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Essays on Patient and Firm Behavior in Health Economics

Author

Hong, Nianyi

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Essays on Patient and Firm Behavior in Health Economics

by

Nianyi Hong

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Committee in charge:

Professor Benjamin R. Handel, Chair
Professor Jonathan T. Kolstad
Professor Ziad Obermeyer

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Abstract

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The first chapter, co-authored with Allyson B. Root and Benjamin R. Handel, studies how information and behavioral nudges impact patient behavior in end-of-life care. Despite the substantial economic and personal implications of end-of-life health care decisions, many fail to document their wishes or select a representative to make medical decisions on their behalf. Descriptive evidence suggests that this can result in sub-optimal outcomes including dissatisfaction and unnecessary medical spending, but it is not well understood why patients fail to engage in this high-value planning. We conduct an initial and subsequent intervention to facilitate advance directive (AD) completion in the patient population of our partner, Providence St. Joseph Health (PSJH). Using a randomized control trial, we find a significant 5 percentage point increase in AD completion with physical letter reminders tied to future primary care appointments, doubling the completion rate in the patient population from the start of the study. In addition, we find that including the physical AD form with paper letters as a nudge to decrease hassle costs increases AD completion 9 percentage points compared to no intervention. Our evidence also suggests that these interventions are more effective for older individuals, who are also less sensitive to the type of intervention. Back-of-the-envelope calculations suggest that it would cost $38 for every additional AD form completion using paper letters and included AD forms, compared to costless electronic reminders. However, we find no significant effects in AD completion from the initial intervention involving in-person AD drives and electronic videos.

In the second chapter, co-authored with Benjamin R. Handel, Lynn M. Hua, and Yuki Ito, we study health plan choice and health plan menu design with 13 years (2008-2020) of health claims and health plan choice data from the California Public Employees' Retirement System (CalPERS). We develop a choice model that predicts the number and type of subscribers moving across plans under different plan environments, as a function of (i) plan premiums, (ii) plan cost-sharing, and (iii) plan brand. We find that (i) subscribers overweight premiums relative to out-of-pocket spending by a factor of roughly five to one, in line with other

literature, and (ii) subscribers place meaningfully differential values on plan brands. We find that these preferences, especially for plan brand, depend crucially on whether a subscriber's family is sick or healthy. We also find some evidence of risk adjustment blunting adverse selection in our market while it was implemented from 2014-2018, although due to inertia the effects were relatively mild. Finally, we present counterfactual scenarios for future enrollment with and without risk adjustment and inertia.

Contents

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Chapter 1

Deferring Agency at End-of-Life: The Role of Information, Nudges, and Advance Directives

1.1 Introduction

End-of-life decision-making has become increasingly relevant to Americans, especially given the aging population of the country. A 2013 Pew Research survey found that 47% of adults have had experience with the terminal illness of a close friend or family member within the past five years, of which the issue of withholding life sustaining treatment came up in roughly half the cases (Pew Research Center, 2013). Demographic changes including declines in fertility rate and increases in life expectancy predict that by 2030, an estimated 1 in 5 Americans will be 65 years old or older (Anderson et al., 2012; U.S. Census Bureau, 2018). Of this population of adults over the age of 65, nearly half report giving a great deal of thought to their own wishes for end-of-life medical treatment. In addition, in a large sample of all individuals dying between 2000 and 2006, around 43% required decision-making about treatment in the final days of life, most of whom were no longer able to make these decisions for themselves (Silveira et al., 2010).

End-of-life care is also of substantial economic importance. In the United States, estimates suggest that between 8 and 13 percent of all medical spending occurs in the last year of life (Emanuel and Emanuel, 1994; Aldridge and Kelley, 2015; French et al., 2017). These numbers are especially large in the Medicare population, with care for patients in the last year of life accounting for around a quarter of yearly Medicare spending or nearly 4% of the entire federal budget (Hogan et al., 2001). Average out-of-pocket medical expenses in the last year of life approached $\$12,000$ in 2006, with the 90th percentile paying roughly $\$29,000$ (Marshall et al., 2010). For total spending, including that paid by insurance, these numbers are even starker, reaching $\$80,000$ per capita in the last year of life and $\$160,000$ over the last three years of life (French et al., 2017).

Despite these significant outlays, care often appears not to align with the wishes of patients and their families. Over 80% of individuals state that they want to avoid hospitalization and intensive care at the end-of-life and most prefer to die at home; yet over 20% of Medicare deaths occur in a hospital (Dartmouth Atlas, 2017; Higginson and Sen-Gupta, 2000; Jha, 2018). One survey of family members of hospitalized patients who ultimately died found that 30% reported dissatisfaction with communication and decision-making (Baker et al., 2000). Furthermore, multiple studies find no evidence that higher spending leads to improved life expectancy, and even that patients who forgo aggressive care in favor of palliative care live longer (Dartmouth Atlas, 2017; Skinner and Wennberg, 1998; Temel et al., 2010).

Even with statistics suggesting that older adults and adults with terminal illnesses think about end-of-life care and have significant financial incentives to do so, advance directives (ADs) and advance care planning (ACP) are still underutilized, although that number has been on the rise over the last decade (Silveira et al., 2014). A large meta-analysis of U.S. advance directive usage suggests that roughly two-thirds of adults do not have an AD on file, as well as nearly a third of patients who ultimately require surrogate decision-making (Yadav et al., 2017; Silveira et al., 2010).

Advance directives can help individuals better align their wishes with their medical treatments. An AD (also known as a living will) is a written legal document regarding an individual's preferences for medical care if he or she is no longer able to make decisions. An AD can force the individual to make many choices, including power of attorney, life support options, feeding tube preferences, CPR decisions, and organ donation, through a number of different states of health such as terminal illness, vegetative state, and extraordinary suffering. Advance directives have been shown to better align patient care and treatments with his or her end-of-life wishes (Detering et al., 2010; Silveira et al., 2010; Brinkman-Stoppelenburg et al., 2014) and lower health care utilization without affecting satisfaction or mortality in nursing homes (Molloy et al., 2000), all while decreasing end-of-life health care spending (Nicholas et al., 2011). Advance directives and advance care planning have also recently been promoted by the federal government, with Medicare starting to reimburse for ACP in 2016. Given these clear benefits, it is not well understood why many patients fail to engage in advance care planning and ultimately face care that may be misaligned with stated preferences. Many potential explanations include lack of information, forgetfulness, hassle costs, fear of death, and inattention. In our study, we investigate two of these potential mechanisms: (i) lack of information and (ii) procrastination because of hassle costs.

In this chapter, we study advance directive take-up, barriers to completion, and utilize simple intervention strategies to improve completion. We conducted an initial and subsequent intervention to test strategies to encourage and facilitate completion of ADs, with our initial intervention informing the subsequent. In addition, within each intervention round we tested multiple strategies to increase AD completion. In July and August 2018, we piloted two initiatives aimed at increasing AD completion across two Oregon PSJH primary care clinics: (i) an electronic reminder for AD completion with a "digital prescription" to ACP Decisions educational materials and (ii) in-person "AD Drives" which were held with access to witnesses and notaries to validate the AD and assistance in uploading the document to

their EMRs.

The first of the two interventions in this initial round included electronically distributed informational videos and materials to patients, to lower information frictions. This intervention was randomly assigned and distributed to half of eligible patient population in each of the two sample clinics. We find no significant effect of the electronic information intervention on AD completion, which we attribute to very low view rates. The second of the two interventions consisted of "AD Drives" at one of the two clinics, chosen at random, of which we informed patients at the clinic. Low attendance at the "AD Drives" contribute to no significant effect of these drives. However, we find that in our population without an email on file, in which individuals were sent physical letters, there was a 4.5 percentage point increase in AD completion in the clinic which hosted the drive.

This initial intervention resulted in substantial and helpful feedback for the design of our subsequent iteration that was conducted between September 2019 and March 2020. The subsequent intervention consisted of an RCT with six intervention arms including behavioral nudges to increase AD completion.

The lack of significant results of the initial intervention suggested the first interventions offered did not do enough to reduce hassle costs and provide information in an easily consumable way to individuals. Attendance at the drives was fairly low—around 30 patients total—and knowledge on ADs was low. The electronic informational outreach component of the pilot also faced issues of low take-up and viewership. Patients appeared to respond to the Notification email—1.5% of the target population uploaded an AD in the month following the outreach. However, there was no significant difference between the group that received the information intervention and the group that did not, and few clicked through to the materials. Our limited outreach made it difficult to improve completion significantly.

Therefore, our subsequent intervention took several steps to address these issues of low take-up. First, we tie the outreach to patients who have an upcoming primary care appointment. Patients thus have a built-in opportunity to drop off their AD for upload and may be more likely to review materials in preparation for their appointment. Additionally, this round focused on paper letter outreach, included in four of the six intervention arms, based on the results that we saw from the initial pilot suggesting this was a more suitable method of communication for our patient population. Finally, we prioritize lowering hassle costs, as our low attendance and viewership of the materials in the first round suggested that individuals may need gentle nudges to increase take-up.

We designed the intervention arms of the subsequent intervention to focus on decreasing hassle costs and lowering information frictions. This was done in three ways in our physical communications: (i) AD forms were included in some communications to decrease the hassle cost of physically finding and printing the form, (ii) a shorter AD form was supplied in some arms to simplify the completion process, and (iii) additional informational brochures on advance care planning were included in the last arm of the intervention.

In this subsequent intervention, we find that the written letter alone, tied to primary care appointments, leads to a statistically significant 5 percentage point increase in AD completion compared to no intervention. In addition, including the AD form with the physical letter

further increased this completion to 9 to 10 percentage points over completion in the control group, with estimates statistically significant and not sensitive to addition of demographic controls. Both of these effects are on top of a base rate AD completion rate of 5.8% for the general population at our chosen clinics, indicating a more than doubling of the completion rate in our subset of individuals. Finally, subsetting our intervention by age suggests that our intervention has larger effects for older populations, with this older population also being less sensitive to the type of intervention, increasing AD completion by roughly 15 percentage points for patients age 75 and older, regardless of intervention type. A quick back-of-the-envelope calculation reveals a cost of roughly $\$30 - 100$ per additional completed AD for our patient population, compared to a costless electronic intervention. Our results suggest that these simple, lost-cost nudges and interventions can be extremely effective in increasing advance directive completion, improving advance care planning, and ensuring that patients' preferences are followed and aligned with their actual care.

Our interventions key in on two aspects that we believe are vital to improving advance directive completion: information and hassle costs. While physicians have generally have positive attitudes about ADs with roughly 80 percent regarding them well (Davidson et al., 1989), patients were substantially less knowledgeable. Patients often have severe misconceptions about life-sustaining treatments, even after conversations about such treatments and advance directives (Fischer et al., 1998). Although more than 90% of patients were aware of the living will and advance directive, only about a third were knowledgeable with the correct definition or circumstances in which it applied (Jacobson et al., 1994). Similarly, patients have frequently confused living wills with actual wills and cited both lack of control and lack of knowledge as impediments to greater AD usage (Elder et al., 1992).

Patients may also have information frictions around ACP. For example, patients may not know their likelihood of requiring proxy decision-making, what care they would likely receive in the absence of an AD, or their preferences regarding this care. Halpern et al. (2013) found that seriously ill patients are influenced in their decision between comfort and life extension oriented care by which option is the default on the AD form. A proposed explanation for this behavior is that patients don't have strong preferences about their end-of-life care, but a lack of information could also explain these results. There is some evidence that providing easy to read ADs and information about related decisions increases completion rates (Sudore et al., 2017). As such, our study includes information interventions to provide patients with additional knowledge regarding advance care planning.

Finally, as mentioned previously, completing a legally valid AD and integrating it with the patient's medical records can be complex and confusing. While the AD form itself is not difficult to complete, asking only simple questions, it many require making uncomfortable decisions or decisions that the individual may not have previously considered. In addition, many states require it to be notarized or signed by multiple witnesses, who are not permitted to be the patient's family or medical care providers (California Department of Justice, 2017). People may be deterred by these hassle costs and avoid planning for end-of-life care until it's too late (Baicker et al., 2015). In this case, an intervention that lowers the immediate hassle costs of completing ADs and encourages patients not to procrastinate could be successful in

increasing completion rates.

Other economic research suggests that gentle nudges can improve uptake in a number of areas from voter registration to retirement savings and organ donation (Thaler and Sunstein, 2009). Traditional theory and the substantial literature behind it shows that financial incentives can increase take-up for many health behaviors including smoking cessation, exercise, healthy eating, and medication compliance (Volpp et al., 2009; Halpern et al., 2015; de Walque, 2020). In addition, recent behavioral economics studies suggest that interventions that range from changing defaults, changing the framing of situations, and preferences for more salient characteristics may significantly alter decision-making (DellaVigna, 2009). Looking at the incomplete take-up of the EITC among low-income families, Bhargava and Manoli (2015) find that simplification and heightened salience of benefits drastically increases claiming of these benefits; we follow many of the same approaches that they use. The health literature in particular shows that small behavioral nudges may improve health outcomes by a greater extent than a simple financial incentive; lottery-based and team incentives have improved adherence to medication (Kimmel et al., 2012), completion of health risk assessments (Haisley et al., 2012), and weight loss (Volpp et al., 2008). Therefore, we evaluate interventions that add gentle nudges to fill out AD forms, as well as ways to lower the hassle costs of this activity by providing the forms, notaries, and witnesses needed for a legally-binding document. Lastly, we tie our outreach to physician appointments to give patients a convenient way to hand off the forms, to remind them to focus on their health, and as an expert to ask questions if they have any.

The remainder of this chapter is structured as follows: Section 2 describes the background and context of our experiments, including more information about advance directives. Section 3 describes the initial intervention and and its results while Section 4 presents the subsequent intervention. Section 5 presents a discussion of the results, its implications, and concludes.

1.2 Background and Setting

Advance Directives

In the United States, an advance directive is a legal document document in which an individual specifies what actions should be taken for their health if they are no longer able to make such decisions for themselves because of illness or incapacity. For our study, we will be focused on advance directive usage in Oregon. The advance directive that we focus on has sections dedicated to choosing health care proxies, directions for these proxies, and gives scenarios and decisions for end-of-life care if the individual is unable to choose for him or herself in the future.

While the AD form is usually not difficult to fill out, the decisions can be difficult and require stark conversations about death and treatments that individuals may wish to postpone or avoid. Furthermore, since the advance directive is a legally binding document, patients

need either a notary or other witness declaration, along with the signature of the future health care representative him or herself. There is also evidence that patients do not know much about advance directives.

While anecdotal evidence has suggested that younger adults have taken a more active role in learning about end-of-life care and recent events have also sparked learning in end-of-life care, there is still substantial room for improvement (Cummins, 2020). Improved advance care planning and completion of advance directives may help to reduce the discrepancy between the care that patients want and the care that they ultimately receive. Observational evidence suggests that ADs influence decisions made by care providers at the end of a patient's life toward alignment with the patient's own preferences. Subjects who indicate limited treatment or comfort care (over 90% of individuals with ADs) are more likely to receive that type of care than those who do not complete an AD; at the same time, patients who indicate a preference for receiving all life-prolonging treatments possible are more likely to receive their preference as well (Silveira et al., 2010). Though there is still limited experimental evidence on the effects of ADs and ACP, one recent randomized control trial found that end-of-life wishes were much more likely to be known and followed for patients receiving facilitated ACP than for those who received usual care (Detering et al., 2010; Brinkman-Stoppelenburg et al., 2014).

Advance care planning, including having an advance directive or durable power of attorney (DPOA) is also associated fewer in-hospital deaths and increased use of hospice care (Bischoff et al., 2013). Patients who do not report having end-of life discussions on average report higher rates of aggressive care, which is in turn associated with worse patient quality of life (Wright et al., 2008). Finally, from a financial standpoint, while more evidence is needed with no direct cost-effectiveness studies, there is no evidence that advance care planning increases health care spending and costs (Dixon et al., 2015). In fact, there is some evidence that AD directives may lower health spending at end-of-life by as much as 68 percent, although there may be significant selection bias given that individuals who complete ADs often choose comfort care, which is less costly, over life-prolonging care (Chambers et al., 1994).

Study Partner

Our study partner, Providence St. Joseph Health (PSJH), is one of the largest nonprofit health systems in the United States. With 51 hospitals and 1,085 clinics operating in Washington, Oregon, California, Montana, New Mexico, Texas, and Alaska, PSJH treats over 5 million patients each year. In this study, we focus primarily on primary care clinics in the state of Oregon.

Medical group leaders across PSJH recently prioritized ACP for primary care patients over the age of 65, with the aim of increasing the proportion of patients with a completed AD saved in the electronic medical record (EMR). PSJH routinely tracks and monitors clinical performance related to ACP documentation and other standards of care. In our sample, around 5.8% of patients had an advance directive at the start of the study, a rate that is

lower than many previous studies, but not out of the ordinary when looking only at studies that use EMR data. For our second intervention, we lowered the age to look at a slightly younger population: patients over 55 with an upcoming primary care appointment.

As part of reaching the ACP targets described above, PSJH had previously used informational videos and pamphlets from ACP Decisions, which provide evidence-based explanations of key topics relevant to ACP and the completion of ADs such as information on selecting health care proxies, information on resuscitation choices, feeding tube choices, and many more (El-Jawahri et al., 2015). The ACP Decisions materials are available in multiple languages, although in our studies, we chose to only send them out in English. Clinicians and patients have welcomed these videos to support meaningful conversations, and they are associated with changes in informed choices patients make regarding treatments such as CPR and mechanical ventilation. ACP Decisions videos can be used in medical facilities or at home, and can be distributed to patients electronically.

Both the pilot and subsequent intervention were pre-registered in the AEA RCT Registry. Please see the Appendix for more information.

1.3 Initial Intervention

Data and Design

The focus of our initial intervention consisted of two separate primary care clinics in Oregon, of which we selected all patients who had a primary care provider at either of these two clinics and an appointment in the last two years to receive a reminder to fill out an advance directive form. We supplement this information with both data from the electronic medical record and in an optional survey that we sent out to a subsample of this population.

In July 2018, one of the two pilot clinics was selected to host an in-person AD Drive, where patients had the opportunity to ask questions about ACP and ADs, receive access to appropriate witnesses and notaries to validate an AD, and receive assistance in uploading an AD to the EMR. The drives were held in an open-house style with no appointment needed, for several hours on three different days. One week prior to the drives, email communications were sent to the target population at both clinics. This target population was defined by patients who were 65 or older, had no AD on file with PSJH, and had an email address listed in their patient records.

In addition to receiving a generic reminder about completing an AD, patients received either (1) notification of the in-person AD Drives happening in their clinic the following week, (2) link to an 11-minute video and informational brochures on ADs and planning for end-of-life, (3) both the AD Drive notification and video link, or (4) generic reminder only. Full text of these email communications can be found in Appendix Section C. Patients were randomly assigned to receive the video link, while the Drive notification was assigned based on clinic. Thus, patients in the No-Drive clinic received either communication (2) or (4),

while patients at the Drive clinic received either (1) or (3). For patients selected to receive the video link, we observed what portion of the video was viewed.

Patients without an email on file who otherwise met sample criteria were sent paper letter versions of the communications through the mail. Those at the AD Drive clinic received notification of the drive with a reminder about completing an AD, while those at the No-Drive clinic received a generic reminder only. Table 1.1 shows the breakdown of the interventions and the number of individuals assigned to each treatment. It also shows the number of patients who watched the ACP Decisions videos and the number of patients who uploaded an AD after the interventions in each treatment group. Letter proofs and communications for this first pilot are included in the Appendix.

Sample and Intervention Participation				
Sample	N	N (No AD Baseline)	N (Uploaded AD Post Baseline)	N (Watched Video)
Clinic with Drive	2337	1994	54	8
Patient No Email (Drive Invitation Letter)	432	376	28	0
Patient Has Email	1905	1618	26	8
Sent Video Link + Drive Invitation	819	809	11	8
Drive Invitation	1086	809	15	0
Clinic Without Drive	2513	2177	35	11
Patient No Email (Reminder Letter)	988	847	19	0
Patient Has Email	1525	1330	16	11
Sent Video Link	670	658	5	11
Reminder Only	855	672	11	0

Table 1.1: This table details study sample and intervention participation.

Electronic Medical Record Data

For all patients in the sample, we had access to detailed electronic medical record data including healthcare use (office visits, hospital stays, medications), health status (diagnoses, depression screening score), insurance status, and demographics. See Table 1.12 in the Appendix for more information, which lists the sample mean and standard deviation for EMR indicators and variables such as the Charlson co-morbidity index which were calculated from EMR data. The table also profiles survey respondents, a subset of the full sample.

Empirical Approach

We focus on estimating the impact of the drive and video interventions as well as their interaction. We run a simple linear regression as follows:

$$Y_i = \beta_0 + \beta_1 \mathbb{1}[DriveOnly] + \beta_2 \mathbb{1}[VideoOnly] + \beta_3 \mathbb{1}[Video\&DriveClinic] + X_i + \epsilon_i \quad (1.1)$$

in which X_i is a list of controls from EMR data, listed in Table 1.12; $\mathbb{1}[DriveOnly]$ is an indicator for individuals at the clinic hosting the drives who did not receive a video link;

$\mathbb{1}[VideoOnly]$ is an indicator for individuals at the clinic not hosting the drives who received a video link; and $\mathbb{1}[Video\&DriveClinic]$ is an indicator for individuals at the clinic hosting the drives who also received a video link. Our main coefficients of interest are β_1 (for the drive only), β_2 (for the video only), and β_3 (for the interaction of the drive and video) to determine the impact of the drive and video interventions as well as their interaction.

