (John 2018; Oliver 2015) and healthcare professionals (Nagtegaal et al. 2019). From a theoretical standpoint, in line with scholarship attempting to bridge nudge theory (Thaler and Sunstein 2008, 2021) and research into prosociality at work (Bolino and Grant 2016), we investigate how emphasizing the prosocial impact of public servants’ actions on different typologies of beneficiaries may work as a nudge for fostering other-oriented behavior. In other words, we explore how public institutions can leverage prosocial behavior of workers in mission-oriented jobs through cost-effective interventions “without forbidding any options or significantly changing their economic incentives” (Thaler and Sunstein 2008:1).

From a practice perspective, our study provides usable experimental evidence on how public organizations and their managers can increase vaccination intention among their employees through messages that emphasize the positive impact of immunization on others. Our results also speak to behavioral research into the use of nudges as policy tools that can alter the way in which individuals think about costs and benefits and evaluate their preferences (Madrian 2014). By illuminating how the effects of those messages vary across job types, we also demonstrate the limitations of a one-size-fits-all approach to vaccination campaigns among the public workforce. Indeed, our results suggest the need for a tailored approach aimed at delivering differentiated messages to different job types. Our findings may be particularly valuable because of the nature of our data, which come from a large-scale randomized controlled trial with 13,785 public healthcare professionals. It is our view that our research design strikes a reasonable balance between internal validity, which is ensured by randomization, and contextual realism, which strengthens the external validity of our results.

Prosocial nudges in public mission-driven professions

Nudge theory (Thaler 2017; Thaler and Sunstein 2008, 2021) examines how high-stake behaviors can be systematically geared toward individual and societal good through low-powered incentives. In a nutshell, “nudges are supposedly irrelevant factors that influence our choices in ways that make us better off” (Thaler 2015:326). More precisely, by exerting libertarian paternalism, choice architects design a decision environment with the awareness that even small variations in context can influence people’s choices and decision-making (Sunstein and Thaler 2003). Choice architects who espouse the libertarian paternalism approach alter the decision environment in ways that simultaneously preserve people’s freedom of choice while using nudges to point them in the direction of choices that will make them be better off, as judged by themselves. Thaler and

Sunstein (2008) provide a mnemonic device that synthesizes six principles that good choice architects leverage in order to encourage desirable behaviors: **NUDGES**, which stands for iNcentives, Understand mappings, Defaults, Give feedback, Expect error, and Structure complex choices. In the context of this study, highlighting the positive impact of vaccines on different categories of beneficiaries may be a useful nudge that helps clarify the relationship between choice and welfare outcomes (an example of mapping).

The nudging approach has rapidly gained traction among academics and policymakers alike. The body of scholarship has grown to the point that several research syntheses and meta-analyses have been published (Benartzi et al. 2017; DellaVigna and Linos 2022; Hummel and Maedche 2019; Mertens et al. 2022). Previous work finds that the average effect of a nudge intervention tends to be very large in papers published in academic journals and smaller in experiments run by nudge units. Specifically, with regards to the average control, the mean take-up impact of a nudge is about 8.7 percentage points in the former case and 1.4 percentage points in the latter case (DellaVigna and Linos 2022). This points to a potential publication bias that can be addressed, in part, by publishing more nudge studies in academic journals.

Individuals need help to avoid making decisions that are not in their best interest, that is “decisions they would not have made if they had paid full attention and possessed complete information, unlimited cognitive abilities, and complete self-control” (Thaler and Sunstein 2008:5). Nudging interventions seek to modify decisions among those actors who, on deliberate reflection, would have made different decisions for themselves or for others (Beattie et al. 1994). Whereas *Econs* (the idealized economic agents portrayed in standard economics) are immune to cognitive biases that systematically affect decisions, *Humans* (the real-world human beings in behavioral economics) err in predictable ways. Thus, although irrational, they can be nudged through changes in choice architecture that have the potential for altering behavior for the better without forbidding any options nor using high-powered incentives.

People tend to be most in need of nudges when they have to make a difficult or rare choice; they have to make a decision for which they do not get immediate or direct feedback; and when some aspects of the situation are difficult to understand or make concrete. Such situations include, for example, the selection of how much to save for retirement (Benartzi 2001; Benartzi and Thaler 2007; Thaler and Benartzi 2004), the decision of whether to be an organ donor (Johnson and Goldstein 2003; Lin et al. 2018), the selection of a healthcare insurance plan (Abaluck and Gruber 2011), or the choice of how much pollution to emit in the environment (Ellerman and Buchner 2007; Schultz et al. 2007). Within public administration, nudging-inspired studies have investigated how to increase diversity in the police workforce (Linos 2018); prevent burnout and resignations among street level bureaucrats (Linos, Ruffini, and Wilcoxon 2022); improve perceptions of government trustworthiness (Grimmelikhuijsen and Meijer 2014); enhance the probability of selecting talent into government jobs (Linos and Riesch 2020); limit the delinquency on mortgages (Moulton et al. 2015); escalate the collection of delinquent fines (Haynes et al. 2013); take up the consent for organ donations (Moseley and Stoker 2015); and promote healthy behaviors (Vlaev et al. 2016).