Though both clinics volunteered to host the drives and one was chosen arbitrarily, selection of patients into each of these clinics is not likely to be random. Thus, to make a causal interpretation, we must assume that the behavior of patients between the two clinics with respect to uploading of ADs is not systematically different as a result of factors other than the AD Drive. Because the outcome is narrowly defined as uploads occurring directly after the communications and drive, we may be more confident in attributing estimated effects to the interventions described. We also take a pooled approach and estimate the following pooled approaches:

$$Y_i = \gamma_0 + \gamma_1 \mathbb{1}[DriveClinic] + X_i + \epsilon_i \tag{1.2}$$

Equation 1.2 estimates the pooled effect of the drive for patients in both video assignment groups, comparing the clinic with the drive with the one without. We also estimate the a second pooled approach:

$$Y_i = \alpha_0 + \alpha_1 \mathbb{1}[Video] + X_i + \epsilon_i \tag{1.3}$$

Equation 1.3 estimates the pooled effect of receiving the video across both clinics, comparing patients who receive the video across both clinics compared to those that do not.

Main Results

Table 1.2 presents the results of the estimation of Equation 1.1 above. Here, we limit the sample to only patients who had an email on file and therefore all communication done via email as well. We further limit the sample to only patients who did not have an AD at baseline. Results are reported for a specification with and without covariates. We estimate lower rates of upload for all treatment groups in comparison to the reminder only group. The comparison is statistically significant at the $p < 0.10$ level for the group that received video link only, who were 1.2 percentage points (SE 0.6) less likely to upload an AD than those in the reminder only group. There is also a significant reduction in probability of uploading an AD with dis-preference for life-prolonging treatments for this group, but this is likely driven by the lower overall upload rate.

Table 1.3 shows the pooled analysis from estimation of Equations 1.2 and 1.3. The takeaways are similar to the analysis above. We see a lower upload rate among treatment groups but not statistically significant. The null effect for video treatment may be because few patients assigned to the video group actually watched the video, as shown in Table 1.1. Of the 1,486 patients who received a link to the video and materials, only 19 clicked through to the video, and of these, only 13 watched more than half. Of the 19 that clicked through, just two uploaded an AD in the post-intervention period. Likewise, the null effect of the AD

Treatment Effect, Patients with Email							
		No Covariates			EMR Covariates		
Post-Intervention AD Upload	Control Mean (SD)	Drive+ Video	Drive Only	Video Only	Drive+ Video	Drive Only	Video Only
Any	0.016	-0.006	-0.003	-0.012*	-0.006	-0.004	-0.012*
	(0.127)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.006)
Has HC Proxy	0.015	-0.007	-0.003	-0.01	-0.007	-0.004	-0.011*
	(0.121)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Has HC Proxy (Validated)	0.009	-0.003	-0.001	-0.007	-0.004	-.002	-.007
	(0.094)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Has End-of-Life Instruction	0.012	-0.005	-0.001	-0.009	-0.007	-0.003	-0.009
	(0.109)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Has End-of-Life Instruction (Validated)	0.009	-0.003	0.001	-0.006	-0.005	-0.001	-0.006
	(0.094)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)
Indicates Life Prolonging Treatment Dispreference	0.012	-0.005	-0.003	-0.013**	-0.007	-0.004	-0.013**
	(0.109)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Indicates Feeding Tube Dispreference	0.012	-0.005	-0.003	-0.013**	-0.007	-0.004	-0.013**
	(0.109)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)

Standard errors in parentheses: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.2: This table displays coefficients and standard errors for β_1, β_2, and β_3 from equation 1.1, which estimates the treatment effect of the AD Drive and ACP Video, relative to receiving only a reminder email in the clinic with no drive. This sample is limited to only patients that received an email.

Drive treatment can be explained by low attendance at the drives—a total of 30 patients attended these drives.

One possible contributing factor is that communications sent out to each group were of different length. The simplest email was sent to the reminder only group (due to less required detail), which also had the highest upload rate. It could be the case that patients receiving longer emails were less likely to read them, resulting in fewer uploads for these groups. Also possible is that the video link and information led patients to perceive the task of completing an AD to be more challenging, and were deterred by this.

Letter Intervention

Patients at the AD Drive clinic without an email address on file who otherwise met sample criteria were sent a paper notification that the drive would be taking place with reminder to complete an AD. Patients in the No-Drive clinic were sent a paper reminder to complete an AD. Text for these letters was in line with what was received by the email groups. Proofs can be found in appendix section C.2.

Table 1.4 reports the estimated impact of the drive for the no-email group and the full sample including patients with and without email. The table reports estimates of γ_1 from Equation 1.2. For the no-email group, we see a statistically significant 4.5 percentage point (SE 1.3) increase in the upload rate at the Drive clinic compared to the No-Drive clinic.

Pooled Treatment Effect, Patients with Email						
	Drive			Video		
Post-Intervention AD Upload	Control Mean (SD)	TE No Covariates	TE Covariates	Control Mean (SD)	TE No Covariates	TE Covariates
Any	0.013	0.001	0.001	0.018	-0.007	-0.007
	(0.115)	(0.004)	(0.005)	(0.131)	(0.004)	(0.004)
Has HC Proxy	0.013	0	-0.001	0.016	-0.007	-0.007
	(0.112)	(0.004)	(0.005)	(0.126)	(0.004)	(0.004)
Has HC Proxy (Validated)	0.008	0.002	0	0.011	-0.005	-0.005
	(0.09)	(0.004)	(0.004)	(0.107)	(0.004)	(0.004)
Has End-of-Life Instruction	0.012	0.001	0	0.016	-0.006	-0.006
	(0.109)	(0.004)	(0.005)	(0.124)	(0.004)	(0.004)
Has End-of-Life Instruction (Validated)	0.009	0.002	0	0.012	-0.005	-0.005
	(0.094)	(0.004)	(0.004)	(0.11)	(0.004)	(0.004)
Indicates Life Prolonging Treatment Dispreference	0.011	0.002	0.001	0.016	-0.007*	-0.007*
	(0.105)	(0.004)	(0.005)	(0.126)	(0.004)	(0.004)
Indicates Feeding Tube Dispreference	0.011	0.002	0.001	0.016	-0.007*	-0.007*
	(0.105)	(0.004)	(0.005)	(0.126)	(0.004)	(0.004)

Standard errors in parentheses: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.3: This table presents the pooled treatments effects—coefficients and standard errors for γ_1 and α_1 from equations 1.2 and 1.3. We estimate the pooled treatment effect of the AD Drive relative to no drive, and ACP Video relative to no video, for patients with email only.

This corresponds to a 1.1 percentage point (SE 0.4) higher upload rate for the full sample of patients. Though this comparison is non-experimental, this potentially indicates that the letter was a better method of encouraging patients to attend the drives than the email. Furthermore, it was not the effect of having received a reminder letter alone that explains this result, as patients at the clinic without the drive still received a reminder letter.

One alternative explanation is that differences in patient characteristics between those who have email addresses and those who do not are driving the differential response to the outreach, rather than the mode of outreach (paper vs. email) itself. To address this question, we use coarsened exact matching to re-weight the data for balance along observable characteristics between the email and no-email populations. Results are reported in Table 1.5. Re-weighting by patient demographics (age, gender, ethnicity, language, and co-morbidity index) leads to little change in the relative treatment effects for patients with and without email, indicating that selection on these factors is not driving the observed difference. Adding an indicator for whether the patient has an active MyChart account to the re-weighting scheme actually leads to a larger estimated treatment effect for patients without email. This is likely because patients without an active MyChart account are less likely to respond to the drive intervention, and are also less likely to have an email address on file. While it is still possible that unobservables could explain the difference in treatment effect from the paper letter vs email outreach, it does not appear to be driven by observable characteristics.

Drive Treatment Effect, Full Sample and Patients Without Email						
	Full Sample			No Email Sample		
Post-Intervention AD Upload	Control Mean (SD)	TE No Covariates	TE Covariates	Control Mean (SD)	TE No Covariates	TE Covariates
Any	0.016	0.011**	0.011**	0.022	0.052***	0.045***
	(0.126)	(0.004)	(0.005)	(0.148)	(0.012)	(0.013)
Has HC Proxy	0.015	0.01**	0.009**	0.021	0.051***	0.043***
	(0.122)	(0.004)	(0.005)	(0.144)	(0.012)	(0.013)
Has HC Proxy (Validated)	0.011	0.008**	0.007*	0.017	0.034***	0.027**
	(0.102)	(0.004)	(0.004)	(0.128)	(0.01)	(0.011)
Has End-of-Life Instruction	0.014	0.011**	0.01**	0.02	0.046***	0.043***
	(0.117)	(0.004)	(0.005)	(0.14)	(0.011)	(0.012)
Has End-of-Life Instruction (Validated)	0.011	0.009**	0.008*	0.017	0.037***	0.032***
	(0.104)	(0.004)	(0.004)	(0.128)	(0.01)	(0.011)
Indicates Life Prolonging Treatment Dispreference	0.013	0.01**	0.009**	0.021	0.032***	0.028**
	(0.115)	(0.004)	(0.005)	(0.144)	(0.011)	(0.012)
Indicates Feeding Tube Dispreference	0.013	0.01**	0.01**	0.021	0.035***	0.031**
	(0.115)	(0.004)	(0.005)	(0.144)	(0.011)	(0.012)

Standard errors in parentheses: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.4: This table displays the pooled treatment effect for the AD Drive for patients that received a paper letter only (no email). Coefficients and standard errors are for γ_1 from equation 1.2.

Drive Treatment Effect: Re-weighting Patients With and Without Email on Observables			
Weighting	Control Mean Upload (SD)	TE, No Email Patients	Difference, Email Patients
Unweighted	0.016	0.052***	-0.048***
	(0.126)	(0.014)	(0.015)
Clinic and Demographics	0.016	0.046***	-0.040**
	(0.126)	(0.016)	(0.017)
Clinic, Demographics, and MyChart Activation	0.016	0.073***	-0.064**
	(0.126)	(0.026)	(0.027)

Standard errors in parentheses: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.5: This table displays coefficients and standard errors for γ_1 from equation 1.2, using different re-weighting schemes.

Initial Takeaways

Our initial intervention suggests a limited impact to the addition of information alone on advance directive take-up, without additional nudges. Both the video and drive intervention resulted in a null effect for our main email patient population. However, the small, but significant effect on AD completion for the letter population suggested takeaways that informed our subsequent intervention. First, letter communication is likely a more appropriate form of communication for this older population, when compared to email and other electronic communications.

Second, hassle costs appear to be important in multiple ways and our subsequent intervention focused on reducing these costs. Providing the information in the video and drive form did not seem to adequately suit the needs of this population; clicking through to watch the video and physically going to attend an AD Drive were not actions that individuals pursued at a substantial rate.

Third, the information intervention appeared to be of secondary importance compared to hassle costs. Unless the information was directly presented to the individual with no effort, there didn't seem to be a substantial willingness to seek out this information, as we saw from our low video viewership.

1.4 Subsequent Intervention

Based on our initial investigation, we designed a follow-up intervention to take advantage of our key findings from the first study. In particular, the substantial difference in AD completion due to mode of outreach (physical letter vs. email) suggested that using paper letters would be a more appropriate form of outreach for this older patient population. Our other important finding of low viewership of the ACP Decisions materials and low attendance of the in-person AD Drives suggested that hassle costs may be a significant barrier; therefore we shifted our interventions to focus on lowering hassle costs in multiple ways: (1) including the AD forms themselves in the letters we sent, (2) shortening the included AD forms, and (3) directly including ACP Decisions brochures in our materials. In addition, we tied the sending of letter reminders to upcoming primary care visits two weeks in advance help patients in two ways: (1) individuals know that they have an upcoming reminder and are therefore primed to complete health forms and (2) to give patients an easy way to give the forms to physicians, in addition to uploading the documents electronically. This step lowers any potential difficulties in using the patient portal to upload documents as the AD forms can simply be handed to the primary care provider at the next appointment. Finally, as we did not detect many changes in attitude to ACP from the first pilot, we focus our treatments on AD completion rather than more specific attitudes such as feeding tube or end-of-life instruction preferences.

Sample Selection and Power

Six PSJH clinics in Oregon were recruited in September 2019 to participate in this second iteration. Individual patients aged 55 or older at these clinics with upcoming primary care appointments (in the next two weeks) who did not have an AD on file were randomized into one of six treatment arms in Figure 1.1 below. We started sending letters and communications to patients in December 2019 and continued through March 2020 when the intervention was stopped due to Covid-19 concerns. In this second pilot, we expanded our outreach to adults 55 and older compared to the subset of adults 65 and older in the first pilot.

Our implementing partner indicated that a change as small as a 5 percentage point increase in AD completion would be of clinical and policy relevance. Our original intention was to enroll 500 patients per arm over a period of six months, with a total enrollment of 3,000 patients for our trial. However, due to Covid-19, we ended our experiment in late March, finishing with roughly 40% of our expected enrollment (total enrollment of 1,200). Our initial power calculations showed we had the power to detect a 3.03 percentage point increase in AD uploads from 500 patients per arm. This assumed that in the randomly selected group of individuals that did not receive the intervention, 1.5% of patients without an advance directive would upload one during the study period, which is based on our previous finding. We also assumed a two-sided test with $\alpha = 0.05$, and power of 80%. Updating our power calculations to enroll 200 patients per arm, the study has the power to detect a 5.70 percentage point increase in AD uploads at a $p < 0.05$ significance level, assuming the same priors as before.

Description of Study Arms	**Sample Size**	**Electronic Notification/Paper Letter**	**ACP Decisions Brochures**	**AD Form included**
(1) Control Arm	168	None	None	None
(2) Electronic Notification Only	207	E. Notification	None	None
(3) Electronic Notification + Paper Letter	210	E. Notification + Paper	None	None
(4) Electronic Notification + Paper Letter + Traditional AD Form	212	E. Notification + Paper	None	Traditional AD (9 pages)
(5) Electronic Notification + Paper Letter + AD Short Form	202	E. Notification + Paper	None	Short Form (3 pages)
(6) Electronic Notification + Paper Letter + AD Short Form + ACP Decisions Brochures	201	E. Notification + Paper	Yes	Short Form (3 pages)

Figure 1.1: Intervention descriptions and sample sizes by study arm.

Research Design

Our intervention was split into six separate arms, including one control arms and five treatment arms with different forms of communications to test behavioral nudges and informational interventions. All eligible patients in the intervention arms received an electronic reminder suggesting the patient to bring a completed AD to their upcoming appointment, roughly two weeks in advance of the scheduled appointment. A paper letter was also physically mailed to the patient at the same time period (two weeks prior to the appointment) for individuals assigned to Arms 3-6. In addition, two Oregon AD forms, the 9-page traditional AD form (used in our previous pilot study) and the 3-page short form AD (the new PSJH Oregon AD EZ form) were used. The traditional AD form was enclosed in the mail along the paper letter in arm 4 and the short form AD was enclosed in the mail along the paper letter in arms 5 and 6. Lastly, arm 6 enclosed three guides from ACP Decisions: (1) a pamphlet with information and guidance about selecting a healthcare proxy, (2) a guide to end-of-life choices providing information about the process and prognosis of resuscitation, and (3) a guide to feeding tubes. Letter proofs, AD form samples, and the ACP Decisions materials are all included in the Appendix.

In our pre-analysis plan, we created the ability to pool certain arms together to amalgamate results; due to the unforeseen circumstances from Covid-19 that stopped our RCT early, this was especially useful as it increased the power to study certain behavior changes and nudges. Therefore, we are able to study the more specific interventions in a smaller scale and analyze the broader impacts of our outreach and nudges as well. While the scenario that led to the reduction in our sample sizes were unpredictable, our pre-analysis plan specifies certain groupings of arms to study larger effects: specifically Arms 3-6 to study the impact of written (physical) communication rather than simply electronic communication and Arms 4-6 to study the effect a gentle nudge from the addition of the advance directive form itself. More information on the pre-analysis plan is in the Appendix.

Empirical Approach

We take a similar empirical approach to our first pilot, first comparing each of our treatment arm to the control arm. We estimate:

$$Y_i = a_0 + a_1 \mathbb{1}[Intervention] + X_i + \epsilon_i \tag{1.4}$$

where X_i is a series of demographic controls and $\mathbb{1}[Intervention]$ is an indicator for any of the previously mentioned five interventions. Like our first pilot, we also pool estimates—in this case we pool the results from Arms 2-6 to test all levels of the intervention; Arms 3-6 to test the letter intervention; and Arms 4-6 to test the added AD form inclusion nudge.

Finally, we further decompose our results, assuming that the interventions build upon each other, to examine which portion of the interventions is most effective at driving AD completion. That estimation is as follows:

$$Y_i = b_0 + b_1 \mathbb{1}[Letter] + b_2 \mathbb{1}[ADForm] + b_3 \mathbb{1}[ShortForm] + b_4 \mathbb{1}[Information] + X_i + \epsilon_i \tag{1.5}$$

where $\mathbb{1}[Letter]$ is an indicator for all arms that include the physical letter, $\mathbb{1}[ADForm]$ is an indicator for all arms including an AD form, $\mathbb{1}[ShortForm]$ is an indicator for the two arms that include the short AD form, and $\mathbb{1}[Information]$ is an indicator for the last arm with informational handouts.

Results

In total, 3 out of 168 patients in the control arm uploaded an advance directive, while in the intervention arms, a total of 94 individuals uploaded advance directives out of 1,032 (see Table 1.6 for more details on each arm). Before our intervention, using data from the EMR, we found that 593 of the 10,304 patients had completed an advance directive for a base rate completion percentage of 5.8%. While this completion percentage is on the low range for advance directive completion in the United States, given that only recently did advance directive completion become a priority for PSJH, it is not unexpected. This completion statistic is in line with other studies that show a base rate of between $4 - 25\%$ for advance directive completion using EMR data, numbers which generally are smaller than those from survey data (Perkins, 2007; Emanuel and Emanuel, 1998; Hanson and Rodgman, 1996).

	Arm 1	Arm 2	Arm 3	Arm 4	Arm 5	Arm 6	Total
AD not completed	165	197	194	187	178	182	1,103
AD completed	3	10	16	25	24	19	97
Total	168	207	210	212	202	201	1,200

Table 1.6: This table presents advance directive completion by arm of our intervention.

Table 1.7 and Figure 1.2 presents the results of Equation 1.4, comparing each intervention arm with the control of no action. The table presents results both with no controls and with using a full set of demographic controls. The results from this analysis are in line with what we expected based on economic theory, with greater AD completion when we add additional nudges to the arms. For the second arm of a simple electronic intervention, we see positive, but not significant, results of a 2.66 percentage point increase in AD completion (SE 1.90). These results suggest at least some effect of tying AD completion to primary care appointments, as this number is larger than the 1.6 percentage point increase in AD completion from all reminders in our initial study. Further, despite the limited sample size of our interventions (roughly 400 individuals), we do see strongly significant increase in AD completion ($p < 0.01$) for all arms that include some type of physical letter (effect size of an increase between 5 and 10 percentage points). For sending the physical letter along with electronic communication (but no included AD form), we see a 5.32 percentage point increase in completion (SE 2.24); adding the long and short AD forms increases this completion rate to 9.91 (SE 2.66) and 9.79 (SE 2.69) percentage points respectively. For our last intervention arm including all of the materials (the physical letter, short AD form, and ACP Decisions leaflets), we see a smaller effect of a 7.28 percentage point increase in AD completion (SE

2.45). This smaller effect maybe imply an overload of information creating a "sweet spot" of including enough information to increase completion but not too much as to discourage it, or just be noise due to small sample size. Regardless, the results from Arms 4-6 suggest that there's between a $7 - 10$ percentage point increase in AD take-up when sending a physical letter with the AD form itself before a primary care appointment, compared to doing nothing. We also note that regardless of whether or not demographic covariates are added, our results for each estimation remain similar.

Comparison to no intervention by arm			
	No Controls	Dem. Controls	Observations
Arm 2	0.0305	0.0266	375
	(0.0190)	(0.0190)	
Arm 3	0.0583**	0.0532**	378
	(0.0224)	(0.0224)	
Arm 4	0.1001***	0.0991***	380
	(0.0266)	(0.0266)	
Arm 5	0.1010***	0.0979***	370
	(0.0268)	(0.0269)	
Arm 6	0.0766***	0.0728***	369
	(0.0245)	(0.0245)	

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.7: This table presents the treatment effects compared to no intervention, by arm. The first column shows the results without any demographic controls while the second column includes these controls.

Next, we pool our results to expand our sample size and to group similar interventions with each other to more precisely estimate broader effects. Table 1.8 and Figure 1.3 presents the results of the pooled regression for our intervention arms. We show these specifications with both no controls and full demographic controls in Table 1.8 below. Our first specification that groups all interventions (electronic and letter, with and without behavioral nudges; Arms 2-6) together shows a 7.00 percentage point increase in AD completion for all interventions (SE 2.24). When we isolate these interventions to just those that received written letters (Arms 3-6), we see a 8.08 percentage point increase in AD completion (SE 2.37). Finally, when we only look at arms in which some type of AD form was also included in the mail (Arms 5-6), we see a 9.02 percentage point increase in AD completion (SE 2.47). All of these effects were statistically significant at the $p < 0.01$ level. These results confirm that our intervention had sizable results and that both the physical letter and the included AD form had additional complementary effects.

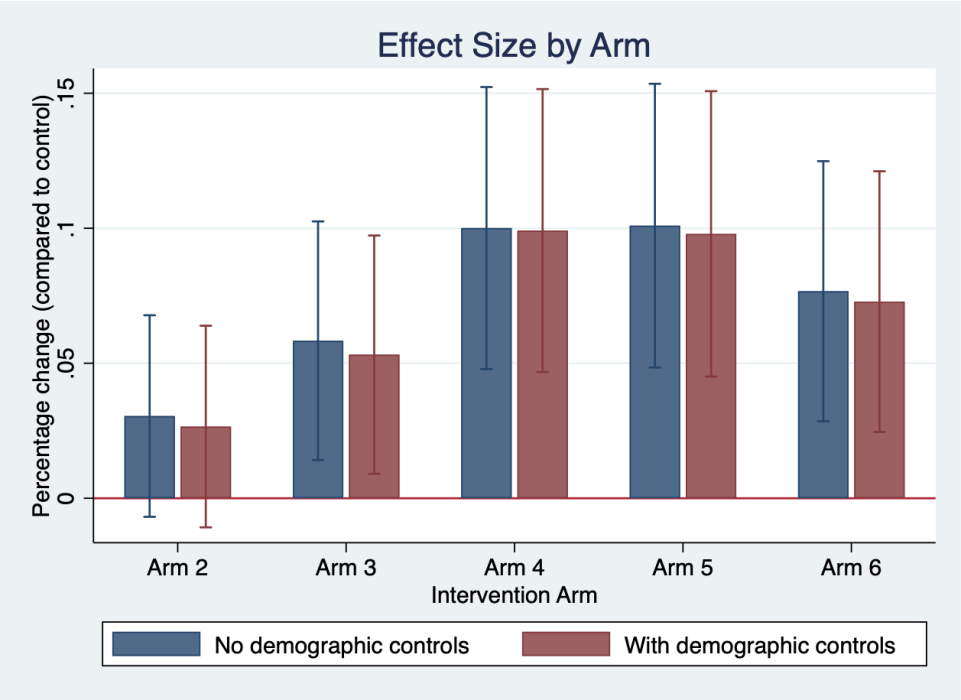


Figure 1.2: This figure shows the treatment effects compared to no intervention, by arm. The first bar shows the results without any demographic controls while the second bar includes these controls.

Age and Advance Directive Completion

While our smaller than expected sample size doesn't allow us to breakdown effects by as many characteristics as we would wish, one way that we do so is by age. We might expect that older patients may have thought more about end-of-life care and decision-making and therefore may be more likely to take up the intervention. We therefore divide up our sample into smaller age subsamples in Table 1.9 and Figure 1.4, once again running a pooled analysis. We analyze the age 65 and older population as we did in the initial intervention and finally also examine an even older subset of adults age 75 and older. We see evidence that suggests that the older the individual, the more likely they are to partake in the form intervention, with a 10.39 percentage point increase in AD completion (SE 4.45) in adults 65 and older and a 13.87 percentage point increase in AD completion (SE 8.05) in adults 75 and older for our form intervention (Arms 4-6). While the sample sizes are small for each of these populations, these results are significant at the $p < 0.05$ and $p < 0.10$ levels respectively. Evidence also suggests that for these older patients, the form of intervention does not matter and that any type of nudge (even just the electronic intervention) is effective at increasing advance directive completion: for the 75 and older population, the effect of any intervention is 15.13 percentage points (SE 7.90), which is even greater than the effect of the form intervention, suggesting that the electronic and simple letter interventions were just as effective as the

Treatment effect, pooled by arms			
	No Covariates	With Dem. Covariates	*N*
Any Intervention (Arms 2-6)	0.0732***	0.0700***	1,200
	(0.0226)	(0.0224)	
Letter Interventions Only (Arms 3-6)	0.0840***	0.0808***	993
	(0.0238)	(0.0237)	
Form Interventions Only (Arms 4-6)	0.0927***	0.0902***	783
	(0.0248)	(0.0247)	

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.8: This table presents the pooled treatment effects model of the second pilot, compared to the control of no intervention.

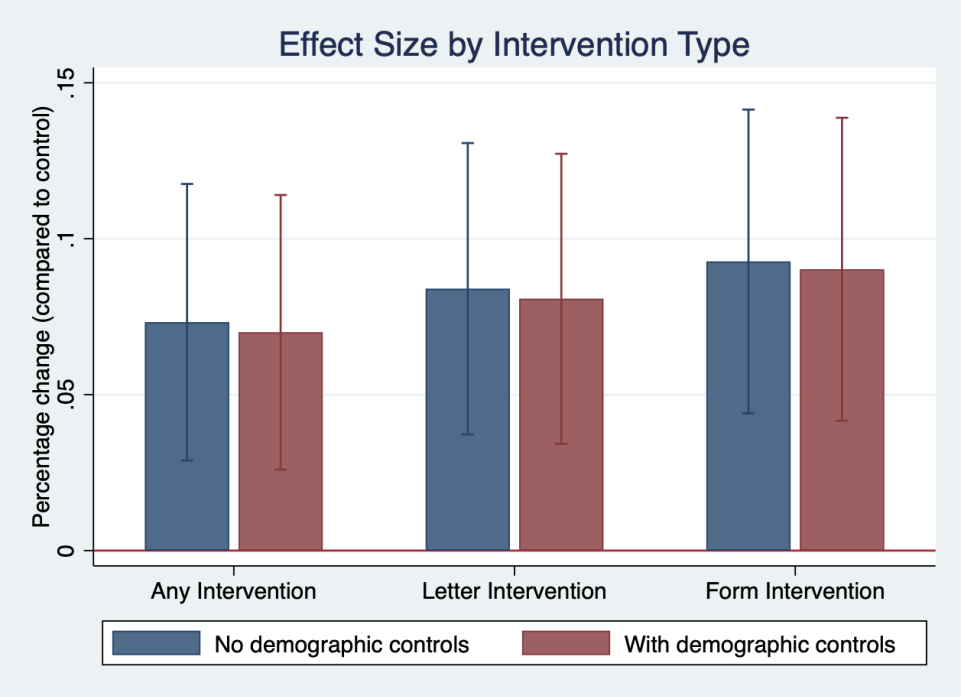


Figure 1.3: This figure shows the pooled treatment effects compared to no intervention. Any Treatment pools Arms 2-6; the Letter Intervention pools Arms 3-6, and the Form Intervention pools Arms 5-6. The first bar shows the results without any demographic controls while the second bar includes these controls.

form intervention, although the sample sizes are too small to generalize these results.

Pooled treatment effect, by age			
	Any Intervention (Arms 2-6)	Letter Interventions Only (Arms 3-6)	Form Interventions Only (Arms 4-6)
Age 55+	0.0700***	0.0808***	0.0902***
	(0.0224)	(0.0237)	(0.0247)
	[1,200]	[993]	[783]
Age 65+ Only	0.0838**	0.0962**	0.1039**
	(.0410)	(0.0428)	(0.0445)
	[511]	[420]	[332]
Age 75+ Only	0.1513*	0.1505*	0.1387*
	(0.0790)	(0.0808)	(.0805)
	[168]	[138]	[108]

Standard errors in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$) with number of observations in brackets below.

Table 1.9: This table presents the pooled treatment effects model of the second pilot, compared to the control of no intervention, divided by age subgroups. All estimates have all demographic covariates included.

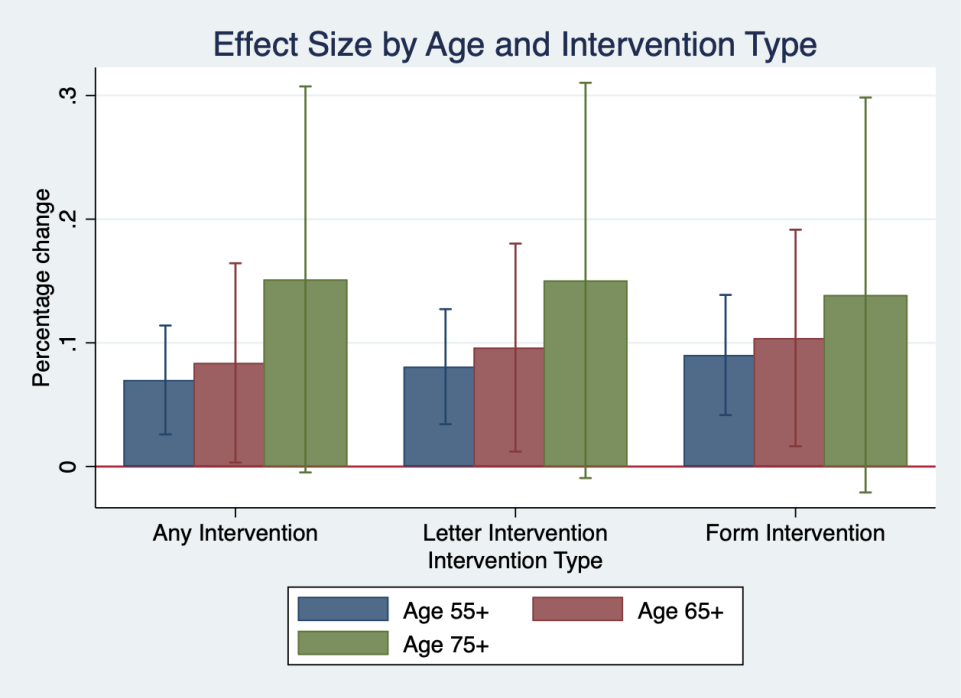


Figure 1.4: This figure shows the pooled treatment effects compared to no intervention, by age. Any Treatment pools Arms 2-6; the Letter Intervention pools Arms 3-6, and the Form Intervention pools Arms 5-6. All results contain demographic controls.

Decomposition of Effects

Finally, to decompose our separate interventions into pieces, we run a linear regression that contains separate indicators for each stage of our intervention in Table 1.10. Our first two

columns group our last three interventions together simple as a form intervention while the last two columns further break down all six arms. We see weak evidence in our decomposition that each separate intervention builds upon the previous one, but due to low sample size, we do not have statistically significant results. There is evidence to suggest that the three largest increases come from: (1) sending any type of message; (2) sending a physical letter on top of an electronic message; and (3) adding any type of AD form to the physical letter. In particular, the addition of the form seems to have the largest effects compared to any other treatment.

Decomposition of effects				
	Form Int. Grouped	Form Int. Grouped	Complete Decomposition	Complete Decomposition
Any Intervention (Arms 2-6)	0.0305	0.0267	0.0305	0.0266
	(0.0281)	(0.0280)	(0.0281)	(0.0280)
Letter Intervention (Arms 3-6)	0.0279	0.0274	0.0279	0.0274
	(0.0265)	(0.0264)	(0.0265)	(0.0264)
Form Intervention (Arms 4-6)	0.0344	0.0356*	0.0417	0.0442*
	(0.0216)	(0.0215)	(0.0264)	(0.0262)
Short Form Intervention (Arms 5-6)			0.000887	-0.00174
			(0.0266)	(0.0265)
Additional Information Intervention (Arm 6)			-0.0243	-0.0228
			(0.0270)	(0.0268)
Demographic Controls		X		X
Observations	1200	1200	1200	1200

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.10: This table presents a decomposition of effects. The first two columns group the last three interventions that include the AD forms in the physical letters together; the last two present a full decomposition.

In all, we find a statistically significant increase in AD completion for our physical letter interventions and a larger increase in AD completion with the inclusion of any type of AD form to the communication. The results suggest that the letter intervention is a more appropriate form of communication for the older population and that attaching the treatment to existing primary care appointments may be a fruitful way of increasing completion. Moreover, our results when split by age suggest that our interventions are more effective the older the individual, with the oldest individuals not sensitive to type of intervention, although sample sizes are small. Finally, the large additional impact of including the AD form compared to the letter alone suggests that lowering hassle costs in simple and relatively inexpensive ways can have a noticeable impact on completion.

1.5 Discussion and Conclusions

Finally, we examine the cost-effectiveness of our intervention. In Table 1.11 below, we re-run our analysis to compare our physical interventions to the costless intervention of electronic reminders. We then use these estimates to conduct a back-of-the-envelope calculation along with our physical letter costs to examine cost-effectiveness.

Cost effectiveness analysis by arm			
	Effect Size	Cost Per Person	Cost Per Individual Effect
Arm 3	0.0290	\$1.07	\$36.90
	(0.0234)		
Arm 4	0.0696***	\$4.92	\$70.69
	(0.0268)		
Arm 5	0.0692**	\$2.63	\$38.01
	(0.0272)		
Arm 6	0.0480*	\$4.92	\$102.50
	(0.0251)		

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.11: This table shows a basic back-of-the-envelope cost effectiveness analysis for the physical interventions (Arms 3-6), comparing each treatment arm to the costless electronic intervention of the second arm. Costs are calculated by dividing the cost of the letters per person by the effect size.

Effect sizes over the electronic intervention are displayed in the first column; the second column displays the cost of each letter to send (with letters with more pages being more expensive to print and send); the third column is the back-of-the-envelope cost-effectiveness calculation, based on a linear effect. Using even the most conservative estimates for our intervention, our calculations still suggest roughly \$100 per additional advance directive upload. To better put these numbers into perspective, while there may be some selection bias in the individuals that choose to fill out advance directives, Chambers et al. (1994) find a significant difference in inpatient charges of individuals with and without advance directives of over $\$60,000$. However, even if one is skeptical of these cost-savings on the account of selection bias (Emanuel and Emanuel, 1994; Emanuel, 1996), given simply the increase in both patient and family satisfaction, as well as some evidence for decreased resource use and hospitalizations with advance care planning (Molloy et al., 2000; Dixon et al., 2015), this would likely be a cost-effective intervention.

Our study is not without limitations—most prominently is the low sample size, as our study was cut short due to Covid-19. Our original expectation was to enroll 500 individuals per arm, for a total enrollment of 3,000; unfortunately we were only able to enroll around 200 per arm. Our initial power calculations were to detect a significant effect of roughly 3

percentage points; with a smaller sample size we were not able to detect such small effects, especially between arms. However, some of our effect sizes were large enough that they were statistically significant even with the smaller sample size. We also created the ability to pool arms together in the pre-analysis plan which we used as a robustness check to our analysis. The main loss in the smaller than expected enrollment is the inability to do direct comparisons between arms.

Another concern is that due to Covid-19 concerns, individuals at the end of the subsequent study may have been more likely to upload advance directives or there may be confounding due to those concerns. While unfortunately we don't have exact data on when our communications were sent out, we do have data on when each (if any) advance directive was uploaded. We find that few advance directives were uploaded in December 2019 or March 2020, when our study was just getting started and just ending. In the two months in-between, we find only a small difference in uploads, with 35 in January and 43 in February. We believe that it's unlikely that Covid-19 concerns caused this difference, especially since the first case in the United States was only reported on January 20, while the first death in Washington state was reported on March 3 (Guan et al., 2020; King County, 2020). Further, we would expect that all of the arms of our RCT would be affected, including our control arms and therefore our results would account for such concerns.

Our sample also may not be representative of other populations. Specifically, our population in Oregon was significantly whiter and wealthier than the nation as a whole and we only sent out our letters in English. It is unclear how this work may apply to other populations—it may be more difficult to reach other populations, but any outreach may be more effective at increasing completion among minority populations.

For future work, we hope to follow-up with individuals from our second pilot over time and send out a final survey to gauge how their ideas about death, mortality, and end-of-life care have changed. We wish to take a look at longer-term trends and differences in these populations, whether advance directive were used, and whether individuals that filled out advance directives made other changes to their lifestyles. We also hope to study both what most significant hassle costs are in our population, and also the behavioral economic reasons behind the significant lack of decision-making for ADs, whether that is fear of death, rational inattention, present bias, or a combination of factors.

This study demonstrated that simple interventions, focused on lowering hassle costs, can substantially increases advance directive completion, while a pure information intervention is less effective. While advance directives are not the "silver bullet" of patient empowerment and decision-making that there were expected to be in the 1960s when they were created, having difficulties with proper completion, lack of knowledge from the proxy, physician noncompliance, and most of all, an inability to complete predict future events and needs (Perkins, 2007), they are part a set of tools in advanced care planning which also includes careful communication and information that is consistently updated (Tulsky, 2005; Prendergast, 2001), that can make end-of-life care better. Our study alleviate some of these concerns about end-of-life care by showing concrete and cost-effective ways to increase proper advance directive completion. Given the 5.8% before intervention completion rate for all individuals

in our survey sample of 10,304 patients, adding $7-10$ percentage points onto the completion of advance directives from our intervention would more than double the completion rate in this population. Considering the relatively low cost of this intervention, we believe that this would be a cost-effective intervention that would improve the lives and comfort of older adults by aligning care more to their expectations and needs.

Lastly, our results suggest that adding a nudge by including the form itself has a significant additional marginal effect on advance directive completion, although our additional information intervention was ineffective. We showed that not only is the appropriate type of outreach important, but also that the outreach materials play a significant role in determining the success of an intervention. Small, relatively inexpensive nudges may have a significant impact on end-of-life care and advance directives, punching well above their weight in terms of value-added.

1.6 Appendix

Trial Registry and Analysis Plan

This study is registered in the AEA RCT Registry and the unique identifying numbers are AEARCTR-0003038 for the pilot and AEARCTR-0004212 for the subsequent intervention. The list below notes any departures from pre-specified analysis (PSA), necessary clarifications, or additional analysis included in this report which was not pre-specified.

Pilot Intervention

- PSA described a synthetic control analysis to evaluate the impact of the AD Drive on AD completion rates. Multi-clinic data required to conduct this analysis was not available. A simple comparison between upload rates at the two sample clinics is performed in place of this analysis.
- PSA did not include descriptive analysis of factors predicting pre-intervention upload.
- PSA proposed heterogeneous effects analysis performed using the causal tree method. Because no significant treatment effect was estimated for most patients, this was not deemed necessary. PSA also proposed model estimation using survey data, which was precluded by limited sample size.

Subsequent Intervention

- PSA described a trial involving 3,000 patients in 5 PSJH primary care clinics. Due to lower than expected appointment volumes, 6 primary clinics were chosen instead and due to Covid-19, the trial was stopped early with 1,200 patients.
- PSA described secondary outcomes of Surrogate Selection on AD; Completes Care Preferences on AD; Preference/Dis-preference for Life Support on AD (clinic and individual level); and Preference/Dis-preference for Tube Feeding (clinic and individual level) being measured. This data ended up not being collected, with the focus instead being on AD completion.

Additional Tables and Figures

Demographic, Health Status, and Healthcare Use Covariates from EMR						
	Full Sample			Survey Respondents		
Covariate	Mean	(SD)	N	Mean	(SD)	N
Visits in Last 2 Years	12.14	(12.51)	4850	12.1	(10.35)	338
Number of Medications	9.81	(8.26)	4850	9.53	(8.27)	338
Number of Inpatient Days, Last 2 Years	.95	(3.78)	4850	.74	(2.72)	338
Had Surgury, Last 2 Years	0	(.06)	4850	.01	(.11)	338
Age	73.99	(7.68)	4850	72	(6.13)	338
Height	65.75	(4.02)	4848	66.16	(3.81)	338
Weight	175.65	(44.55)	4848	179.44	(44.49)	338
BMI	28.44	(6.31)	4848	28.68	(6.16)	338
Depression Screening Score	1.38	(3.46)	3332	1.07	(2.8)	262
Number of Diagnoses	14.75	(9.12)	4827	14.41	(9.29)	337
Charlson Comorbidity Index	.91	(1.33)	4827	.78	(1.36)	337
PCP Specialty: Internal Medicine	.13		4850	.11		338
PCP Specialty: Family Practice	.73		4850	.75		338
Male	.37		4850	.36		338
English is Primary Language	.97		4850	1		338
White, Non-Hispanic	.89		4850	.95		338
Not Religious	.28		4850	.3		338
MyChart Activated	.71		4850	.96		338
Married	.6		4850	.64		338
Public Insurance	.89		4850	.91		338

Table 1.12: This table presents health and demographic information for the full sample and optional survey sample.

Communications

Pilot Intervention: Email Communication

All patients at Providence are encouraged to engage in Advance Care Planning and to have an Advance Directive completed and stored in their medical record. You are being contacted because you do not have an Advance Directive stored in your medical record.

Advance Care Planning focuses on the care you want if you are unable to speak for yourself because of an injury or illness. Your plan is based on your values, goals, and the type of care you want to receive. Your decisions about your Advance Care Planning should be written down in an Advance Directive.

An Advance Directive is a legal form that tells your family and doctors about the care you would like to receive. It is important to know that an Advance Directive is different from having a Physician Orders for Life-Sustaining Treatment, commonly known as a POLST.

Your physician, [Dr. PCP Name] invites you to attend an upcoming Advance Directive Drive held at [Clinic Name] to get in-person help with filling out an Advance Directive. There will be staff members who can answer your questions, help you fill out the form, ensure it is legally valid, and add the form to your medical record. You can come to the clinic during any of the following times:

- [time] and [time] on [dates].
- [time] and [time] on [dates].
- [time] and [time] on [dates].

If you're not able to come to the Advance Directive Drive, your care team can answer any questions about having an Advance Directive at your next appointment. In addition, you can find Providence resources on Advance Care Planning by clicking here.

If you're not able to come to the Drive and want to fill out an Advance Directive on your own, just follow these steps:

1. Click here to download and print the Advance Directive form.
2. Talk to you loved ones about the care you want to receive.
3. Complete the form.
4. Sign the form in front of 2 witnesses or a notary public.
5. Have the 2 witnesses or notary public sign the form.
6. Upload the form to MyChart, or bring it to your next appointment.

We look forward to seeing you soon.