According to Benartzi et al. (2017), flu vaccination is a public policy area in which nudge interventions have proven more cost-effective than traditional interventions. In deciding whether to get a flu shot, public employees may potentially benefit from nudges because the consequences of immunization are delayed and difficult to envisage. People typically get flu shots only once a year. Moreover, the choice to get immunized against a novel virus may be even more rare. A few months after the breakout of the Covid-19 pandemic, the World Health Organization technical advisory group on behavioral insights and sciences for health suggested ways to increase vaccine acceptance and uptake by creating an enabling environment, harnessing social influences, and managing motivation (World Health Organization Technical Advisory Group 2020). All three approaches seem to naturally belong to the broader set of nudging-inspired interventions.

Since Herbert Simon's (1990, 1993) foundational work into the mechanisms for the positive selection of altruism, scholarship on other-oriented motivation and behavior has grown rapidly

across the social sciences. According to Simon's theorization, genuine altruism is an inevitable byproduct of human docility. In his perspective, docile individuals cannot help engaging in purely altruistic behavior due to their bounded rationality. Bénabou and Tirole's (2006) economic theory of prosocial behavior combines heterogeneity in individual altruism with reputational concerns. Drawing on Bénabou and Tirole (2006), Ariely et al. (2009) and Bellé (2015) experimentally demonstrate that extrinsic incentives are more effective in facilitating private, rather than public, prosocial activity. Moreover, Madrian (2014) and Beshears et al. (2016) have extensively researched nonstandard other-regarding preferences as a common psychological bias that violates classic economic assumptions about individuals' behavior. Their work investigates how governments can tackle market failures stemming from several possible causes, i.e. market structure, incentives of market participants, and agents' psychological biases. Nonstandard preferences, which are one of several types of biases, entail that individual choices may be other-regarding and also depend on how costs and benefits are framed. Within the same stream of research, Cooper and Kagel (2016) provide a review of theoretical and experimental literature on other-regarding preferences. This evidence suggests that prosociality may operate differently across various professions, calling for future theoretical and empirical research efforts to investigate this heterogeneity by exploring variations across jobs with varying degrees of prosocial impact. These comparisons could involve public healthcare workers compared to other public professionals, or comparisons among job types within the healthcare workforce.

Prosociality has also drawn extensive scholarship in allied social sciences, such as general management (Bolino and Grant 2016) and public administration (Bozeman and Su 2015; Christensen, Paarlberg, and Perry 2017; Ritz, Brewer, and Neumann 2016; Siciliano and Thompson 2022; Wright and Grant 2010). Prosocial behavior in the workplace refers to acts that are "intended to benefit coworkers, customers, teams, stakeholders, or the organization as a whole. In organizations, prosocial behavior may be either role-prescribed (i.e. in-role behavior) or discretionary (i.e. extra-role behavior)" (Bolino and Grant 2016:4). Relevant extra-role behaviors in public health organizations can certainly include employees' immunization and vaccination advocacy among colleagues. This is especially so when vaccination coverage is suboptimal (World Health Organization 2019). The job impact framework (Grant 2007) explains how the relational architecture of jobs may motivate employees to behave prosocially by connecting them to the impact of their actions on others. According to this model, the motivation to make a positive difference in other people's lives is fueled by the job impact on beneficiaries coupled with contact with beneficiaries. In the context of relational job design theory, beneficiaries are defined from the workers' perspective as "the people and groups of people whom employees believe their actions at work have the potential to positively affect" (Grant 2007:395). Beneficiaries, therefore, include clients and relevant others, such as family and friends. Experimental evidence shows that having a positive impact on beneficiaries improves compliance to guidelines (Grant and Hofmann 2011a), affects job preferences (Bellé and Cantarelli 2018; Cantarelli, Belle, and Longo 2020), and influences job decisions in a predictable way (Bellé, Cantarelli, and Belardinelli 2018; Cantarelli, Belle, and Belardinelli 2020). Similarly, randomized studies unveil that being in contact with beneficiaries improves task performance and reduces errors (Bellé 2013, 2014; Grant 2008, 2012; Grant and Hofmann 2011b). The relational job design theory capitalizes on the fact that meaningfulness is a job feature that is more valuable than career promotions, salary, job security and hours (Cascio 2003; Marvel and Resh 2019). Likewise, prosocial messages can play a crucial role in addressing two specific challenges among healthcare professionals: their overconfidence in personal immunity and their lack of awareness of being potential virus transmitters, which leads them to avoid getting vaccinated against the flu (Dunning, Heath, and Suls 2004; Klitzman 2006).

Observational studies suggest that seasonal influenza vaccine acceptance is positively correlated with the desire for the protection of the self, family and friends, and patients (Dini et al. 2018). Guidelines by the World Health Organization specifically dedicated to the implementation of successful influenza vaccination programs among health professionals suggest leveraging on their

need for protecting oneself and others (World Health Organization 2019). Consistent with research into how framing may influence the implicit goals that an individual adopts (Levin, Schneider, and Gaeth 1998), a small-scale online experiment has shown that citizens' intentions to get immunized and seek information about avian flu vaccination vary significantly across different benefit-target frames, with messages that emphasize benefits to society being more effective than messages framed in terms of benefits to the self (Kelly and Hornik 2016). A mega study conducted among patients with a primary care appointment in two health systems in the United States, however, found no effects of reminders emphasizing the benefits of a seasonal flu shot for self-protection, generic other-protection, or protection of a vulnerable loved one. Effects were in the desired direction of increased vaccination rates compared to usual care in which average coverage is 42%, but not statistically significant at the conventional levels (Milkman et al. 2021). Work applying the same logic finds that a "protect yourself" message increased the flu vaccination uptake by 2.7 percentage points among patients of a health system in the United States with an upcoming primary care visit, whereas a "protect a vulnerable loved one" prompt or a "protect others" prompt did not outperform the control message (Patel et al. 2023). Randomized research testing the causal impact that self- vs other-oriented messages can have on vaccination rates among the general population has been applied in the domain of Covid-19. Compared to a control message that generated a 29.4 vaccination coverage among pharmacy patients, different reminders targeted around the protection of self or generic others caused an increase in vaccination in a range from 2.6 to 2.1 percentage points. These effects are statistically indistinguishable from each other (Milkman et al. 2022). Similarly, with reference to a holdout arm, patients of a university in the United States were more likely to schedule an appointment to get the first dose of the Covid-19 vaccine and more likely to actually vaccinate when receiving a message emphasizing either self-protection or protection for family, friends, and community (Dai et al. 2021). Based on this evidence, we expect that nudging public healthcare employees to think about the positive impact that getting a flu shot for oneself can have on family, friends, and patients, may boost the probability of being willing to get vaccinated and advocate vaccination more than nudging workers to think about the benefits of self-protection.

Thus, we test the effectiveness of three different nudges directed at public professionals in a healthcare setting: 1) a nudge to think about the benefits of flu vaccination for themselves; 2) a nudge to think about the benefits of flu vaccination for their family and friends; and 3) a nudge to think about the benefits of flu vaccination for their patients. Given our review of theory and evidence from prior studies, just discussed, we expect the first (self-regarding) nudge to be less effective than the more prosocial, other-regarding nudges focused on family and friends and on patients in the healthcare setting. Testing these nudges may help advance ongoing research efforts aimed at gauging the effectiveness of psychological nudges that highlight the prosocial impact of one's behavior in comparison to cues that emphasize personal benefits (Capraro et al. 2019; DellaVigna and Linos 2022; Milkman et al. 2021).

Research design and procedure

We tested the three nudges using an online randomized controlled trial (RCT) that was embedded in an anonymous work satisfaction survey that is routinely administered to all the employees of two regional healthcare systems in Italy. The experiment took place between March and April 2019 in Region A and between October and November of the same year in Region B. Rates of influenza vaccination among public healthcare workers are largely suboptimal in both regions (in 2019: 32% in Region A and 33% in Region B; in 2021: 25% in Region A and 58% in Region B). Upon completion of the employee satisfaction survey, respondents were invited to take our RCT survey by clicking on an anonymous link that would redirect them to a Qualtrics questionnaire, which was totally separated and independent from the satisfaction survey. Participation in the experimental survey was voluntary and responses were anonymous. To ensure that subjects

were totally blind to our research question, respondents did not receive any prior information about the purpose of the experimental survey and the experimental question of interest was preceded and followed by a series of questions on unrelated topics regarding their job.

Respondents were asked about the probability - on a scale from zero to a hundred percent - that (i) they would get a flu shot and (ii) they would advocate for flu vaccination among their colleagues during the upcoming flu season. More precisely, the two questions read, “How likely is it that you will you get vaccinated against the flu during the next flu season?” and “How likely is it that you will encourage your colleagues to get vaccinated against the flu during the next flu season?” The outcome variables in our RCT are the stated probabilities of engaging in those two extra-role behaviors, i.e. getting immunized and encouraging colleagues to immunize. To control for any effects due to the sequence of the two questions, those were presented in a random order to participants.

Using the Qualtrics randomization feature, subjects were randomly assigned to four experimental arms, one for each type of beneficiaries. Professionals in the control group (*Ctrl*) directly answered the two outcome questions. Their peers in the three treatment arms did the same after being prompted to reflect on the positive impact that flu vaccination may have on three categories of beneficiaries, namely the respondent (*Self*), their family and friends (*Family & Friends*), or their patients (*Patients*). More precisely, professionals in the three treated conditions read the following messages, respectively, before stating their behavioral intentions: “By getting the flu shot, you protect yourself;” “By getting the flu shot, you protect your family and friends;” or “By getting the flu shot, you protect your patients.”

Respondents also indicated their job type, the type of organization they work for, and their gender. We use those demographic characteristics as control variables in our study.

Results

A total of 13,785 public healthcare professionals participated in our survey experiment. About 54% of our sample work for Region A and the remaining 46% work for Region B. Of the sample, 50% are nurses, 20% medical doctors, 12% administrative staff, 11% allied health professionals (e.g. diagnostic radiographers, nuclear medicine radiographers, magnetic resonance radiographers, medical/cardiac sonographers, radiation therapists, and medical laboratory technicians), 6% belong to other job types, and 2% did not provide any information about their job type. As for organizational type, 55% of the participants work in hospitals, 26% in ambulatory care settings, 16% in teaching hospitals, 1% in administrative agencies, and 2% did not indicate the type of organization they work for. Of the sample, 67% is female, 31% is male, and 2% did not say. [Table 1](#) reports the distribution of respondents along with the average and standard deviation of the outcome variables, separately for the pooled sample and each of the four experimental arms. As expected, due to randomization, these characteristics did not significantly differ across the experimental conditions.