To your health,

[PCP] and your Providence care team

Figure 1.5: Email sent with AD drive invite and reminder to fill out AD (Drive only intervention).

All patients at Providence are encouraged to engage in Advance Care Planning and to have an Advance Directive completed and stored in their medical record. You are being contacted because you do not have an Advance Directive stored in your medical record.

Advance Care Planning focuses on the care you want if you are unable to speak for yourself because of an injury or illness. Your plan is based on your values, goals, and the type of care you want to receive. Your decisions about your Advance Care Planning should be written down in an Advance Directive.

An Advance Directive is a legal form that tells your family and doctors about the care you would like to receive. It is important to know that an Advance Directive is different from having a Physician Orders for Life-Sustaining Treatment, commonly known as a POLST.

Your physician, [Dr. PCP Name] invites you to attend an upcoming Advance Directive Drive held at [Clinic Name] to get in-person help with filling out an Advance Directive. There will be staff members who can answer your questions, help you fill out the form, ensure it is legally valid, and add the form to your medical record. You can come to the clinic during any of the following times:

- [time] and [time] on [dates].
- [time] and [time] on [dates].
- [time] and [time] on [dates].

Before you attend the Drive, or even if you're not able to, [Dr. PCP Name] invites you to watch a 10 minute video about Advance Care Planning and read a few pages of information about some of the decisions you need to make when filling out an Advance Directive.

[Link to video & Information Sheets]

If you're not able to come to the Advance Directive Drive, your care team can answer questions about an Advance Directive at your next appointment. In addition, you can find Providence resources on Advance Care Planning by clicking here.

If you're not able to come to the Drive and want to fill out an Advance Directive on your own, follow these steps:

1. Click here to download and print the Advance Directive form.
2. Talk to you loved ones about the care you want to receive.
3. Complete the form.
4. Sign the form in front of 2 witnesses or a notary public.
5. Have the 2 witnesses or notary public sign the form.
6. Upload the form to MyChart or bring it to your next appointment.

We look forward to seeing you soon.

To your health,

[PCP] and your Providence care team

Figure 1.6: Email sent with AD drive invite, ACP Decisions videos, and reminder to fill out AD (Drive and video intervention).

All patients at Providence are encouraged to engage in Advance Care Planning and to have an Advance Directive completed and stored in their medical record. You are being contacted because you do not have an Advance Directive stored in your medical record.

Advance Care Planning focuses on the care you want if you are unable to speak for yourself because of an injury or illness. Your plan is based on your values, goals, and the type of care you want to receive. Your decisions about your Advance Care Planning should be written down in an Advance Directive.

An Advance Directive is a legal form that tells your family and doctors about the care you would like to receive. It is important to know that an Advance Directive is different from having a Physician Orders for Life-Sustaining Treatment, commonly known as a POLST.

[Dr. PCP Name] would like you to watch a 10-minute video about Advance Care Planning and read through a few pages of information about some of the decisions you need to make when filling out an Advance Directive.

[Link to video & Information Sheets]

Your care team can answer any questions about having an Advance Directive at your next appointment. In addition, you can find Providence resources on Advance Care Planning by clicking here.

If you want to fill out an Advance Directive now, just follow these steps:

1. Click here to download and print the Advance Directive form.
2. Talk to you loved ones about the care you want to receive.
3. Complete the form.
4. Sign the form in front of 2 witnesses or a notary public.
5. Have the 2 witnesses or notary public sign the form.
6. Upload the form to MyChart, or bring it to your next appointment.

We look forward to seeing you soon.

To your health,

[PCP] and your Providence care team

Figure 1.7: Email sent with ACP Decisions videos and reminder to fill out AD (Video only intervention).

All patients at Providence are encouraged to engage in Advance Care Planning and to have an Advance Directive completed and stored in their medical records. You are being contacted because you have not completed and/or provided an Advance Directive to be stored in your medical record.

Advance Care Planning focuses on the care you want if you are unable to speak for yourself because of an injury or illness. Your plan is based on your values, goals and the type of care you want to receive. Your decisions about your Advance Care Planning need to be written down in an Advance Directive.

An Advance Directive is a legal form that tells your family and doctors about the care you would like to receive. It is important to know that an Advance Directive is different from having a Physician Orders for Life-Sustaining Treatment, commonly known as a POLST.

Your care team can answer any questions about having an Advance Directive at your next appointment. In addition, you can find Providence resources on Advance Care Planning by clicking here.

If you want to fill out an Advance Directive now, just follow these steps:

1. Click here to download and print the Advance Directive form.
2. Talk to you loved ones about the care you want to receive.
3. Complete the form.
4. Sign the form in front of 2 witnesses or a notary public.
5. Have the 2 witnesses or notary public sign the form.
6. Upload the form to MyChart, or bring it to your next appointment.

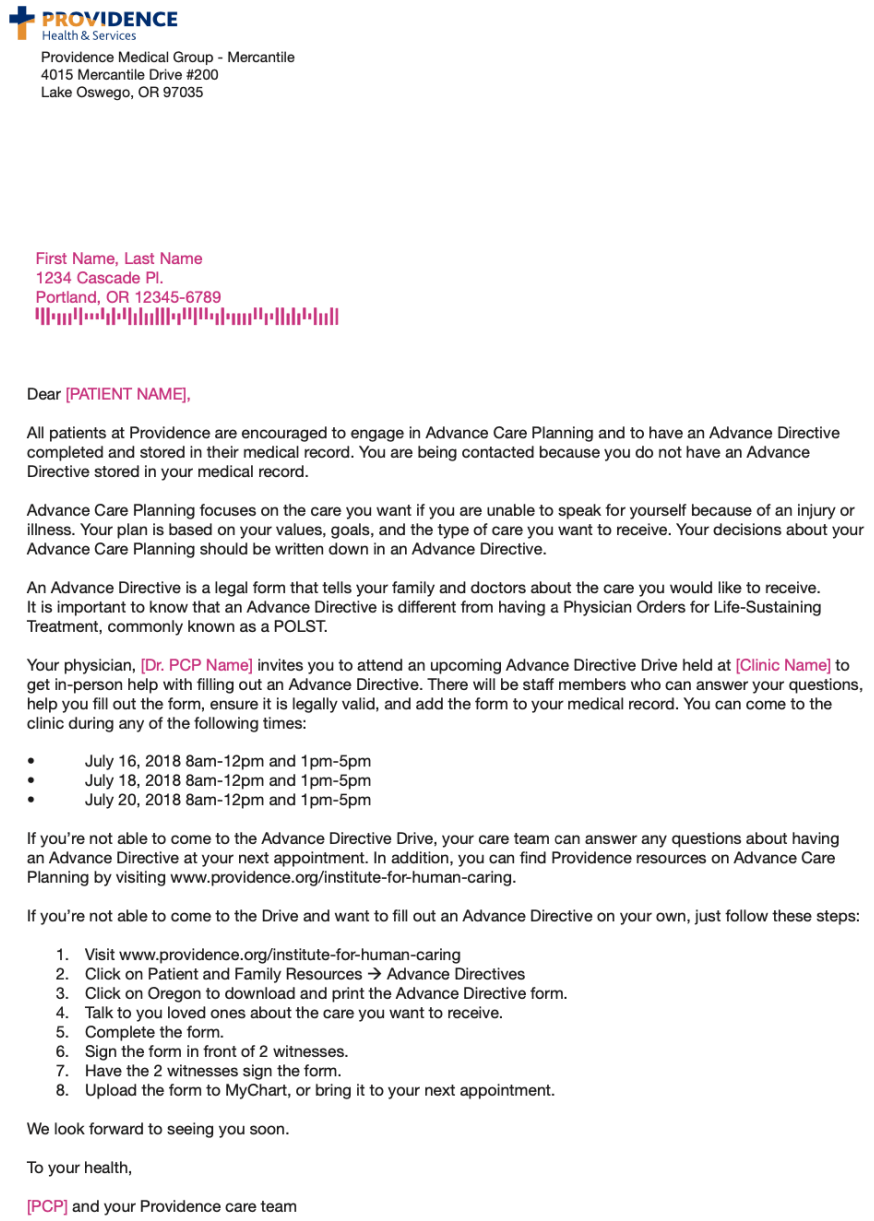
We look forward to seeing you soon.

To your health,

[PCP] and your Providence care team

Figure 1.8: Email sent with reminder to fill out AD only (Control).

Pilot Intervention: Letter Communications



PROVIDENCE
Health & Services

Providence Medical Group - Mercantile
4015 Mercantile Drive #200
Lake Oswego, OR 97035

First Name, Last Name
1234 Cascade Pl.
Portland, OR 12345-6789

Dear [PATIENT NAME],

All patients at Providence are encouraged to engage in Advance Care Planning and to have an Advance Directive completed and stored in their medical record. You are being contacted because you do not have an Advance Directive stored in your medical record.

Advance Care Planning focuses on the care you want if you are unable to speak for yourself because of an injury or illness. Your plan is based on your values, goals, and the type of care you want to receive. Your decisions about your Advance Care Planning should be written down in an Advance Directive.

An Advance Directive is a legal form that tells your family and doctors about the care you would like to receive. It is important to know that an Advance Directive is different from having a Physician Orders for Life-Sustaining Treatment, commonly known as a POLST.

Your physician, [Dr. PCP Name] invites you to attend an upcoming Advance Directive Drive held at [Clinic Name] to get in-person help with filling out an Advance Directive. There will be staff members who can answer your questions, help you fill out the form, ensure it is legally valid, and add the form to your medical record. You can come to the clinic during any of the following times:

- July 16, 2018 8am-12pm and 1pm-5pm
- July 18, 2018 8am-12pm and 1pm-5pm
- July 20, 2018 8am-12pm and 1pm-5pm

If you're not able to come to the Advance Directive Drive, your care team can answer any questions about having an Advance Directive at your next appointment. In addition, you can find Providence resources on Advance Care Planning by visiting www.providence.org/institute-for-human-caring.

If you're not able to come to the Drive and want to fill out an Advance Directive on your own, just follow these steps:

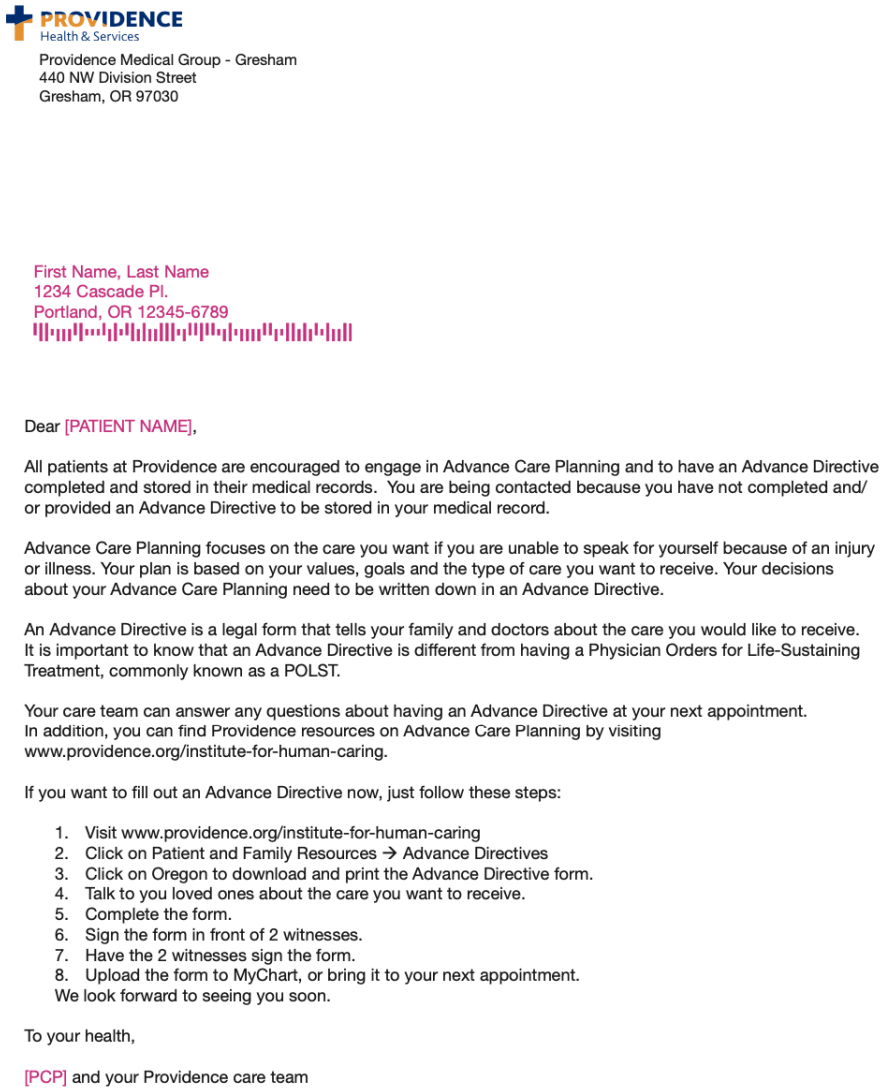
1. Visit www.providence.org/institute-for-human-caring
2. Click on Patient and Family Resources → Advance Directives
3. Click on Oregon to download and print the Advance Directive form.
4. Talk to you loved ones about the care you want to receive.
5. Complete the form.
6. Sign the form in front of 2 witnesses.
7. Have the 2 witnesses sign the form.
8. Upload the form to MyChart, or bring it to your next appointment.

We look forward to seeing you soon.

To your health,

[PCP] and your Providence care team

Figure 1.9: Letter proof sent to patients at the clinic with AD Drive.



PROVIDENCE
Health & Services

Providence Medical Group - Gresham
440 NW Division Street
Gresham, OR 97030

First Name, Last Name
1234 Cascade Pl.
Portland, OR 12345-6789

Dear [PATIENT NAME],

All patients at Providence are encouraged to engage in Advance Care Planning and to have an Advance Directive completed and stored in their medical records. You are being contacted because you have not completed and/or provided an Advance Directive to be stored in your medical record.

Advance Care Planning focuses on the care you want if you are unable to speak for yourself because of an injury or illness. Your plan is based on your values, goals and the type of care you want to receive. Your decisions about your Advance Care Planning need to be written down in an Advance Directive.

An Advance Directive is a legal form that tells your family and doctors about the care you would like to receive. It is important to know that an Advance Directive is different from having a Physician Orders for Life-Sustaining Treatment, commonly known as a POLST.

Your care team can answer any questions about having an Advance Directive at your next appointment. In addition, you can find Providence resources on Advance Care Planning by visiting www.providence.org/institute-for-human-caring.

If you want to fill out an Advance Directive now, just follow these steps:

1. Visit www.providence.org/institute-for-human-caring
2. Click on Patient and Family Resources → Advance Directives
3. Click on Oregon to download and print the Advance Directive form.
4. Talk to you loved ones about the care you want to receive.
5. Complete the form.
6. Sign the form in front of 2 witnesses.
7. Have the 2 witnesses sign the form.
8. Upload the form to MyChart, or bring it to your next appointment.

We look forward to seeing you soon.

To your health,

[PCP] and your Providence care team

Figure 1.10: Letter proof sent to patients at the clinic without AD Drive.

Subsequent Intervention: Email Communications

Dear [PATIENT NAME],

We are contacting you because our records show that you do not have an Advance Directive in your patient file; you meet our 55 years and older criteria; and you have an upcoming medical appointment at one of the clinics in Providence Health & Services.

An Advanced Directive is a legal form. It tells your family and doctors the medical care you want if you are unable to speak for yourself due to injury or illness. Having this plan in place can prevent unnecessary suffering and help relieve stress for family and loved ones.

We see that you have an upcoming appointment at our clinic. We encourage you to complete an Advance Directive and bring it with you. Completing an Advance Directive involves several steps:

1. Think about the care you want to have if you were to become seriously ill.
2. Talk to your loved one and care providers about the care you want to have.
3. Choose health care agents to speak for you if you were unable to speak for yourself.
4. Complete an Advance Directive form.
5. Give a copy of your completed Advance Directive to your care providers, your healthcare representatives, and your family.

Your care team can answer any questions about having an Advanced Directive at your appointment.

You can find Providence resources on Advance Care Planning here. You can also visit our website at www.instituteforhumancaring.org/Advance-Care-Planning.

To fill out an Advance Directive now, just follow these 2 steps:

1. Download and print the Advanced Directive and follow instructions provided.

   Click here for the EZ form or here for the traditional form.

2. Upload the completed, signed, and notarized (if necessary) form using your MyChart account. Or bring the form to your upcoming appointment. Notary service is available at the clinic.

We look forward to seeing you soon!

To your health,

[PCP] and your Providence Care Team

PROVIDENCE Health & Services

Figure 1.11: Electronic notification sent to Arms 2-6.

Subsequent Intervention: Letter Communications

PROVIDENCE Health & Services

[Provider/Clinic address]

[Patient address]

Dear [PATIENT NAME],

We are contacting you because our records show that you do not have an Advance Directive in your patient file; you meet our 55 years and older criteria; and you have an upcoming medical appointment at one of the clinics in Providence Health & Services.

An Advanced Directive is a legal form. It tells your family and doctors the medical care you want if you are unable to speak for yourself due to injury or illness. Having this plan in place can prevent unnecessary suffering and help relieve stress for family and loved ones.

We see that you have an upcoming appointment at our clinic. We encourage you to complete an Advance Directive and bring it with you. Completing an Advance Directive involves several steps:

1. Think about the care you want to have if you were to become seriously ill.
2. Talk to your loved one and care providers about the care you want to have.
3. Choose health care agents to speak for you if you were unable to speak for yourself.
4. Complete an Advance Directive form.
5. Give a copy of your completed Advance Directive to your care providers, your healthcare representatives, and your family.

Your care team can answer any questions about having an Advanced Directive at your appointment.

You can also find Providence resources on Advance Care Planning at www.instituteforhumancaring.org/Advance-Care-Planning.

To fill out an Advance Directive now, just follow these steps:

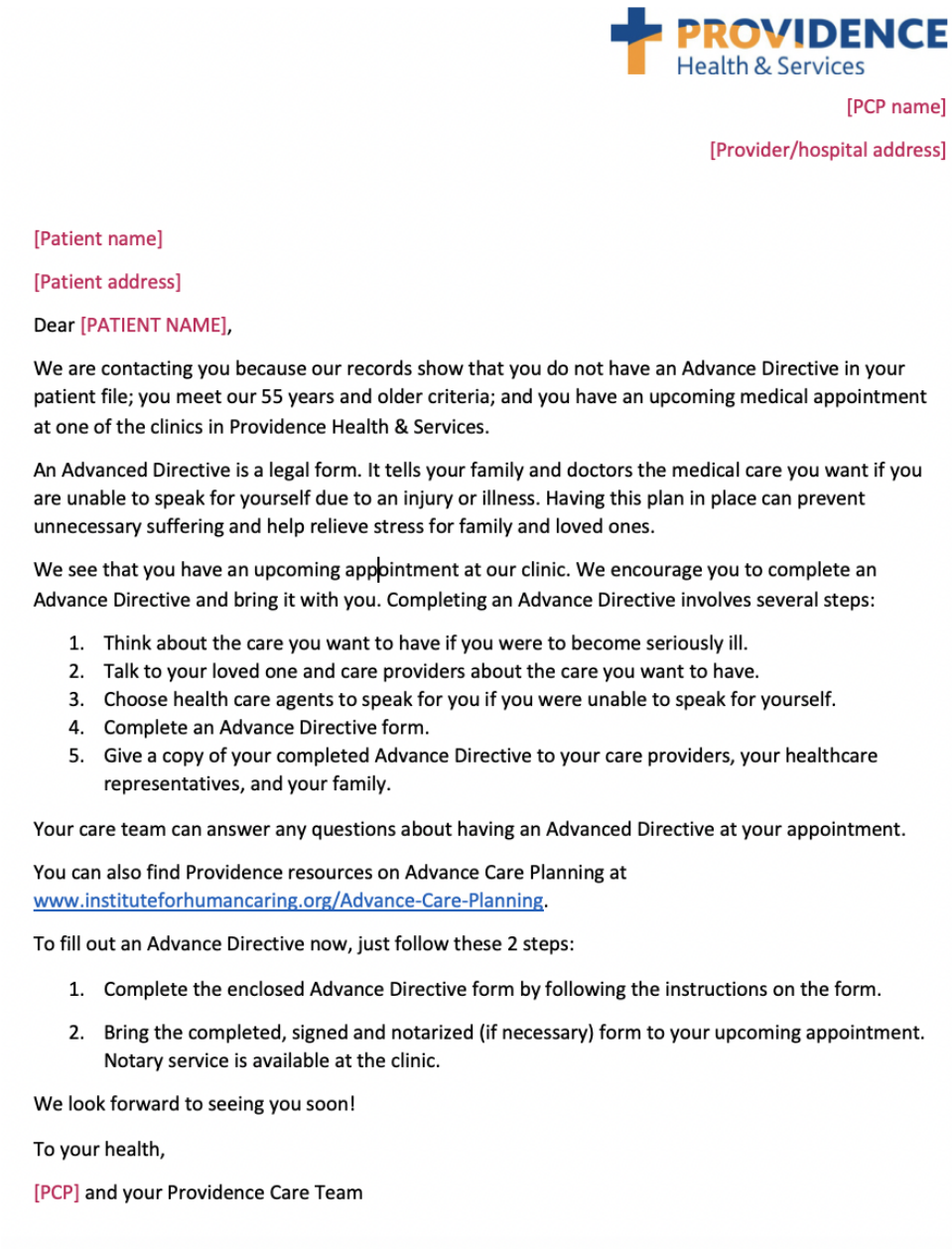
1. Go to the Providence web address above.
2. Choose COMPLETE on the left side of the page.
3. Select OREGON under the state options at the bottom of the page to download and print the Advanced Directive form.
4. Complete the Advance Directive form by following the instructions on the form.
5. Bring the completed, signed, and notarized (if necessary) form to your upcoming appointment. Notary service is available at the clinic.

We look forward to seeing you soon!

To your health,

[PCP] and your Providence Care Team

Figure 1.12: Letter communication sent to individuals in Arm 3 of the intervention.



PROVIDENCE
Health & Services

[PCP name]

[Provider/hospital address]

[Patient name]

[Patient address]

Dear [PATIENT NAME],

We are contacting you because our records show that you do not have an Advance Directive in your patient file; you meet our 55 years and older criteria; and you have an upcoming medical appointment at one of the clinics in Providence Health & Services.

An Advanced Directive is a legal form. It tells your family and doctors the medical care you want if you are unable to speak for yourself due to an injury or illness. Having this plan in place can prevent unnecessary suffering and help relieve stress for family and loved ones.

We see that you have an upcoming appointment at our clinic. We encourage you to complete an Advance Directive and bring it with you. Completing an Advance Directive involves several steps:

1. Think about the care you want to have if you were to become seriously ill.
2. Talk to your loved one and care providers about the care you want to have.
3. Choose health care agents to speak for you if you were unable to speak for yourself.
4. Complete an Advance Directive form.
5. Give a copy of your completed Advance Directive to your care providers, your healthcare representatives, and your family.

Your care team can answer any questions about having an Advanced Directive at your appointment.

You can also find Providence resources on Advance Care Planning at www.instituteforhumancaring.org/Advance-Care-Planning.

To fill out an Advance Directive now, just follow these 2 steps:

1. Complete the enclosed Advance Directive form by following the instructions on the form.
2. Bring the completed, signed and notarized (if necessary) form to your upcoming appointment. Notary service is available at the clinic.

We look forward to seeing you soon!

To your health,

[PCP] and your Providence Care Team

Figure 1.13: Letter communication sent to individuals in Arms 4 and 5 of the intervention.

Figure 1.14: Letter communication sent to individuals in Arm 6 of the intervention.

Advance Directive - OREGON

Providence St. Joseph Health

This form may be used in Oregon to choose a person to make health care decisions for you if you become too sick to speak for yourself. The person is called a health care representative.

If you do not have an effective health care representative appointment and become too sick to speak for yourself, a health care representative will be appointed for you in the order of priority set forth in ORS 127.635 (2).

This form also allows you to express your values and beliefs with respect to health care decisions and your preferences for health care.

- If you have completed an advance directive in the past, this new advance directive will replace any older directive.
- You must sign this form for it to be effective. You must also have it witnessed by two witnesses or a notary. Your appointment of a health care representative is not effective until the health care representative accepts the appointment.
- If your advance directive includes directions regarding the withdrawal of life support or tube feeding, you may revoke your advance directive at any time and in any manner that expresses your desire to revoke it.
- In all other cases, you may revoke your advance directive at any time and in any manner as long as you are capable of making medical decisions.

This advance directive belongs to: (please print your name on this line) **Date of Birth**

This advance directive and designation of a health care representative is in compliance with ORS 127.531. **PAGE 1**

Figure 1.15: Long advance directive form provided in Arm 4 of the intervention.

Advance Directive - OREGON

Providence St. Joseph Health

1. ABOUT ME

Name: _____ Date of Birth: _____

Telephone numbers: (Home) _____ (Work) _____

(Cell) _____ E-mail: _____

Address: _____

2. MY HEALTH CARE REPRESENTATIVE

I choose the following person as my health care representative to make health care decisions for me if I can't speak for myself.

Name: _____ Relationship: _____

Telephone numbers: (Home) _____ (Work) _____

(Cell) _____ E-mail: _____

Address: _____

I choose the following people to be my alternate health care representatives if my first choice is not available to make health care decisions for me or if I cancel the first health care representative's appointment.

First alternate health care representative:

Name: _____ Relationship: _____

Telephone numbers: (Home) _____ (Work) _____

(Cell) _____ E-mail: _____

Address: _____

Advance Directive - OREGON

Providence St. Joseph Health

2. MY HEALTH CARE REPRESENTATIVE (continued)

Second alternate health care representative:

Name: _____ Relationship: _____

Telephone numbers: (Home)_____ (Work) _____

(Cell) _____ E-mail: _____

Address: _____

3. INSTRUCTIONS TO MY HEALTH CARE REPRESENTATIVE

If you wish to give instructions to your health care representative about your health care decisions, initial one of the following three statements:

_____ To the extent appropriate, my health care representative must follow my instructions.

_____ My instructions are guidelines for my health care representative to consider when making decisions about my care.

_____ Other instructions:

_____

_____

_____

_____

_____

This advance directive belongs to: (please print your name on this line) **Date of Birth**

This advance directive and designation of a health care representative is in compliance with ORS 127.531. **PAGE 3**

Advance Directive - OREGON

Providence St. Joseph Health

4. DIRECTIONS REGARDING MY END OF LIFE CARE

In filling out these directions, keep the following in mind:

- The term "as my health care provider recommends" means that you want your health care provider to use life support if your health care provider believes it could be helpful, and that you want your health care provider to discontinue life support if your health care provider believes it is not helping your health condition or symptoms.
- The term "life support" means any medical treatment that maintains life by sustaining, restoring or replacing a vital function.
- The term "tube feeding" means artificially administered food and water.
- If you refuse tube feeding, you should understand that malnutrition, dehydration and death will probably result.
- You will receive care for your comfort and cleanliness no matter what choices you make.

A. Statement Regarding End of Life Care. You may initial the statement below if you agree with it. If you initial the statement you may, but you do not have to, list one or more conditions for which you do not want to receive life support.

_____ I do not want my life to be prolonged by life support. I also do not want tube feeding as life support. I want my health care provider to allow me to die naturally if my health care provider and another knowledgeable health care provider confirm that I am in any of the medical conditions listed below.

_____

_____

_____

_____

_____

_____

This advance directive belongs to: (please print your name on this line) **Date of Birth**

Advance Directive - OREGON

Providence St. Joseph Health

4. DIRECTIONS REGARDING MY END OF LIFE CARE (continued)

B. Additional Directions Regarding End of Life Care. Here are my desires about my health care if my health care provider and another knowledgeable health care provider confirm that I am in a medical condition described below:

a. Close to Death. If I am close to death and life support would only postpone the moment of my death:

INITIAL ONE:

_____ I want to receive tube feeding.

_____ I want tube feeding only as my health care provider recommends.

_____ I DO NOT WANT tube feeding.

INITIAL ONE:

_____ I want any other life support that may apply.

_____ I want life support only as my health care provider recommends.

_____ I DO NOT WANT life support.

b. Permanently Unconscious. If I am unconscious and it is very unlikely that I will ever become conscious again:

INITIAL ONE:

_____ I want to receive tube feeding.

_____ I want tube feeding only as my health care provider recommends.

_____ I DO NOT WANT tube feeding.

INITIAL ONE:

_____ I want any other life support that may apply.

_____ I want life support only as my health care provider recommends.

_____ I DO NOT WANT life support.

c. Advanced Progressive Illness. If I have a progressive illness that will be fatal and is in an advanced stage, and I am consistently and permanently unable to communicate by any means, swallow food and water safely, care for myself and recognize my family and other people, and it is very unlikely that my condition will substantially improve:

INITIAL ONE:

_____ I want to receive tube feeding.

_____ I want tube feeding only as my health care provider recommends.

_____ I DO NOT WANT tube feeding.

INITIAL ONE:

_____ I want any other life support that may apply.

_____ I want life support only as my health care provider recommends.

_____ I DO NOT WANT life support.

This advance directive belongs to: (please print your name on this line) **Date of Birth**

This advance directive and designation of a health care representative is in compliance with ORS 127.531. **PAGE 5**

Advance Directive - OREGON

Providence St. Joseph Health

4. DIRECTIONS REGARDING MY END OF LIFE CARE (continued)

d. Extraordinary Suffering. If life support would not help my medical condition and would make me suffer permanent and severe pain:

INITIAL ONE:

_____ I want to receive tube feeding.

_____ I want tube feeding only as my health care provider recommends.

_____ I DO NOT WANT tube feeding.

INITIAL ONE:

_____ I want any other life support that may apply.

_____ I want life support only as my health care provider recommends.

_____ I DO NOT WANT life support.

C. Additional Instruction. You may attach to this document any writing or recording of your values and beliefs related to health care decisions. These attachments will serve as guidelines for health care providers. Attachments may include a description of what you would like to happen if you are close to death, if you are permanently unconscious, if you have an advanced progressive illness or if you are suffering permanent and severe pain.

_____

_____

_____

_____

_____

_____

_____

This advance directive belongs to: (please print your name on this line) **Date of Birth**

Advance Directive - OREGON

Providence St. Joseph Health

5. MY SIGNATURE

My Signature: _____ Date:_____

6. WITNESS

COMPLETE EITHER A OR B WHEN YOU SIGN.

A. NOTARY:

State of OREGON

County of _____

Signed (or attested) before me on (date) _____ , 2_____ ,

by (name(s) of individual(s))_____ .

_____

Notary Public - State of Oregon

B. WITNESS DECLARATION:

The person completing this form is personally known to me or has provided proof of identity, has signed or acknowledged the person's signature on the document in my presence and appears to be not under duress and to understand the purpose and effect of this form.

In addition, I am not the person's health care representative or alternate health care representative, and I am not the person's attending health care provider.

Witness Name (print): _____

Signature: _____ Date: _____

Witness Name (print): _____

Signature: _____ Date: _____

This advance directive belongs to: (please print your name on this line)	**Date of Birth**

Advance Directive - OREGON

Providence St. Joseph Health

7. ACCEPTANCE BY MY HEALTH CARE REPRESENTATIVE

I accept this appointment and agree to serve as health care representative.

Health care representative:

Printed Name:_____

Signature or other verification of acceptance: _____ Date:_____

First alternate health care representative:

Printed Name:_____

Signature or other verification of acceptance: _____ Date:_____

Second alternate health care representative:

Printed Name:_____

Signature or other verification of acceptance: _____ Date:_____

Advance Directive - OREGON

Providence St. Joseph Health

Submit a copy of your completed advance directive.

Once you have signed your advance directive and it has been witnessed, keep the original and make copies of pages 1-8 to send to your:

- Health care representative
- Family
- Friends
- Medical providers
- Hospital

Options for returning your completed advance directive:

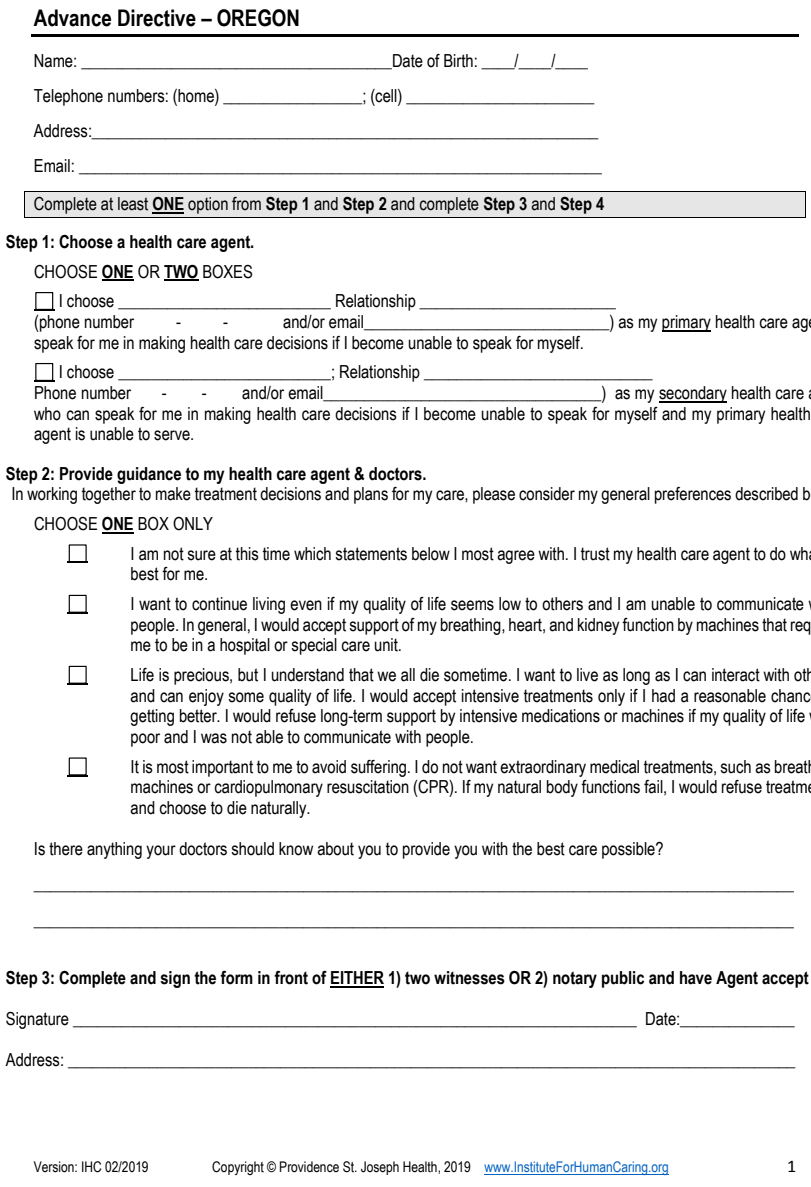
1. Return a **COPY** to your preferred Providence St. Joseph Health doctor or hospital at your next visit.
2. Return a **COPY** by using the self-addressed stamped envelope (if available).
3. Return by fax to your Providence St. Joseph Health hospital:

Providence Hood River Memorial Hospital
Providence Medford Medical Center
Providence Milwaukie Hospital
Providence Newberg Medical Center
Providence Portland Medical Center
Providence Seaside Hospital
Providence St. Vincent Medical Center
Providence Willamette Falls Medical Center
Fax to 503-215-3025

For hospitals not listed, please contact your hospital for the correct fax number.

If you have any questions related to completing or returning your advance directive, please contact us at:

Providence.org/InstituteForHumanCaring
424-212-5444



Advance Directive – OREGON

Name: _____Date of Birth: ____/____/____

Telephone numbers: (home) _____; (cell) _____

Address:_____

Email: _____

Complete at least **ONE** option from **Step 1** and **Step 2** and complete **Step 3** and **Step 4**

Step 1: Choose a health care agent.

CHOOSE **ONE** OR **TWO** BOXES

☐ I choose _____ Relationship _____
(phone number - - and/or email_____) as my primary health care agent to speak for me in making health care decisions if I become unable to speak for myself.

☐ I choose _____; Relationship _____
Phone number - - and/or email_____) as my secondary health care agent who can speak for me in making health care decisions if I become unable to speak for myself and my primary health care agent is unable to serve.

Step 2: Provide guidance to my health care agent & doctors.
In working together to make treatment decisions and plans for my care, please consider my general preferences described below:

CHOOSE **ONE** BOX ONLY

☐ I am not sure at this time which statements below I most agree with. I trust my health care agent to do what is best for me.

☐ I want to continue living even if my quality of life seems low to others and I am unable to communicate with people. In general, I would accept support of my breathing, heart, and kidney function by machines that require me to be in a hospital or special care unit.

☐ Life is precious, but I understand that we all die sometime. I want to live as long as I can interact with others and can enjoy some quality of life. I would accept intensive treatments only if I had a reasonable chance of getting better. I would refuse long-term support by intensive medications or machines if my quality of life was poor and I was not able to communicate with people.

☐ It is most important to me to avoid suffering. I do not want extraordinary medical treatments, such as breathing machines or cardiopulmonary resuscitation (CPR). If my natural body functions fail, I would refuse treatments and choose to die naturally.

Is there anything your doctors should know about you to provide you with the best care possible?

_____

_____

Step 3: Complete and sign the form in front of EITHER 1) two witnesses OR 2) notary public and have Agent accept

Signature _____ Date:_____

Address: _____

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Figure 1.16: Short advance directive form provided in Arms 5-6 of the intervention.

Advance Directive – OREGON

SIGNATURE OF FIRST WITNESS
I declare under penalty of perjury under the laws of Oregon that:

- The individual completing this form is personally known to me or has provided proof of identity;
- The individual completing this form has signed or acknowledged the person's signature on the document in my presence and appears to be not under duress and to understand the purpose and effect of this form.
- I am not the individual's health care provider
- I am not the individual's health care representative or alternative health care representative.

Signature:_____

Print Name:_____

Address:_____

SIGNATURE OF SECOND WITNESS
I declare under penalty of perjury under the laws of Oregon that:

- The individual completing this form is personally known to me or has provided proof of identity;
- The individual completing this form has signed or acknowledged the person's signature on the document in my presence and appears to be not under duress and to understand the purpose and effect of this form.
- I am not the individual's health care provider
- I am not the individual's health care representative or alternative health care representative.
- I am not a relative/spouse/adoptee, heir/beneficiary of the individual

Signature:_____

Print Name:_____

Address:_____

2. Option 2 – Notary
State of Oregon
County of _____

I certify that I know or have satisfactory evidence that _____ signed this instrument and acknowledged it to be his or her free and voluntary act for the uses and purposes mentioned in the instrument.
(Notary Seal)

Date: _____
Signature of Notary Public: _____
Title: _____
My appointment expires: _____

Step 4: Health Care Representative's(s') acceptance of the appointment.
I hereby accept the appointment to be the health care agent for _____

Name: _____

I hereby accept the appointment to be the secondary health care agent for _____

Name: _____

Name: _____ Date of Birth: _____

Advance Directive – OREGON

This form may be used in Oregon to choose a person to make health care decisions for you if you become too sick to speak for yourself. The person is called a healthcare representative. If you have completed a form appointing a health are representative in the past, this new form will replace any older form. You must sign this form for it to be effective. You must also have it witnessed by two witnesses or a notary. Your appointment of a health care representative is not effective until the health care representative accepts the appointment. If you become too sick to speak for yourself and do not have an effective health care representative appointment, a health care representative will be appointed for you in the order of priority set forth in ORS 127.635(2).

Instructions for Step 1: Appointing a health care agent.

Name someone you trust to make health care choices for you if you are unable to make your own decisions. Provide name and contact information for this person, along with one additional individual

Choose a family member or friend who:

- Is 18 or older and knows you well
- Is willing to do this for you
- Is able to make difficult decisions based on your wishes
- Will effectively communicate the information you provide in this packet to health
- Agrees to accept the appointment

Your representative cannot be your doctor or someone who works at the hospital or clinic where you are receiving care unless he or she is a member of your family.

Your health care representative can:

- Decide where you will receive care
- Select or dismiss health care providers
- Say yes/no to medications, tests, treatments
- Take legal action to carry out your wishes

Your health care representative CANNOT authorize:

- Electro-convulsive therapy
- Psycho-surgery
- Sterilization
- Abortion
- Life-sustaining procedures*
- Nutrition & Hydration*

*Refusal permissible if expressly authorized or if specific conditions are met (ex: individual has been medical confirmed to be in a terminal condition or permanently unconscious)

Instructions for Step 2: Information for my health care agent & doctors in making decisions for my care.

Indicate your health care wishes

1. Select one of the choices to provide guidance concerning life support treatments. Below is some information about some life support treatments that may or may not be successful in helping you live longer.

   CPR or cardiopulmonary resuscitation: This may involve (1) Pressing hard on your chest to keep your blood pumping, (2) Electrical shocks to jump-start your heart, (3) Medicines in your veins.

   Ask your health care providers for more information as needed.

ACP DECISIONS

Goals of Care

A Guide to End-of-Life Choices

It's important to think about what type of medical care you would want if you become sick. Generally, there are 3 ways to think about your medical care goals. They are Life-Prolonging Care, Limited Medical Care, and Comfort Care.

Life-Prolonging Care

With Life-Prolonging Care the goal is to stay alive. Health providers will use everything possible. This includes CPR and a ventilator. CPR stands for Cardio-Pulmonary Resuscitation. CPR would be done if your heart stops beating. CPR includes pushing hard on the chest and using a machine that gives an electric shock to the heart. The provider may also need to put a tube down your throat to help you breathe. This tube connects to a breathing machine. The breathing machine is also called a ventilator.

Here is what happens with CPR:

1. **The provider may push very hard on a person's chest.**

2. **The provider may use a machine that gives the heart an electric shock.**

3. **Patients may need a tube to help with breathing.**

About 15% of the people who get CPR will survive the experience. This means that if 100 people are given CPR, 15 of them would live and 85 would not survive. The chance of living after CPR is 5% for people who are older or very sick. In other words, in 100 people, 95 would die and 5 would survive.

It is important to know that people who are alive after CPR usually have health problems. Some examples include broken ribs and brain injury. Most people with a serious illness who survive CPR can no longer take care of themselves.

Limited (or Selected) Medical Care

With Limited (Or Selected) Medical Care some but not all treatments to cure medical problems would be tried. For instance, the provider might give you medicines through a vein to treat an infection. They would not perform CPR or use a ventilator to keep you alive.

Comfort Care

With Comfort Care the goal is to help you feel more comfortable, even if that means not doing everything possible to prolong life or cure every condition. Comfort care can help with symptoms like pain and problems breathing. Patients can get comfort care at home or in a hospice, skilled nursing facility, or hospital.

Figure 1.17: ACP Decisions information brochure on end-of-life choices provided in Arm 6 of the intervention.