[Figure 1a](#) displays the average probability P of getting a flu shot as reported by subjects in the four experimental arms. A series of Analyses of Variance (ANOVAs) show that, relative to the average stated intention of getting a flu shot for subjects in the *Ctrl* group ($p=52.29\%$, $n=3,453$), reminding healthcare professionals about potential benefits for themselves causes an increase that is not significant at the conventional levels (+1.66 percentage points, $p = .528$; $n=3,425$). Our data indicate more than a fifty percent probability of observing the effect that we did observe were the true average treatment effect equal to zero. Thus, we cannot rule out the possibility that the true effect is different from zero. However, we observed a significant positive effect for those in the *Family & Friends* nudge (+ 3.73 percentage points, $p = .001$; $n=3,466$) and in the *Patients* nudge (+4.44 percentage points, $p < .001$; $n=3,441$). The difference between the *Family & Friends* and *Patients* nudges (+.72 percentage points) is statistically insignificant ($p=1.000$). Whereas the *Self* nudge was less effective than the *Patients* intervention

Table 1. Summary statistics for the pooled sample and each of the experimental arms.

Obs.	13785	54.75 (40.43)	56.75 (37.51)	3453	52.29 (40.65)	53.81 (37.84)	3425	53.95 (40.58)	56.13 (37.73)	3466	56.02 (40.44)	57.93 (37.45)	3441	56.73 (39.91)	59.12 (36.79)
Job family															
Administrative staff	1647	49.07 (40.73)	50.49 (37.67)	415	46.87 (41.36)	46.00 (37.70)	388	47.12 (40.91)	49.16 (37.99)	422	51.98 (40.21)	52.40 (37.32)	422	50.12 (40.38)	54.21 (37.31)
Nurses	6859	48.55 (39.93)	51.59 (37.15)	1719	47.23 (39.93)	49.98 (37.26)	1715	47.89 (39.83)	51.04 (37.22)	1721	48.17 (40.06)	51.49 (37.22)	1704	50.90 (39.82)	53.86 (36.83)
Medical doctors	2786	76.11 (34.00)	75.78 (31.64)	689	74.25 (34.96)	72.89 (33.17)	679	77.30 (33.81)	77.09 (31.11)	717	76.82 (33.50)	77.14 (30.72)	701	76.04 (33.71)	75.95 (31.45)
Allied health professionals	1482	50.42 (40.31)	52.04 (37.77)	349	45.23 (39.78)	47.14 (37.57)	386	45.69 (40.58)	47.26 (38.10)	356	55.80 (39.88)	55.61 (37.70)	391	54.82 (39.92)	57.87 (36.61)
Others	786	53.75 (40.30)	55.96 (37.49)	216	47.46 (40.71)	50.36 (37.91)	188	55.92 (38.37)	58.93 (35.94)	194	57.25 (42.12)	58.49 (38.71)	188	55.19 (39.27)	56.81 (36.84)
NA	225	53.01 (39.60)	58.13 (36.12)	65	41.72 (37.62)	50.00 (38.02)	69	54.03 (40.11)	57.86 (36.51)	56	58.42 (40.79)	64.30 (35.43)	35	63.31 (36.83)	63.91 (30.94)
Organization type															
Hospital	7566	55%		1907	55%		1848	54%		1922	55%		1889	55%	
Ambulatory	3572	26%		907	26%		888	26%		862	25%		915	27%	
Teaching hospital	2167	16%		525	15%		552	16%		554	16%		536	16%	
Administrative agency	166	1%		28	1%		50	1%		44	1%		44	1%	
NA	314	2%		86	2%		87	3%		84	2%		57	2%	
Gender															
Female	9184	67%		2310	67%		2280	67%		2287	66%		2307	67%	
Male	4313	31%		1056	31%		1067	31%		1107	32%		1083	31%	
NA	288	2%		87	3%		78	2%		72	2%		51	1%	