ACP DECISIONS

A Guide to Goals of Care

Think About Your Choices

There is a lot to think about before choosing your type of care.

Life-Prolonging Care

Many people who choose **Life-Prolonging Care** feel it is important to live as long as they can. They want to live longer even if it means agreeing to procedures that may be painful or have a small chance of success.

Limited (or Selected) Medical Care

Many people who choose **Limited (or Selected) Medical Care** feel it is important to live as long as possible, but not if it means being in pain. They want to avoid procedures like CPR that can be painful and are not likely to work.

Comfort Care

Many people who choose **Comfort Care** feel it is more important to be comfortable than to live as long as possible. They do not want CPR. They want treatment that focuses on their comfort. They want to avoid being in pain or kept alive artificially, even if it means they might miss a chance to live longer.

Which type of medical care should you pick?

Your decision comes from your personal beliefs. Some people want to take a chance, even if it is a small one, at living more. Let your friends, family and providers know about your wishes.

Many people also think about how their choice will affect their friends and family. Do you worry about this? Have you talked with them? Talking with your friends, family, and health providers about your wishes is very important. Talking about your wishes will help protect your rights and values.

Studies About CPR Success Rates and Problems

- Ehlenbach et al. Epidemiologic Study of In-Hospital Cardiopulmonary Resuscitation in the Elderly. N Engl J Med 2009;361:22-31.
- Nadkarni VM, Larkin GL, Peberdy MA, Carey SM, Kaye W, Mancini ME, Nichol G, Lane-Truitt T, Potts J, Ornato JP, Berg RA; National Registry of Cardiopulmonary Resuscitation Investigators. First documented rhythm and clinical outcome from in-hospital cardiac arrest among children and adults. JAMA. 2006;295:50–57.
- Brindley PG, et. al. Predictors of survival following in-hospital adult cardiopulmonary resuscitation. CMAJ 2002;167(4):343-8.

Information About This Patient Decision Aid

This Goals-of-Care fact sheet was developed by Angelo Volandes MD, MPH, a physician and researcher at Harvard Medical School.

Dr. Volandes is a recognized expert on educating patients about their medical choices. Dr. Volandes was not paid by any outside groups to develop this fact sheet which was last updated in 2017. Subsequent iterations have been funded by the Stupski Foundation, ACP Decisions, and the Melik-Baschkopf Foundation. Dr. Volandes and these non-profit organizations do not make money from medical choices people make.

ACP DECISIONS

A Guide to Feeding Tubes

When a person is unable to eat food or drink liquids they can get food and liquid through a vein for a short time. This is really not a long-term solution. When this happens, it is important to learn about feeding tubes. This way you can decide if a feeding tube does or does not make sense for you.

What is a Feeding Tube?

A feeding tube is a tube that goes through the skin directly into the stomach.

A small surgery in needed to place this tube.

As with all surgery, there is a slight risk of bleeding and infection.

Do Feeding Tubes Help?

Sometimes, a person cannot eat or drink because of a health problem that can get better. In this situation, a feeding tube may be useful. However, sometimes a person cannot eat or drink because of a health problem that will not improve. In this situation, a feeding tube will not help that person get better. For example, for people with advanced dementia or advanced cancer, feeding tubes do not help. Research shows that feeding tubes do not improve the length or quality of life for people with an advanced illness.

Thinking About Your Choices

Feeding Tube

Many people who choose a feeding tube feel it is important to live as long as they can. They have a temporary illness and the feeding tube can help them get through the worst of their illness.

No Feeding Tube

Many people who choose not to have a feeding tube want to focus on comfort. They don't want to have any additional procedures that might cause pain and suffering, especially if they already have an advanced illness. Often, a very small amount of food and liquids can be given by hand.

Figure 1.18: ACP Decisions information brochure on feeding tubes provided in Arm 6 of the intervention.

ACP DECISIONS

A Guide to Feeding Tubes

Some Additional Thoughts

You may have beliefs that affect how you think about feeding tubes. Many people worry about how their choice will affect their friends and family. Have you talked with them? It is very important to talk with your friends, family, and health providers about your wishes. Talking about your wishes will help protect your rights and values.

Studies about options for people who are no longer able to eat and drink:

- Mitchell SL, Kiely DK, Lipsitz LA. The risk factors and impact on survival of feeding tube placement in nursing home residents with severe cognitive impairment. Arch Intern Med. 1997 Feb 10;157(3):327-32.
- Finucane TE, Christmas C, Travis K. Tube feeding in patients with advanced dementia: a review of the evidence. JAMA. 1999 Oct 13;282(14):1365-70.
- Gillick MR, Volandes AE. The Standard of Caring: Why Do We Still Use Feeding Tubes in Patients With Advanced Dementia? J Am Med Dir Assoc. 2008 Jun;9(5):364-7. doi: 10.1016/j.jamda.2008.03.011.
- Mitchell SL. Clinical crossroads: A 93-year-old man with advanced dementia and eating problems. JAMA 2007;298:2527–2536.

Information About This Decision Aid

This Feeding Tube guide was developed by Angelo Volandes MD, MPH who is a physician and researcher at Harvard Medical School.

Dr. Volandes is recognized worldwide as an expert on educating patients about their choices for feeding tubes. Dr. Volandes was not paid by any outside groups to develop this fact sheet which was last updated in 2017. Subsequent iterations have been funded by the Stupski Foundation, ACP Decisions, and the Melik-Baschkopf Foundation. Dr. Volandes and these non-profit organizations do not make money from choices people make about getting feeding tubes.

Chapter 2

Risky Business: Plan Choice, Risk Adjustment, and Inertia in the CalPERS Health Insurance Market

2.1 Introduction

The combination of adverse selection, information frictions, and inertia in the health insurance market is one of many reasons why the market is so inefficient (Handel et al., 2019). While most models assume that consumers are informed and that decision-making is frictionless, we know that in practice, this is rarely the case. However, evidence also suggests that in some cases, the inertia of staying in the same health plan may be welfare-enhancing to the population as a whole due to adverse selection, even if it is welfare-reducing to each specific individual (Handel, 2013). Risk adjustment is often seen as a solution to helping reduce these welfare losses, especially when combined with nudges to create more active decision-making in individual health insurance plan choices.

The California Public Employees' Retirement System (CalPERS) administers health and retirement benefits on behalf of more than 3,000 public school, local agency, and state employers. CalPERS offers a number of different health plans including three PPO plans (since 2008) and at least three HMO plans (since 2008). The primary rationale for offering plan choices is to allow CalPERS subscribers to select an option that achieves their best blend of cost, coverage, and care accessibility every year. Uniquely, CalPERS both implemented risk adjustment in 2014 for their plans, and subsequently discontinued risk adjustment just 5 years later in 2019. Therefore, this environment provides us with an opportunity to to observe the effects of risk adjustment implementation and removal in practice and leverage 3 periods due to the policy changes: (i) pre-risk adjustment (2008-2014), (ii) during risk adjustment (2014-2018), and (iii) post risk adjustment (2019-2020).

In this chapter, we study how individuals within CalPERS make health insurance plan decisions under a unique insurance plan characteristic structure. Unusually, CalPERS plans

offer little differentiation in cost-sharing characteristics, with most of the HMO plans (chosen by 88% percent of all subscribers) offering the same cost sharing characteristics. Instead, these HMO plans are differentiated through in- and out-of provider network memberships.

In our approach, we first study beneficiary demand for insurance plans in-depth, spanning a study period of 2008-2020. We use the entire claims database from CalPERS between 2008-2020 to put together a data set with claims, plan choice, and key beneficiary information.

We create a logit choice demand model that allows for subscribers to choose between all plans in their respective choice sets and tells us how much their choices suggest they value different plan characteristics. We estimate a sophisticated demand model that accounted for factors such as (i) premiums, (ii) plan brand effects, (iii) beneficiary health risk, (iv) beneficiary inertia, and (v) beneficiary out-of-pocket costs in one unified framework. Our model includes rich interactions between plan brands, regional location, and consumer health status, in order to measure health-status specific plan preferences, in addition to measuring preferences for financial plan attributes.

Our demand estimates have a number of clear patterns. First, as documented elsewhere in the health economics literature (Chandra et al., 2019; Abaluck and Gruber, 2011; Gruber et al., 2020), subscribers act as if they value a dollar in premium savings much more highly than a dollar in expected out-of-pocket spending. We find that for every $\$1,000$ increase in expected out-of-pocket spending, subscribers are 3.29% less likely to choose that specific plan while for a $1,000 increase in yearly plan premiums an individual would be roughly 17.1% less likely to choose that given plan. This roughly 5 to 1 ratio is consistent with previous findings that consumers value premium savings between 4 and 8 to 1 times that of out-of-pocket spending within the literature on Medicare Part D.

Next, we examine the effectiveness of the CalPERS' risk adjustment transfers between 2014 and 2018. Risk adjustment transfers are a well-known policy tool used to mitigate adverse selection in health insurance markets. These transfers shift money from plans that enroll cheaper consumers to plans that enroll more expensive consumers, based on algorithms that map ex-ante claims to risk scores and, ultimately, to expected spending in a benchmark plan. These transfers slow down or stop adverse selection death spirals by dampening the link between enrollee costs and plan premiums that is inherent to insurance markets and other selection markets. We present descriptive evidence that both inertia is strong and that risk adjustment had a noticeable effect on both insurance premium changes and individuals' decisions when it comes to selecting health plans. Our descriptive evidence shows how risk adjustment dampened adverse selection among PPO plans when it was implemented in 2014 as healthier consumers switched into more generous plans as premiums fell due to risk adjustment transfers. Similarly, we see the opposite effect where risk adjustment was removed after 2018, healthier consumers once again left these plans. However, due to the strong inertia effects in our small-group market, plan choice changes are relatively small.

Finally, we use our demand estimates to study the implications of (i) re-implementing risk adjustment transfers and (ii) active choice policies for future plan migration at CalPERS. We add counterfactual simulations on what may occur in the future if risk adjustment is re-implemented and how patients may behave with either full inertia or active choice scenarios

to reduce inertia. We use our demand model estimates to simulate 50 choices for each subscriber present in 2020, for each policy scenario, in order to account for the stochastic nature of the demand estimates.[1] Our simulations show small effects when risk adjustment is implemented with inertia, but significant and large effects when risk adjustment is combined with active choices. These simulations suggest that for a given risk adjustment scenario (including no risk adjustment) moving from inertia to no inertia has large implications for enrollment. As expected from theory and previous literature, policies that substantially increase active choice should only be considered in the presence of effective risk adjustment, which both mutes adverse selection and allows for efficient re-matching of consumers to different plans. Without effective risk adjustment, switching is likely to lead to a significant increase in welfare losses due to adverse selection as healthy consumers select into cheaper plans leading to higher premiums for plans that enroll sicker individuals. We also show that risk adjustment transfers are crucial for mitigating adverse selection and allow for the active choice policies to unlock an efficient matching of consumers to plans in the choice set.

Our work adds to the literature on consumer health insurance plan choices, risk adjustment, and inertia. Recently, there has been significant work detailing that consumers make poor choices in insurance markets (see Chandra et al. (2019) and Handel and Kolstad (2015b) for overviews of this literature). These decision-making issues have been demonstrated most prominently in Medicare Part D prescription drug plans (Abaluck and Gruber, 2011; Ketcham et al., 2012; Heiss et al., 2016; Polyakova, 2016; Ho et al., 2017a), but also in Medicare Advantage (Handel et al., 2019) and employer-sponsored health insurance markets (Bhargava et al., 2017; Handel, 2013; Handel and Kolstad, 2015b). Similar to these papers, we study the choice architecture, framework, and the decision-making of the individuals inside the CalPERS network. Unlike the previous studies in this area, we have rich claims-level data from CalPERS over a 13 year period of time; the CalPERS system is also significantly larger than the the previous studies on employer-sponsored health insurance and the plan structure is uniquely differentiated as previously mentioned.

We also focus on adverse selection and inertia in health insurance markets, using risk adjustment to improve the efficiency and equity of the markets. Adverse selection in health insurance has been widely studied, first by Akerlof (1970) and Rothschild and Stiglitz (1976). When premiums are risk-rated, or adjusted to the mean expected claims under that contract, individuals with expensive medical conditions may not be able to afford the premiums of their plans. In the extreme, selection may cause premiums of the generous plan to spiral up as consumers who remain are increasingly costly. The market would then unravel because individuals are not willing to subsidize the pooled cost of those with higher demand. Cutler and Reber (1998) find in a study of a change from generous health insurance to fixed contributions for Harvard employees a small but significant welfare loss, although increased competition reduced Harvard's premiums. On the extensive margin, healthy individuals are

[1]We simulate 50 choices for each subscriber in order to account for the statistical uncertainty inherent to the demand model, which gives a probabilistic prediction of what plan each subscriber will choose. By simulating 50 choices per subscriber, from the given choice set they have, we mimic this predicted probability distribution estimated in the statistical model.

more likely to be uninsured and on the intensive margin, more sick individuals sort themselves into more generous plans. These distortions are a concern to policymakers who design regulations for health insurance markets. Simon (2005) similarly finds evidence of adverse selection in state small-group health insurance markets after health care reform, where healthy individuals exited the market after reforms to restrict insurers' ability to distinguish between high and low-risk customers. Looking at the market for employer-provided health insurance, Einav et al. (2020) also find small welfare losses associated with adverse selection, although these welfare losses are an order of magnitude smaller than those from monopolistic pricing. Studying the Massachusetts health insurance exchange, Shepard (2016) finds evidence of adverse selection against covering the most prestigious and expensive hospitals, with most plans having a disincentive disincentive to covering these "star" hospitals due to higher costs and increase steering patients to lower-cost hospitals. In the most extreme cases, adverse selection has been shown to cause a complete unravelling of generous insurance as shown in health insurance exchanges (Handel and Kolstad, 2015b), disability and life insurance (Hendren, 2013), and unemployment insurance (Hendren, 2017).

To address the instability caused by selection, policy mechanisms such as premium subsidies or insurance mandates can assist in promoting affordability and efficiency such that consumers, regardless of level of income and health status, can purchase a certain level of coverage and coverage levels can be increased towards the efficient level. One solution to these adverse selection issues is to use risk adjustment to ameliorate adverse selection across plans by adjusting payments to insurers based on the expected health care costs of their enrollees. Risk adjustment counters cream-skimming behavior so that the healthy subsidizes the less-healthy to improve their efficiency and equity.

Risk adjustment has been proposed and implemented in a variety of applications; there is now a substantive academic literature in economics studying properties of risk adjustment transfers. Cutler and Reber (1998) find that using either prospective adjustment using demographic and past medical information or retrospective risk adjustment using differences in utilization at the end would be efficiency for Harvard employees. Handel et al. (2013) find that in health insurance exchanges, there is substantial welfare cost in adverse selection, but it pales in comparison to the welfare loss in premium reclassification risk; risk adjustment can be used to lower the welfare loss in both scenarios. However, risk adjustment may have downsides as well: Mahoney and Weyl (2017) find that risk adjustment can offset adverse selection, but may also reduce coverage and social surplus. Other risk adjustment proposals have been suggested or implemented for managed care (Glazer and McGuire, 2000), Medicare (Brown et al., 2014), and Medicare Advantage plans (Newhouse et al., 1997), with many being effective at reducing favorable selection (McWilliams et al., 2012).

More recent literature has also focused on the interaction between adverse selection, information frictions, inertia, and risk adjustment. While risk adjustment transfers dampen adverse selection, active choice policies make markets more fluid, improving the matches of consumers to plans, given a set of plan characteristics. However, active choices can also make the market more volatile by inducing faster plan switching based on health status changes and plan characteristic changes. There are now myriad papers showing the strength of inertia

in reducing plan switching in health insurance markets (see, e.g., Chandra et al. (2019) for an overview). Handel (2013) studies scenarios where more active choice policies that reduce inertia worsen an adverse selection death spiral and Spinnewijn (2017) and Handel et al. (2019) present general frameworks showing the subtle interactions between active choice policies and risk adjustment transfer policies. Broadly speaking, these papers show that these two types of policies are highly complementary to one another: the better a market organization is at implementing risk adjustment transfers, the more it makes sense for them to consider policies / nudges that facilitate active, fluid, informed choices in the marketplace.

Although risk adjustment transfers are a crucial policy tool for mitigating adverse selection in health insurance, implementing these transfers can be logistically challenging for a range of reasons. As such, in practice, risk adjustment is often imperfect. From a policy standpoint, risk adjustment has been particularly important as a key component of the Affordable Care Act (ACA), although implementation has been difficult. Key papers that discuss the difficulty of implementing risk adjustment transfers in practice include Brown et al. (2014) in Medicare Advantage, Finkelstein et al. (2017) with the Affordable Care Act, and Ellis and Layton (2014) across a range of markets.

Historically, the policy relevance of risk adjustment increased during the 1990s as many countries (including the United States with the dominance of HMO and managed care plans) make their individual health insurance market more competitive in order to increase access to coverage for higher-risk individuals (Wynand et al., 2000). However, technology and data for risk adjustment was primitive at this time, with incentives using only observable characteristics such as age creating crude measures and without the usage of diagnostic and rich claims information (Newhouse, 1998). The risk adjustment plans in the Clinton health care proposals of the mid-1990s were criticized for giving plans a choice between selecting good risks and an incentive to produce at lowest cost (Newhouse, 1994). As recently as the early 2000s, usage of risk adjustment was rare. Most plans around the world did not use risk adjustment but instead focused on regulating the dimensions and prices along which health plans were allowed to compete, pooling customers into a relatively small number of rate categories (Wynand et al., 2000). Geruso and Layton (2017) note more recent usages of risk adjustment.

Our contribution to the literature is two-fold. First, we expand the work on mistakes in individual behavior when choosing insurance plans to the a small private employer-sponsored insurance market that is unusually undifferentiated from a cost perspective: while there is a difference in the cost-sharing details between PPOs and HMOs, within each group the differences are largely the same. Previous work in this area have focused primarily on Medicare Part D (Abaluck and Gruber, 2011; Heiss et al., 2016; Ketcham et al., 2012), Medicare Advantage (Handel et al., 2019), and employer-sponsored insurance (Bhargava et al., 2017; Handel, 2013). Uniquely, most of our differentiation in health plan selection comes from large brand effects rather than financial differences. Even in this idiosyncratic environment with strong brand effects, our findings reinforce previous ones as consumers lose money on their plan choices because they overweight premiums costs by a factor of 5 to 1 relative to expected out-of-pocket spending.

Secondly, we show evidence of risk adjustment at work in our insurance market and its interaction with plan choice inertia and active choice. Our descriptive statistics suggest that even simple risk adjustment works to dampen adverse selection issues, as during the period where risk adjustment was in place, healthier patients selected the more generous plans. However, our demand estimates suggest that in the absence of active choice or a way to facilitate regular consumer decision-making, the impact of risk adjustment is minimal and isolated mostly to new consumers in the market. We add to the literature in suggesting that any implementation of risk adjustment requires decision-support and active choice tools (e.g. Handel et al. (2019)).

The rest of this chapter proceeds as follows. Section 2 presents the data and setting for the paper, including sample construction. Section 3 presents the demand modeling approach and presents the results from the demand model. Section 4 presents our risk adjustment descriptive statistics as well as future planned work. Finally, Section 5 presents some counterfactual scenarios based on our demand model and risk adjustment changes and Section 6 concludes.

2.2 Data and Setting

Member Sample Construction

We analyze health care claims data from CalPERS over a thirteen year period of time between 2008 and 2020, for non-Medicare consumers. Our data consists of three major components: (1) member-level enrollment information for all CalPERS subscribers which includes plan choice and basic demographics; (2) complete line-level health care claims with information on diagnoses, procedures, providers, and spending; and (3) plan details consisting of cost-sharing details including deductibles, copays, and maximum out-of-pocket spending as well as some network-related information. This data is similar in content to other detailed data sets used recently in the health insurance literature, such as those in Einav et al. (2010); Handel (2013); Brot-Goldberg et al. (2017); Gruber et al. (2020).

Our data contains a rich set of information including demographic and health plan information about each individual, detailed claim line spending information, and procedure and diagnosis information for each claim line. We construct our primary analysis sample at the subscriber-year level—we condense our claims data to yearly subscriber spending, further separated into discrete parts such as outpatient, inpatient, and pharmacy spending to calculate predicted out-of-pocket spending; information on the original size of our sample is in Appendix Table 2.11. Finally, we add age-adjusted Charlson Morbidity scores as an indicator of health status for each individual.

This cleaned claims data are then merged with our enrollment and plan information. For our plan choice modelling, we then omit all subscribers who have missing data (3% of remaining subscribers dropped, primarily from missing zip), as well as all subscribers enrolled in smaller plans or plans significantly different from the usual HMO and PPO options (6%

Table 2.1: Single tier plan cost sharing characteristics (2019)

Plan	Deductible	Office Copay	Inpatient Coinsurance	Brand Drug Copay	Generic Drug Copay	MOOP
Anthem HMO Select	$0	$15	0%	$20	$5	$1,500
Anthem HMO Traditional	$0	$15	0%	$20	$5	$1,500
Blue Shield Access+	$0	$15	0%	$20	$5	$1,500
Health Net Salud y Mas	$0	$15	0%	$20	$5	$1,500
Health Net SmartCare	$0	$15	0%	$20	$5	$1,500
Kaiser	$0	$15	0%	$20	$5	$1,500
PERS Select	$1,000	$10	20%	$20	$5	$3,000
PERS Care	$500	$20	10%	$20	$5	$2,000
Pers Choice	$500	$20	20%	$20	$5	$3,000
Sharp	$0	$15	0%	$20	$5	$1,500
UHC Alliance HMO	$0	$15	0%	$20	$5	$1,500
WHA	$0	$15	0%	$20	$5	$1,500

of remaining subscribers dropped). We are left with subscribers in thirteen health insurance plans: Anthem HMO Select, Anthem HMO Traditional, Blue Shield Access+, Blue Shield NetValue, Health Net Salud y Mas, Health Net SmartCare, Kaiser, PERS Select, PERS Care, Pers Choice, Sharp, UHC Alliance HMO, and WHA. PERS Select, PERS Care, PERS Choice are PPO plans while the other ten are HMO plans. These thirteen plans are not present through all the years of our analysis—the Anthem plans, Health Net plans, Sharp, and UHC entered the market in 2014; WHA entered in 2018; and Blue Shield NetValue was discontinued in 2017, with individuals defaulted into the Blue Shield Access+ plan. Total subscriber numbers by plan and year are presented in Table 2.2 below.