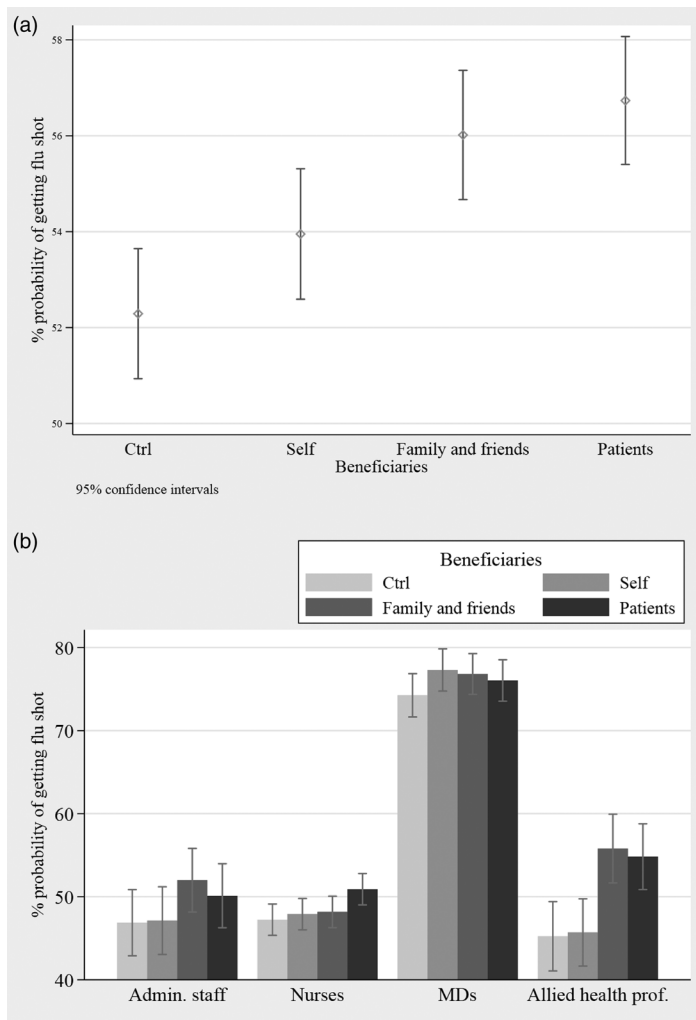


Figure 1. a. Average percentage self-reported probability that workers will get vaccinated against seasonal influenza, by beneficiary. b. Average percentage self-reported probability that workers will get vaccinated against seasonal influenza, by beneficiary, by respondents' job family.

(-2.78 percentage points, $p = .026$), the difference in impact relative to the *Family & Friends* prompt was not statistically significant at the standard levels (-2.06 percentage points, $p = .203$).

Figure 1b provides a breakdown of respondents' probability of getting immunized by their job type. Among subjects in the *Ctrl* arm, the stated probability of getting a flu shot is, on average, higher for medical doctors ($p=74.25\%$) compared to nurses ($p=47.23\%$, $p < .001$), administrative staff ($p=46.87\%$, $p < .001$), and allied health professionals ($p=45.23\%$, $p < .001$), which do not significantly differ from each other ($p=1.000$ for all pairwise comparisons). In other words, medical doctors tend to show a higher baseline propensity to get immunized relative to the other job types.

Among medical doctors ($n=2,786$) and administrative staff ($n=1,647$), we do not detect any significant differences in the probability of getting a flu shot across the four experimental arms. As to nurses ($n=6,859$), those in the *Patients* ($n=1,704$) arm reported a higher propensity of getting immunized relative to their counterparts in the *Ctrl* ($n=1,719$) condition (+3.67 percentage points, $p = .043$). Finally, for allied health professionals ($n=1,482$), probabilities of getting a flu shot were higher for those in the *Patients* ($n=391$) and those in the *Family & Friends*

($n=356$) nudges and lower for their peers in the *Ctrl* ($n=349$) and *Self* ($n=386$) conditions. More precisely, those exposed to the *Patients* nudge tend to report a probability of getting immunized that is 9.58 percentage points higher relative to the *Ctrl* ($p = .007$) and 9.13 percentage points higher compared to those in the *Self* arm ($p = .009$). Similarly, subjects prompted to think about the positive impact of immunization for their *Family & Friends* reported a probability of getting the seasonal flu shot that is 10.56 percentage points higher relative to the *Ctrl* ($p = .003$) and 10.10 percentage points higher compared to those in the *Self* arm ($p = .004$).

Figures 2a and 2b suggest a similar pattern of results for the second outcome variable, i.e. the stated intention of advocating flu vaccination among colleagues. More precisely, Figure 2a shows the mean stated probability of encouraging coworkers to get a flu shot across the four experimental arms. Relative to the *Ctrl* group ($p=53.81\%$, $n=3,453$), the stated probability of advocating flu vaccination at work is marginally higher among participants prompted to reflect on personal benefits (+2.32 percentage points, $p = .061$; $n=3,425$). However, the effect is more sizable and significant for the nudges focused on *Family and Friends* (+4.12 percentage points, $p < .001$; $n=3,466$) and especially *Patients* (+5.31 percentage points, $p < .001$; $n=3,441$). The

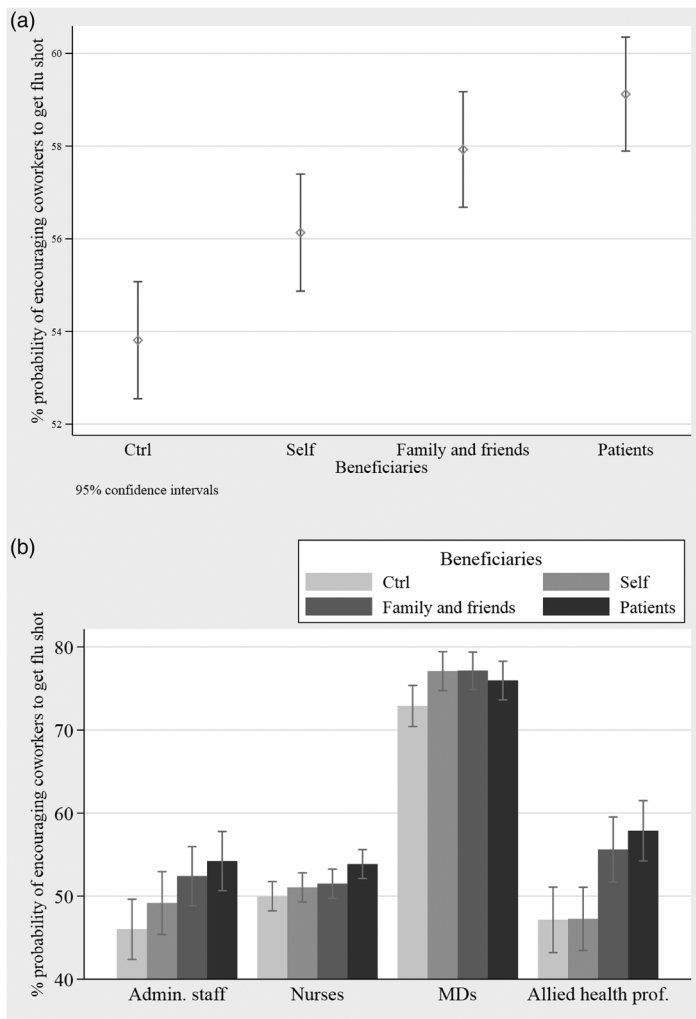


Figure 2. a. Average percentage self-reported probability that workers will advocate vaccination against seasonal influenza among colleagues, by beneficiary. b. Average percentage self-reported probability that workers will advocate vaccination against seasonal influenza among colleagues, by beneficiary, by respondents' job family.

difference between these two conditions is statistically negligible (1.20, $p=1.000$). The *Self* intervention was outperformed by the *Patients* nudge (-2.99 percentage points, $p = .006$), but not by the *Family and Friends* nudge (-1.79 percentage points, $p = .281$).

Figure 2b provides a breakdown of the probability of encouraging immunization at work by job type. Among subjects in the *Ctrl* arm, the stated probability of advocating flu vaccination among colleagues is, on average, higher for medical doctors ($p=72.89\%$) compared to nurses ($p=49.98\%$, $p < .001$), administrative staff ($p=46.00\%$, $p < .001$), and allied health professionals ($p=47.14\%$, $p < .001$), which do not significantly vary from each other ($p=1.000$ for all pairwise comparisons). Averaging across job types, subjects tend to report a 2.18 percentage point higher probability of advocating flu vaccination among colleagues rather than getting immunized themselves ($p = .021$).

Among medical doctors ($n=2,786$), we do not detect any significant differences at the .05 level in the probability of advocating flu vaccination across the four experimental arms. However, the propensity to promote immunization is marginally higher for those exposed to the *Family & Friends* nudge (+4.25 percentage points, $p = .071$; $n=717$) compared to their peers in the *Ctrl* group ($n=689$). Among nurses ($n=6,859$), then, only those in the *Patients* arm ($n=1,704$) tend to report a higher propensity of advocating immunization relative to their counterparts in the *Ctrl* ($n=1,719$) condition (+3.88 percentage points, $p = .013$). As to allied health professionals ($n=1,482$), the probabilities of advocating vaccination were higher for those exposed to the *Patients* nudge ($n=391$) and those in the *Family & Friends* ($n=356$) arm and lower for their peers in the *Ctrl* ($n=349$) and *Self* ($n=386$) conditions. More precisely, those who received the *Patients* nudge tend to report a probability of advocating immunization that is 10.72 percentage points higher relative to the *Ctrl* ($p = .001$) and 10.61 percentage points higher compared to those in the *Self* arm ($p = .001$). Similarly, those in the *Family & Friends* arm tended to report a probability of advocating immunization that is 8.47 percentage points higher relative to the *Ctrl* ($p = .017$) and 8.35 percentage points higher compared to those in the *Self* arm ($p = .015$). Finally, as to the administrative staff ($n=1,647$), the probability of advocacy reported by those in the *Ctrl* arm ($n=415$) tend to be significantly lower than those exposed to the *Patients* ($n=422$) nudge (-8.21 percentage points, $p = .010$) and marginally lower than those in the *Family & Friends* ($n=422$) condition (-6.40 percentage points, $p = .083$).

To summarize, averaging across job types, we find as expected that the *Self* nudge was ineffective compared to the *Ctrl* condition, whereas both the *Family & Friends* nudge and especially the *Patients* nudge had a positive impact on both our outcome variables. The *Family & Friends* nudge did not outperform the *Self* message, whereas the *Patients* nudge did.

Discussion and implications

Our large-scale randomized controlled trial with public healthcare professionals tested the effect of nudges that emphasize the positive impact of flu vaccination on different categories of beneficiaries on the stated probability of getting vaccinated and encouraging vaccination among coworkers, thus connecting research into nudging and prosociality in a mission-driven public administration context. In the context of an extra-role behavior such as immunization decisions, highlighting the positive impact on different categories of beneficiaries may be useful to clarify the relationship between choice and welfare outcomes (i.e., a mapping). Thus, highlighting professionals' prosocial impact is a supposedly irrelevant factor that public administrators can, indeed, use to nudge immunization among public employees, especially in those cases in which vaccination coverage is largely suboptimal.