We note that Kaiser is by far the largest plan, with close to a 50% market share in 2019, having steadily grown over time. Cost-sharing details for the single tier on each of the twelve plans that were active in 2019 are presented in Table 2.1.[2]

The nature of differentiation in the CalPERS options is unusual: most large plan menus have more meaningful differences in financial cost-sharing across the plans. As we see from Table 2.1, there is very little differentiation in cost-sharing characteristics across plans in the CalPERS market. For most HMOs there is no coinsurance and a small copay for office visits or inpatient visits; for the three PPOs (PERS Select, PERS Care, PERS Choice) there is a deductible ($500 for the PERS Care and PERS Choice plans; $1,000 for the PERS Select plan). Post-deductible, PERS Select and PERS Choice have 20% inpatient coinsurance rates while PERS Care has a 10% rate, prior to reaching the plan-specific out-of-pocket maximums. Generally, copays and coinsurance are the same regardless of coverage tier while deductibles and out-of-pocket maximums are doubled for the 2-party and family tiers.

Finally, we present some high-level descriptive statistics for our total sample as well as for only the year 2019 in Table 2.3.

[2]The 13th plan, the Blue Shield NetValue plan, was disbanded in 2017 and is therefore not included in this table. We use 2019 data as it is the last complete year in our dataset.

Table 2.2: Total Subscriber Plan Enrollment by Year

Plan	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Anthem HMO Select	—	—	—	—	—	—	4,499	10,997	13,536	13,534	11,390	15,970	18,297	18,298
Anthem HMO Traditional	—	—	—	—	—	—	3,638	5,654	8,181	6,721	6,635	7,447	6,418	6,418
Blue Shield Access+	107,442	108,894	108,668	97,417	88,043	79,980	75,183	70,293	65,202	71,917	74,719	56,270	41,871	41,871
Blue Shield NetValue	40,012	44,708	52,189	59,248	65,619	71,804	81,085	60,215	35,942	—	—	—	—	—
Blue Shield Trio	—	—	—	—	—	—	—	—	—	—	—	—	3,340	3,340
Health Net Salud y Mas	—	—	—	—	—	—	337	1,336	1,797	2,895	4,088	4,509	4,555	4,555
Health Net SmartCare	—	—	—	—	—	—	268	460	5,882	15,334	8,194	11,469	7,958	7,958
Kaiser	164,186	172,514	182,959	189,078	193,452	194,572	193,979	208,159	219,756	234,331	241,235	249,117	238,063	238,063
PERS Choice	82,707	85,183	88,886	88,477	87,802	78,594	71,667	72,263	66,932	62,574	59,379	58,385	54,363	54,366
PERS Select	2,365	3,733	5,529	9,012	12,919	22,825	19,424	17,816	20,678	23,267	25,244	34,999	37,533	37,534
PERSCare	9,860	10,070	8,966	7,632	6,198	5,194	11,070	12,916	13,053	13,700	16,877	12,548	10,842	10,842
Sharp	—	—	—	—	—	—	657	3,370	4,149	4,442	4,919	5,486	5,633	5,633
UHC Alliance HMO	—	—	—	—	—	—	2,686	9,609	20,754	29,578	30,340	31,769	32,554	32,555
WHA	—	—	—	—	—	—	—	—	—	—	2,608	4,373	4,594	4,594

Table 2.3: Sample Demographics: Non-Medicare Subscribers

	All Years Total	2019 Only
N – Subscribers	6,438,491	492,342
N – Subscribers and Members	14,753,569	1,127,061
Subscriber % female	56.11%	55.51%
Age (Subscribers)		
<30	39.58%	41.03%
30-54	32.75%	32.39%
55+	27.67%	26.57%
Family Size		
1	41.44%	42.26%
2	23.10%	21.81%
3+	35.46%	35.93%
Subscriber Allowed Spending		
Mean	$11,063.65	$14,188.99
25th percentile	$801.47	$1,132.95
Median	$2,853.57	$3,794.22
75th percentile	$8,582.96	$11,017.52
95th percentile	$42,598.05	$54,672.08
99th percentile	$128,842.40	$164,831.10

Premium Contributions

Premiums for this sample range between $356.50 and $3,469.39 per month (before the CalPERS contribution) for 2019. Premiums are set for state employees on a statewide basis depending on the plan and number of covered dependents. The plans subscribers are offered and the networks for a given plan are both regionally determined. Premiums are constructed with three tiers: a single tier, a 2-party tier that pays double the single premium, and a family tier that pays 2.6 times the single premium.

A crucial factor in consumer choice of plans is the premium contribution that they have to pay. As a general heuristic, an "80-20" rule can be used to approximate premium contributions where each subscriber pays 20 percent of the premiums; however, we use more precise calculations on how premium contributions are set based on information on employee status and bargaining units to model each subscriber's contribution for each plan in their choice set, which is described in the Appendix.

Complete information for the premiums for the single enrollees are shown in Figures 2.6 and 2.7 in the Appendix.

Charlson Health Status Measure

We use a medically-motivated measure of predicted health risk to model whether a consumer is "more healthy" or "less healthy." In the demand estimation model, this variable is used to assess whether healthier or less healthy consumers have stronger relative preferences

for different specific insurance carriers. The statistic we use is the Age-Adjusted Charlson Comorbidity Index (ACCI), as defined by Charlson et al. (1994), which combines the age equivalence index and original Charlson Comorbidity Index (CCI) to measure estimated relative risk of death. For each decade after 40 years of age, a point is added until a maximum of 4 points for ages 80 and older is reached. This age score is added to the Charlson Comorbidity Index (CCI), which is calculated by the presence of certain diagnosis codes, to calculate the ACCI. This risk measure reflects both the (1) independent influence of age and (2) the burden of co-morbidites in the survival of patients. While the Charlson Comorbility Index is a well-known and widely used measure of health risk, it is also relatively crude and can be an imperfect proxy for actual patient health. For members in a household, we calculate the average ACCI for each subscriber. A higher ACCI score reflects a decrease in estimated 10-year survival, which has been shown to be directly related to higher medical spending.[3]

2.3 Demand Model

Empirical Specification

The core of our analysis is a choice model at the consumer level that investigates the value subscribers place on different plan characteristics, given their own underlying health. This model takes in data on choices made, plan options, plan characteristics, and consumer characteristics and is implemented as a logit regression. We use this choice model to assess the key determinants of plan choice and plan migration for subscribers and then use our estimates of these determinants to study counterfactual policies such as alternative CalPERS plan menus.

The demand model we estimate is based on the following subscriber utility specification:

$$U_{ij} = \alpha + \beta_1 \mu_{ij} + \beta_2 P_{ij} + \beta_3 X_{ij} + \beta_4 \xi_{ij} * H + \beta_5 \xi_{ij} * S + \beta_6 1[j_t = j_{t-1}] + \epsilon_{ij} \tag{2.1}$$

over each member i and plan j. μ_{ij} denotes the mean of member-specific expected health out-of-pocket spending in plan j. We quantify μ_{ij} empirically with two elements: (i) a projection of total consumer health spending and (ii) the impact of plan financial characteristics on out-of-pocket spending (e.g. deductible, coinsurance, out-of-pocket maximum). For (i), we use a simple model where the total spending projection is the prior year's spending for that subscriber, using that year's spending if the prior year's spending does not exist.

P_{ij} denotes our estimate of the member contribution to their premium. X_{ij} reflects plan characteristics such as (i) network breadth, (ii) PPO or HMO status, and (iii) financial characteristics while ξ_{ij} reflects preferences for a specific insurer brand. Here the indicator variable H, equals one if a consumer is among the healthiest 70% of the sample (as indicated

[3]See Roffman et al. (2016) for an additional discussion of how the Charlson score is calculated and how it should be interpreted. The score is calculated based on one year of claims data, so, in our data, we calculate a new score for each open enrollment period for each member of each family.

by the Charlson risk score), is interacted with ξ_{ij} to reflect potential health status-specific preferences for different insurers. S is a dummy for if a consumer is among the least healthy 30% of the population, according the the Charlson risk score. Finally, $1[j_t = j_{t-1}]$ is an indicator variable if a given plan option is the same as a consumer's previously chosen plan. β_6 is thus a value of inertia, reflecting money consumers are willing to leave on the table above and beyond what they would if facing the choices fresh, in an active choice environment. ϵ_{ij} reflects unobserved idiosyncratic preferences for plan j.

With the assumption of a multinomial error logit term, we transform this utility specification into the following standard multinomial logit regression equation:

$$1[j_t'] = \alpha + \beta_1 \mu_{ij} + \beta_2 P_{ij} + \beta_3 X_{ij} + \beta_4 \xi_{ij} * H + \beta_5 \xi_{ij} * S + \beta_6 1[j_t = j_{t-1}] + \epsilon_{ij} \quad (2.2)$$

where $1[j_t'] = 1$ if a subscriber chooses a given plan j' and 0 otherwise. We estimate the coefficients (α, β) using plan choice data and plan characteristic data. Specifically, we use the choices each subscriber could make in each year, the characteristics of those choices, and subscriber health and demographic information.

The key to our identification of the model parameters for plan preferences, separate from the inertia parameter β_6, is from comparing the choices made by new CalPERS members (who are active choosers) to existing members who have default options (their previously chosen plan) but who are otherwise similar (see Handel (2013); Handel and Kolstad (2015b); Ho et al. (2017a) for similar approaches).[4]

Demand Estimation Results

Our primary analysis focuses on the plan choices made by subscribers between 2018 and 2020, using recent choice parameters that best reflect the current CalPERS environment as much as possible. We present the results in Table 2.4 with three separate regressions:

Column (1) presents the model with out-of-pocket spending predictions that reflect those from the previous plan-year and plan fixed effects. The specific plan fixed effect coefficients are presented in Table 2.5. Column (2) presents the model but with region-plan interaction fixed effects. The plan-region fixed effects allow for a different plan effect region-by-region, to accurately assessing the role of regional provider networks and brand equity in a given region more broadly.

Finally, Column (3) presents our primary model of interest which we also will use to generate our counterfactual examples. This model includes out-of-pocket spending predictions that reflect those from the previous plan-year, inertia, and crucially, plan-region-health status interaction fixed effects. One key distinction of the first two models is that all subscribers are assumed to have the same preferences for plans and medical groups. A key rationale for offering choice in markets is heterogeneous matching of subscribers to plans, and, in the CalPERS environment, this is heavily linked to matching subscribers to different networks.

[4]Note that we model health status at the time of plan choice for new enrollees using their contemporaneous / upcoming spending data, since that is the first data we have for those consumers.

Table 2.4: Regression estimates predicting 2018-2020 plan choices for all CalPERS beneficiaries

	Plan Fixed Effects Only	Region-Plan Fixed Effects	(2) with Health Effects
Premium Paid	-0.000180***	-0.000178***	-0.000171***
	(0.00000118)	(0.00000129)	(0.00000130)
OOP Estimate (Last Year)	-0.0000560***	-0.0000244***	-0.0000329***
	(0.00000338)	(0.00000360)	(0.00000368)
Deductible	0.000321***	0.000428***	0.000446***
	(0.0000146)	(0.0000154)	(0.0000154)
MOOP	-0.000139***	-0.000196***	-0.000185***
	(0.00000881)	(0.00000928)	(0.00000939)
Inertia	4.504***	4.458***	4.453***
	(0.00388)	(0.00411)	(0.00412)
Plan Fixed Effects	X		
Region-Plan Fixed Effects		X	X
Health Status Effects			X
Observations	16,211,508	16,211,508	16,211,508

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In our case, we define health status via Age Adjusted Charlson Score. We define being in poor health as a binary variable, with the cut-off an average Charlson Score of 2 or lower being considered in good health (roughly 70% of our population).

Our first main finding is that subscribers overweight premiums to expected out-of-pocket spending by a factor of a little over 5 to 1 ($-0.000171/-0.0000329$), similar to the level of bias that has been noted in prior work such as in Medicare Part D drug plan choice (Abaluck and Gruber, 2011) and others (Gruber et al., 2020) which find that subscribers overweight premiums between 4-8 times that of the expected out-of-pocket spending.

We also find that there are significant and large brand effects for California state employees in choosing their plan. This is consistent with prior work and especially salient in the CalPERS context where there is limited financial differentiation but meaningful network variation. In Table 2.5, Kaiser is the omitted group, which means that the preference estimates presented for brands is relative to Kaiser. Since Kaiser has high brand equity, most of the estimated coefficients for the other plans are negative.

Looking at the estimates in Table 2.5, we see that patients value Kaiser over Anthem HMO Select the same as $-1.508/-0.000180 = \$8,377.78$ in additional yearly premium

Table 2.5: Specific plan fixed effects from Table 2.4 Column (1) (Kaiser is the omitted comparison group)

	Plan Fixed Effect
Anthem HMO Select	-1.508***
	(0.00893)
Anthem HMO Traditional	-1.516***
	(0.0110)
Blue Shield Access+	-1.275***
	(0.00745)
Blue Shield Trio	-1.459***
	(0.0179)
Health Net Salud y Mas	-2.633***
	(0.0108)
Health Net SmartCare	-2.299***
	(0.0116)
PERS Choice	-0.894***
	(0.0145)
PERS Select	-1.375***
	(0.0154)
PERSCare	-1.501***
	(0.0121)
Sharp	-2.372***
	(0.00874)
UHC Alliance HMO	-1.135***
	(0.00705)
WHA	-2.177***
	(0.0109)
Observations	16,211,508

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

spending. There is substantial variation in relative plan fixed effects relative to Kaiser, ranging from -0.894 for Blue Shield Access+ (Kaiser only preferred by roughly $\$5,000$ in equivalent premium dollars) to -2.633 for Health Net Salud y Mas (equivalent to a roughly $\$15,000$ yearly premium preference for Kaiser). We present the estimates for the preferences for specific health plan carriers, separated into health status (as a function of their Charlson risk score) in Figures 2.1 and 2.2.

We also find that, as we might expect, the OOP estimates are negative, which align with our expectations that a lower expected OOP estimate would lead to an individual being more likely to choose that plan. The coefficient on the expected out-of-pocket estimate from column (3) suggests that for every $\$1,000$ increase in expected out-of-pocket spending, individuals are 3.29% less likely to choose that specific plan. Subscribers are much more sensitive to plan premiums where a $\$1,000$ increase in yearly premium implies that an individual would be roughly 17.1% less likely to choose that given plan.

Finally, as shown extensively in prior work such as Chandra et al. (2019), we find that inertia is very important in predicting year-on-year choices. Individuals are not likely to switch plans and, as a result, leave substantial sums of money on the table as plan options change year-to-year. Our estimate from column (3) finds that people are willing to leave $4.453/0.000171 = \$26,040.94$ of additional premium on the table not to switch plans. Therefore, in line with previous expectations and research, we expect very limited natural plan switching.

2.4 Risk Adjustment

Our beneficiary demand results suggest that subscribers value a dollar in premium savings significantly more than a dollar in expected out-of-pocket savings. Consumer inertia plays a strong role in plan choices; subscribers also seem to be primarily drawn to brand effects as there is meaningful variation in plan networks and little financial differentiation in cost-sharing in the plans.

Risk adjustment transfers are a well-known policy tool used to mitigate adverse selection in health insurance markets. These transfers move money from plans that enroll healthier consumers to plans that enroll less healthy consumers, based on algorithms that map ex-ante claims to risk scores and, ultimately, to expected spending in a benchmark plan. These transfers slow down or stop adverse selection death spirals by dampening the link between enrollee costs and plan premiums that is inherent to insurance markets and other selection markets.

Our small-group market setting provides a unique opportunity to empirically study the impact of risk adjustment on adverse selection with the presence of inertia. Unlike in the individual market, one would not need to disentangle the effects of other policy instruments like premium subsidies, reinsurance, and the individual mandate tax penalty. Furthermore, the introduction and removal of risk adjustment provides a natural experiment to observe

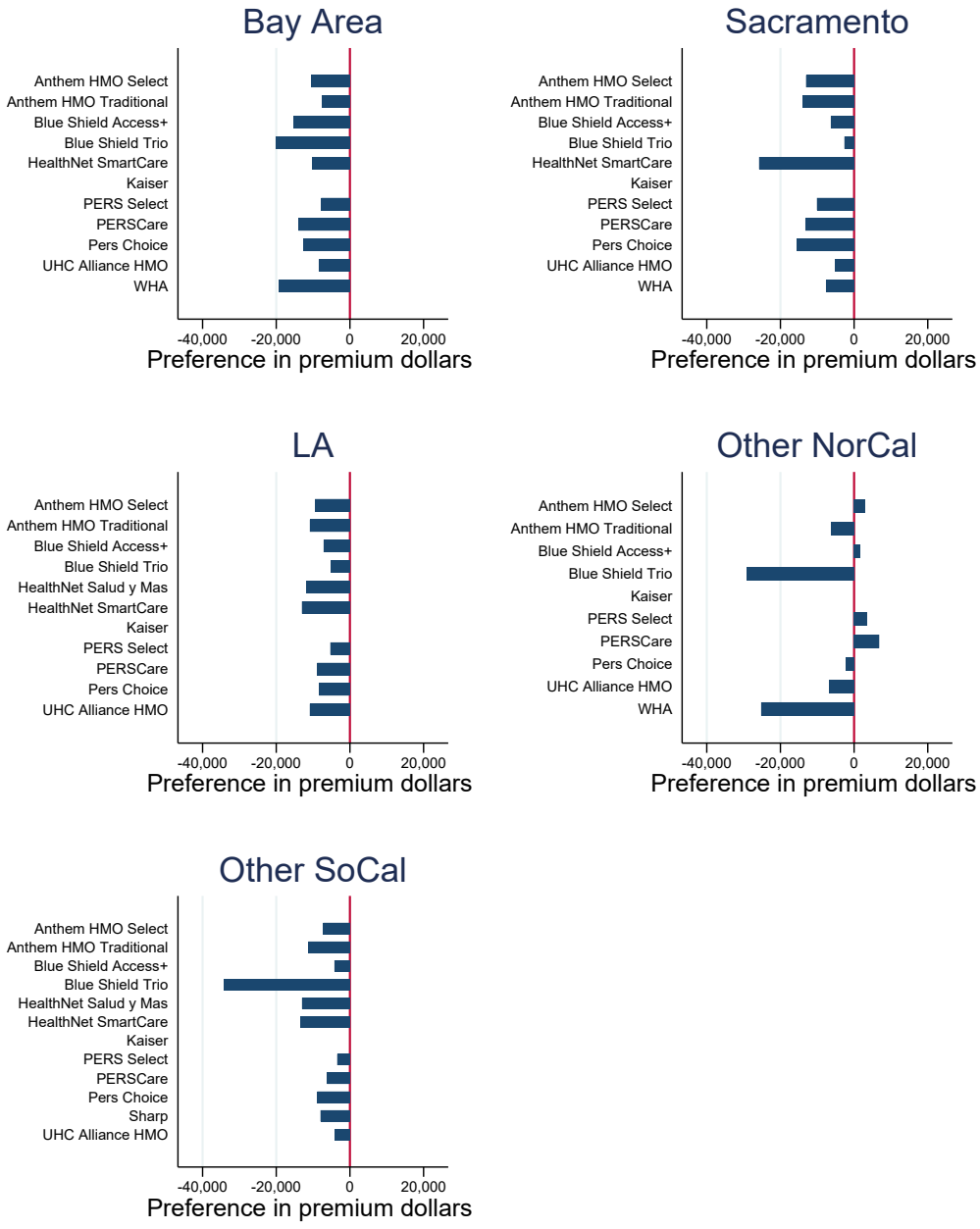

Figure 2.1: This figure presents carrier brand preferences for consumers with Charlson scores that are in the lowest 70% of health risk.