Our survey experiment adds valuable evidence to existing efforts aimed at increasing flu vaccination uptake among healthcare workers (Barbara et al. 2020). Although the size of the effects induced by our experimental manipulations is smaller compared to the average effect of nudging interventions reported in research published in academic journals (DellaVigna and Linos

2022), the fact that the impact goes in the desired direction might still bring practical relevance. Firstly, our data consistently show that the intention to vaccinate and to promote vaccination in the workplace were higher when subjects were nudged to reflect on the positive impact on others, namely their family and friends and their patients. Taking stock of these findings and related evidence (Bellé 2013; Grant 2008), choice architects in public administration can nudge immunization behaviors for the greater good by activating individuals' motivation to make a prosocial difference in other people's lives. Additional analyses of our data reveal that emphasizing the self-protection generated by the flu shot is no more effective than not mentioning any benefits at all. This finding, thus, warns policy makers against the use of nudges that prompt personal benefits for prosocial behaviors. Furthermore, the use of prosocial nudges for desirable conduct might better leverage different categories of others. Recent work measuring actual vaccination rates has investigated the impact of prosocial messages focused on generically defined others (Dai et al. 2021; Milkman et al. 2021, 2022). Our work, therefore, might add valuable nuances to this scholarship by isolating the unique impact of prompting reflection on different categories of others. Relatedly, our survey experiment provides additional evidence to the minority of studies that specifically target the impact of prosocial nudges on flu vaccination among healthcare workers (Ng et al. 2020), compared to the majority of work focused on the effect of prosocial messages on flu or Covid-19 vaccination among patients of a healthcare system or the general population (Dai et al. 2021; Milkman et al. 2021, 2022; Patel et al. 2023).

Secondly, averaging across the four experimental arms (i.e., control, self, family and friends, or patients), the mean probability of advocating for immunization in the workplace was higher than the mean propensity to getting immunized. This result seems to resonate with studies on self-persuasion (Aronson 1999; Bellé 2013; Elms 1966; Gordijn, Postmes, and de Vries 2001; Wright and Grant 2010) showing that individuals are more likely to adopt desirable behaviors when they are involved in advocating that desired behavior among others compared to when they are being persuaded. Experienced policy makers and public administrators may design immunization campaigns taking into account these insights.

Thirdly, our data reveal that the effect of manipulating the type of beneficiaries to encourage the uptake of prosocial behaviors was moderated by professionals' job type. On the one hand, averaging across the four experimental arms, the baseline probability of getting immunized and advocating for immunization was higher for medical doctors relative to nurses, allied health professionals, and administrative staff. Hence, in line with existing evidence (Durovic et al. 2020), different types of healthcare professionals have different baseline motivation to get the flu shot. A recent contribution of Brody and colleagues (2022) demonstrates that informational nudges devised to enhance intentions to vaccinate against the seasonal flu by targeting misconceptions are more effective for those with lower levels of motivation. On the other hand, the nudge emphasizing the positive impact on patients turned out to be effective in improving the average propensity of getting vaccinated among nurses and allied health professionals only. These job types, indeed, may be the ones that spend more of their working time caring for patients as compared to the other job types included in our study. As far as the average availability of advocating for immunization is concerned, instead, the prompt that getting the flu shot protects patients outperformed other messages for nurses, allied health professionals, and administrative staff but not for medical doctors. Other speculative explanations of the heterogeneous effects of our manipulations across job types may come from scholarship suggesting that healthcare professions might differ in terms of overconfidence about personal immunity, awareness of serving as virus transmitters, consciousness about the severity of the disease and its chained consequences, or salience of the prosocial impact of their efforts (Dunning, Heath, and Suls 2004; Grant 2008; Klitzman 2006; Meckawy et al. 2023). These findings raise a warning for the untailed use of nudges and manipulation of supposedly irrelevant factors. It is important to note that our research design does not permit the elucidation of certain causal mechanisms underpinning our experimental results, such as the causal factors contributing to heterogeneity across job types.

Overall, our work seems to provide the following contributions to scholars and practitioners alike interested in applying behavioral science evidence to public administration and policy (Battaglio et al. 2019; Grimmelikhuijsen et al. 2017; James, Jilke, and Van Ryzin 2017; Madrian 2014; Nagtegaal et al. 2019). To the best of our knowledge, attempts to bridge the nudge theory (Thaler and Sunstein 2008) and research into prosociality at work (Bolino and Grant 2016) are still at their infancy across disciplines. From a theoretical standpoint, as “employees are likely to provide help to beneficiaries beyond the prescriptions of their jobs” (Grant 2007:404) when their motivation to make a prosocial difference is fueled, extra-role prosocial behaviors seem to be a natural candidate for nudging interventions in mission-driven jobs. While not being a job mandate, that conduct presents the opportunity to make others better off. From an empirical viewpoint, our data show that emphasizing the prosocial impact of their choices at no additional costs for their organizations can motivate public servants to engage in other-oriented behavior that makes individuals and society better off. Thus, altering the visibility of job impact is a supposedly irrelevant factor available to good choice architects. Another contribution of our work lies in increasing the number of large-scale survey experiment with public sector employees, which are still an exception rather than the norm in the public administration field (Meyer-Sahling, Mikkelsen, and Schuster 2019). Thirdly, our RCT provides a nuanced understanding of two complementary outcome variables related to the intent of vaccinating against the seasonal influenza. Indeed, it tests the effect that messages highlighting the positive impact on different categories of beneficiaries cause on both the probability of getting immunized and the probability of advocating for immunization among colleagues. This has valuable implications for practitioners working on designing vaccination campaigns. The fourth contribution of our RCT is to the boundary conditions that may enhance or diminish the hypothesized effect of any nudging interventions. Indeed, respondents’ job type moderated the pattern of our results. Thus, altering the architecture of relations to nudge choices toward the individual and societal good requires the identification of the categories of beneficiaries that is most effective in activating the motivation to make the difference for different professions.

Limitations

Our study, of course, is not without limitations. Firstly, our outcome variables consist of stated rather than revealed preferences. Our work shares this limitation with previous studies that address analog research questions in different settings (Belle and Cantarelli 2021; Kelly and Hornik 2016). In light of scholarship showing that a given intervention generate differential effects when the outcome is vaccination intention or actual vaccination (Dai et al. 2021), observing actual behavior would certainly have been preferable and allowed ruling out social desirability bias. Unfortunately, this was not a viable option at this stage due to ethical and practical constraints. Nonetheless, we are convinced that our findings may provide valuable insights to healthcare organizations designing communication campaigns aimed at increasing vaccination uptake among their workers.

Secondly, although best suited to estimate the magnitude of the average causal effect of the treatments on the outcome variables, our RCT is unable to explain the mechanisms underlying that effect. Other research designs, most notably parallel designs (Imai, Tingley, and Yamamoto 2013), are better equipped to examine the process through which any behavioral change plays out. By hypothesizing that the relational job architecture influences behaviors through the mediation of three psychological states – namely the perceived impact on beneficiaries, the affective commitment to beneficiaries, and the motivation to make a prosocial difference – the job impact framework (Grant 2007) lends itself naturally to parallel design tests that can disentangle the overall, direct and indirect causal effects of the mediating factors.

Lastly, as with most randomized controlled trials, our inference is not immune to external validity threats. Although generalizability of the study results beyond the healthcare setting

to other categories of public sector employees cannot be taken for granted, external validity concerns are somewhat toned down by the fact that healthcare workers comprise more than twenty percent of the public workforce in Italy. Moreover, influenza vaccination has proven key for ensuring government preparedness by preserving the health and availability of health care workers during previous health crises (Prematunge et al. 2012). According to the World Health Organization, “health-care workers are an important priority group for influenza vaccination” and their immunization “should be considered part of a broader infection control policy for health-care facilities” (World Health Organization 2012:475). Furthermore, comparisons between administrative and clinical workers in our sample may serve as an informative proxy to gauge the generalizability of our findings beyond health-care settings. Indeed, the administrative personnel employed at public organizations that belong to different industries within the Italian public sector, which amount to 23% of the public workforce (Ministero dell’Economia e delle finanze 2020), share significant similarities in terms of background, status, job requirements, and working arrangements (e.g. hours, salary, and career paths).

External validity concerns may also be counterbalanced by the large size of our sample, by the contextual realism of the task, and by the replication of the same RCT in two different regional healthcare systems. Nevertheless, concerns about the generalizability of results to naturally occurring settings are legitimate. In particular, the degree to which our results focused on the stated intentions to engage in immunization behavior are generalizable to actual immunization conduct is yet to be tested. Natural field randomized controlled trials can add valuable evidence to the debate by uncovering any environmental boundary conditions under which emphasizing the positive impact on beneficiaries is a powerful nudge to increase immunization coverage against influenza among public professionals. More generally, natural field experiments could test the generalizability of the pattern of our findings by varying types of units, treatments, operations, and settings (Shadish, Cook, and Campbell 2002).

Conclusions

Evidence from the behavioral sciences can provide powerful tools to alter the decisions of public and healthcare workers in ways that make them and their clients better off. Our work represents one of the first attempts in this direction by theorizing and testing whether a low-powered message that emphasizes the positive impact of one’s action on different categories of beneficiaries increases the intention to engage in an extra-role high-stakes behavior, namely the probability to get immunized and advocate for immunization against the seasonal influenza, among public healthcare workers. Massive vaccination campaigns pose serious implementation challenges and are key for public health. By adopting Thaler and Sunstein’s (2008) six principles of good choice architecture (i.e., NUDGES), more behavioral public administration work using rigorous research designs – that include but are not limited to RCT – can provide novel findings to the broader social sciences and improve public policies. Our findings resonate with extant scholarship on how policy design can be informed by insights from behavioral research that is being conducted across disciplines, such as economics, management, and public administration. More precisely, our results suggest that prosocial nudges may serve as a cost-effective tool that public organizations and their managers can use to increase vaccination coverage among their workforces. More broadly, our study aims at contributing to recent efforts that a fast-growing number of government and research institutions around the globe have undertaken over the last decade. Such initiatives tend to be inherently interdisciplinary and share a common goal of solving pressing social and economic issues by applying insights from behavioral science (Benartzi et al. 2017; DellaVigna and Linos 2022; Hummel and Maedche 2019).

Acknowledgments

This research is an integral component of a collaborative project conducted in partnership with two Italian regional governments, for whose invaluable support and collaboration we extend our sincere gratitude: Regione Toscana and Regione del Veneto – Azienda Zero. Additionally, we express our heartfelt appreciation to the Editors for their insightful guidance, which significantly enriched the quality of this study.

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