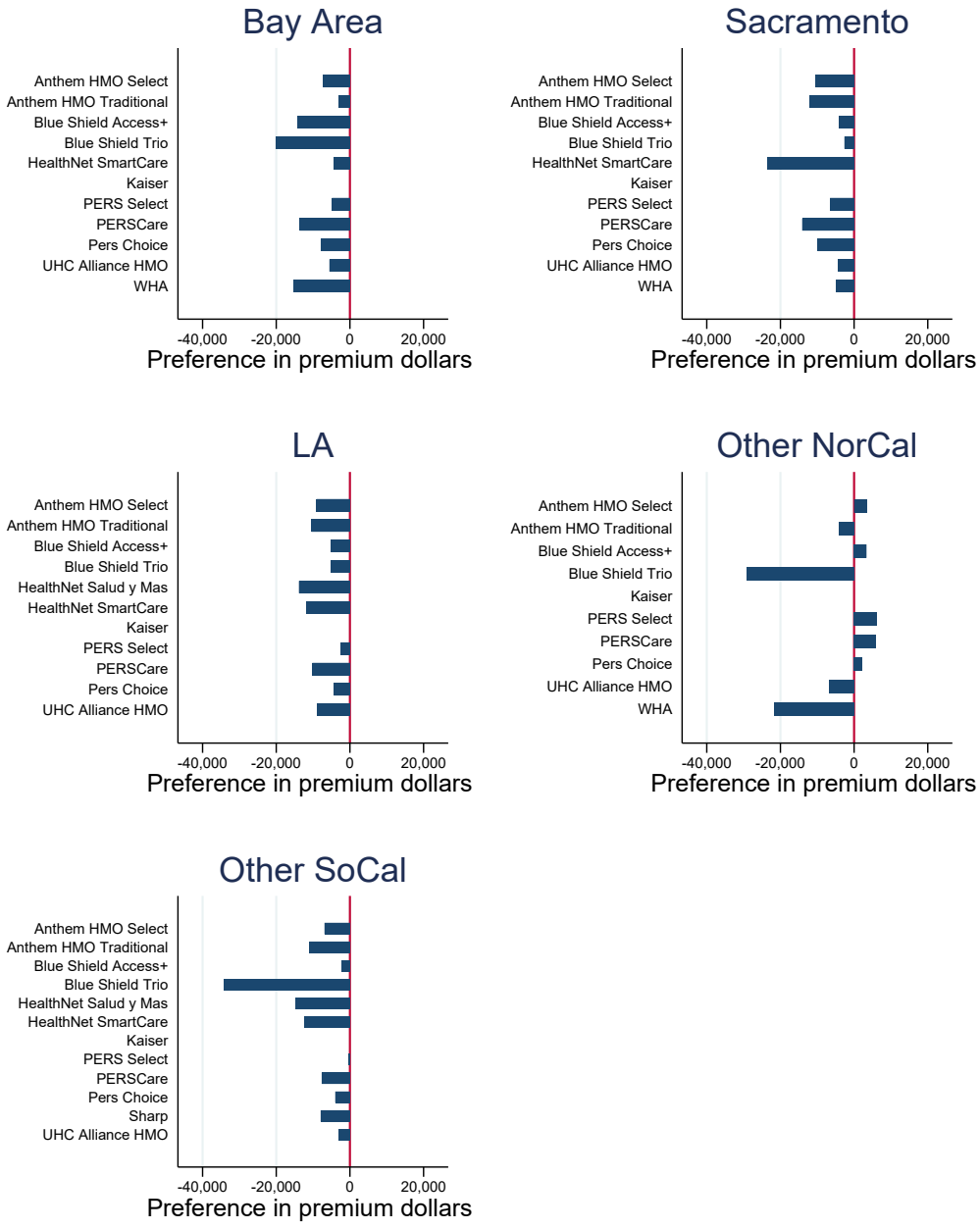

Figure 2.2: This figure presents carrier brand preferences for consumers with Charlson scores that are in the highest 30% of health risk.

the health plan choices of employees of a firm who are previously enrolled in a plan and are not required to make active choices year-to-year.

Traditional risk adjustment methodologies vary the plan premiums and transfer payments are made between insurers with more generous (high) and less comprehensive (low) plan options. However, in our environment, there are many plans which are horizontally differentiated by their provider networks and the plans have similar cost-sharing, which allows us to study individual preferences for specific carriers and networks.

We first present evidence of risk adjustment through descriptive statistics, then we discuss our future planned work in risk adjustment.

Risk Adjustment: Descriptive Statistics

First, we look at simple premium changes over time by plan. In Figure 2.3 and Table 2.7, we can see that when risk adjustment is first implemented in 2014, there are significant changes in premiums for certain insurance plans.[5] Most significantly, we see that the cost of the generous PERSCare plan sharply falls and that of the cheaper PERS Select plan rises significantly. We combine this information with Figure 2.4, which shows the average age adjusted Charlson Score for each plan and Figure 2.5, which shows enrollment over time. We note that for PERSCare, the Charlson score decreases significantly at the beginning of risk adjustment, suggesting that the lower cost from risk adjustment draws in healthier patients. This explanation is supported by the significant increase in PERSCare enrollment in 2014 as well as a dip in PERS Select membership.

In 2019, after risk adjustment is removed, we notice a smaller, but opposite effect from when risk adjustment was introduced. This smaller effect may be due to the greater choice environment in 2019, as other insurance plans have entered this market in the meantime. The most significant effects we see are that the premiums for the PERSCare and Anthem HMO Traditional plans increase significantly; as expected, these also happen to be two of the plans with relatively sicker populations as seen from the average Charlson scores. On the other hand, as expected, the PERS Select plan has the greatest decrease in premiums after risk adjustment is removed; individuals selecting this plan also seem to be healthier based on Charlson scores.

Secondly, we calculate crude risk adjustment transfers and analyze year-to-year premium differences both before and during the risk adjustment period to examine the effectiveness of the implementation of risk adjustment by CalPERS. We find some evidence of risk adjustment examining the crude risk adjustment numbers in Table 2.6 in 2013 versus 2014. Table 2.6 suggests that the main beneficiary of risk adjustment is the PERSCare plan, like previously identified—individuals enrolled in the PERSCare plan on average spend significantly less in 2014 than in 2013. We note that after risk adjustment is removed in 2019, we see a similar, but opposite reaction in the PERSCare plan, as individuals in 2019 are higher-spenders than in 2018 when risk adjustment was still in place, suggesting that when

[5]Detailed tables with premium information are presented in the Appendix.

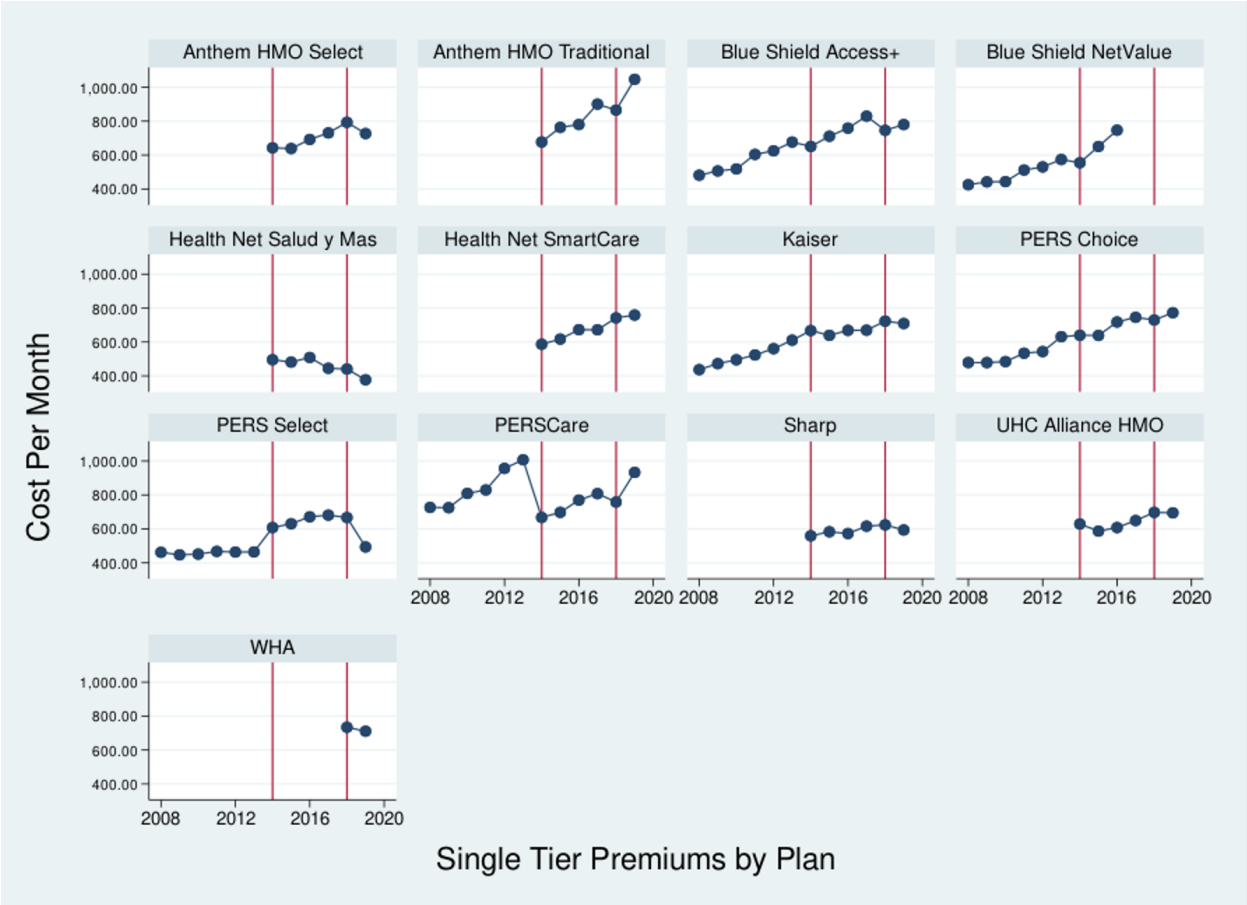

Figure 2.3: This figure presents monthly single tier premiums over time, by health plan. This calculation includes both premiums paid by CalPERS and the subscriber.

risk adjustment was removed, some lower-spending patients exited the plan. Given our environment of strong inertia, our numbers suggest that risk adjustment had at least some effect on insurance plan choice and in reducing adverse selection effects.

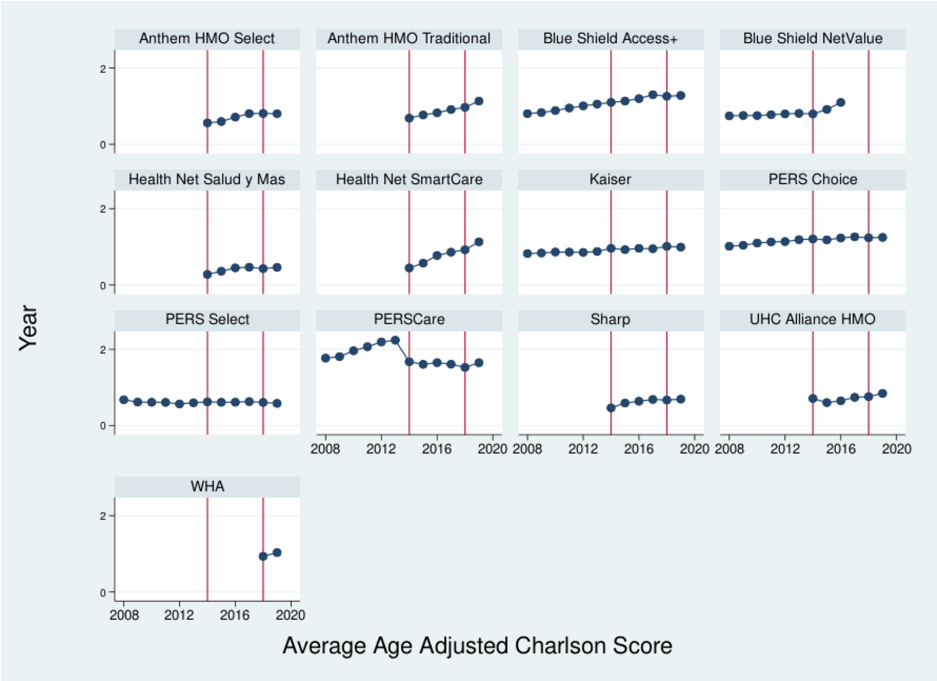

Figure 2.4: This figure presents age adjusted Charlson comobidity scores over time, by health plan.

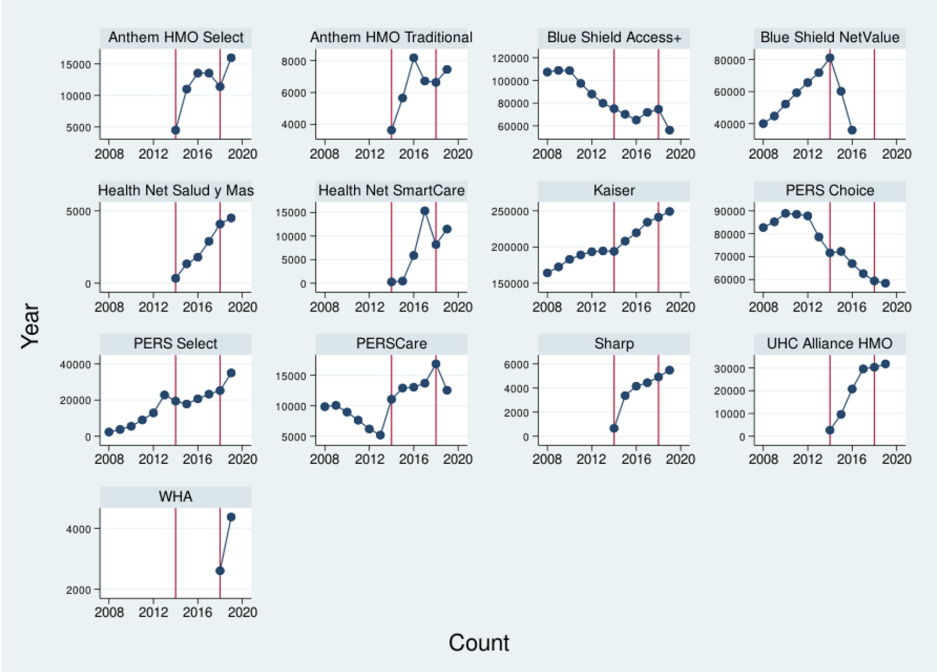

Figure 2.5: This figure presents plan enrollment over time.

Table 2.6: Crude risk adjustment transfers per member

Year	Anthem HMO Select	Anthem HMO Traditional	Blue Shield Access+	Blue Shield NetValue	HealthNet Salud y Mas	HealthNet SmartCare	Kaiser	PERS Choice	PERS Select	PERSCare	Sharp	UHC Alliance	WHA	Average
2012			266	-837			-135	736	-1785	5816				677
2013			884	-522			-317	674	-1766	6365				886
2014	-1309	-236	346	-700	-3442	-2762	-56	858	-1794	4107	-2217	-1233		-703
2015	-984	412	954	-98	-3554	-2640	-391	589	-1869	4839	-1993	-1614		-529
2016	-608	507	1303	650	-3042	-418	-527	785	-1872	4448	-1721	-1443		-161
2017	-233	1007	1628	Exit Market	-2941	512	-561	936	-1851	4436	-1811	-1357		-22
2018	202	1150	1510		-3005	780	-569	954	-1923	4465	-1975	-1189	-704	-25
2019	-600	3615	1354		-2901	803	-482	1530	-1899	5136	-1892	-686	-589	282

Table 2.7: Average premium difference between year X and year X+1 per member (total annual premiums paid by CalPERS and subscriber)

Year	Anthem HMO Select	Anthem HMO Traditional	Blue Shield Access+	Blue Shield NetValue	HealthNet Salud y Mas	HealthNet SmartCare	Kaiser	PERS Choice	PERS Select	PERSCare	Sharp	UHC Alliance	WHA
2012			469	396			459	858	-38	675			
2013			-233	-133			598	90	1324	-4130			
2014	-116	864	566	873	-45	385	-241	-24	214	264	-10	-774	
2015	554	218	437	982	208	247	274	745	335	777	-86	132	
2016	344	1167	789	Exit Market	-630	42	13	260	149	323	409	502	
2017	653	-291	-816		-79	716	511	-180	-129	-640	85	366	
2018	-631	1933	347		-603	182	-123	424	-1654	1838	-281	65	-63
2019	387	716	1366		248	1215	239	263	-15	851	167	303	324

Our descriptive statistics suggest that risk adjustment had a moderate, but significant effect on premiums and plan selection when implemented by CalPERS. With risk adjustment in place, the premiums of the most generous plans decreased, having been buoyed by transfers from relatively cheaper plans. This, in turn, allowed for some healthier members to select into the more generous insurance plans, as we can see from the reduction in the Charlson scores in these plans. However, effects from risk adjustment and plan changes are certainly muted from the substantial inertia in this plan environment. In Section 2.5, we discuss some counterfactual scenarios, including these that involve more active choice and reduced inertia.

Risk Adjustment: Future Work

Our future work in risk adjustment will involved more detailed analysis of how risk adjustment is implemented and in creating our own model of risk adjustment rather than taking CalPERS' risk adjustment premiums. We plan to create our own risk adjustment model by computing the fixed point for premiums of all plans. We plan to do this from both an ex-ante and ex-post risk adjustment mechanism to determine what premiums should be set based on our own model and compared to the calculations make by CalPERS. From this, we also hope to make welfare calculations from risk adjustment to see if risk adjustment was effective and improved total welfare.

Next, we hope to examine more with how risk adjustment affects equity and distributional consequences—does risk adjustment help sicker patients or are more of the welfare gains from risk adjustment focused on simply making more generous plans affordable for relatively healthy patients? What patients (both from a health status perspective and from a employment type perspective) gain the most from risk adjustment? Which insurers gain the most from risk adjustment? Is the objective of the employer to focus on distributional equity or efficiency outcomes and how might they differ?

Finally, we hope to also continue examine how our unique horizontally differentiated environment has implications for health and risk selection and how this might interact with inertia (see Handel et al. (2019) for a discussion of the impact of inertia and risk adjustment in a different environment).

2.5 Migration and Counterfactuals

Finally, we use our demand estimates from Table 2.4 in Section 2.3 to assess plan migration across CalPERS plans for several hypothetical scenarios involving the interaction of (i) risk adjustment and (ii) inertia (through active plan choice).

In the CalPERS context from 2019-2020, no risk adjustment transfers were implemented, largely due to the logistical difficulties of implementing a comprehensive risk adjustment program. We study three risk adjustment scenarios, focusing on the last:

1. **Status Quo:** No risk adjustment

2. **Partial Risk Adjustment:** risk adjustment that partially corrects for differences in enrollee health status across plans

3. **Full Risk Adjustment**

For these scenarios, we selected potential premiums that fit each of these scenarios after consultation with the CalPERS actuarial team. Future work will involve our own ex-ante risk adjustment mechanism based around equilibrium premiums where all plans earn zero profit (or close to zero profit). The premiums across three scenarios are described Table 2.8 below:

Table 2.8: Hypothetical 2022 Single-Party Monthly Premiums Used in Risk Adjustment Scenarios.

	Status Quo	Partial RA	Full RA
Anthem HMO Select	$837.73	$882.30	$932.17
Anthem HMO Traditional	$1,386.70	$1,241.73	$1,124.98
Blue Shield Access+	$1,027.54	$927.13	$845.64
Blue Shield Trio	$754.91	$772.91	$791.88
Health Net Salud y Mas	$442.97	$442,97	$442.97
Health Net Smart Care	$984.57	$960.39	$937.44
Kaiser	$788.36	$791.42	$794.51
PERS Choice (86 AV)	$919.23	-	-
PERS Select (86 AV)	$558.40	-	-
PERSCare (91 AV)	$1,286.11	-	-
PERS Platinum (91 AV)	-	$971.85	$925.32
PERS Gold (81 AV)	-	$652.39	$691.21
Sharp	$655.35	$703.71	$760.74
UHC Alliance HMO	$803.15	$871.88	$954.76
WHA	$731.96	$784.90	$782.71

We note that in our hypothetical 2022 market, our three PPO plans (PERS Choice, PERS Select, and PERSCare) are replaced by two new PPO options in the risk adjustment scenarios, but remain in the status quo scenario. While they are not directly the same, we have added average value numbers to these choices to better compare the options. For our scenarios with inertia, PERSCare and PERS Choice default into PERS Platinum and PERS Select defaults into the Gold plan.

As shown in the table, risk adjustment has a substantial effect on premiums, especially in increasing the premiums of HMO plans enrolling healthier consumers. For example, UHC Alliance HMO has single-party monthly premium increase from $803.15 to $954.76 (approximately $2,000 per year) moving from no risk adjustment to full risk adjustment. Sharp and Anthem HMO Select also have substantive price increases. The premium of the more generous PPO option across the scenarios decreases substantially, by over $3,500

per year. Anthem HMO Traditional and Blue Shield Access+ have hypothetical changes that are large premium reductions (over $2,000 per year) while Kaiser has very similar premiums across the three scenarios. We also note that there is also an increase in premiums for consumers moving from the least generous PPO option in the status quo to the least generous PPO option under risk adjustment, despite this option under risk adjustment being less generous than its counterparts under the status quo.

We combine this risk adjustment analysis with a second dimension of inertia. Inertia is a major impediment to fluid plan choices in health insurance markets—previous literature has demonstrated that consumers are sticky in their plan choices and willing to leave large sums of money on the table to avoid switching (Chandra et al., 2019). In a health context, this has been shown in both private health insurance markets (Handel, 2013) and, particularly, Medicare Part D (Ericson, 2014; Ho et al., 2017b; Abaluck and Gruber, 2016a).

In our demand model, as shown in Table 2.4, we estimate substantial consumer inertia in plan choices. Consequently, there are significant differences in plan migration for different risk adjustment scenarios with and without consumer inertia factored in. We investigate two specific cases:

1. **Status Quo:** inertia as estimated in context
2. **Active Choice:** no plan inertia, consumers required to make an active choice from menu of health plans

Requiring active choice is a policy that is often considered as a way to encourage consumers to evaluate all plan options carefully. While active choices yield clear benefits in terms of matching consumers to the best plans for them, plan search and evaluation is also quite costly, which is a potential drawback of this policy. In addition, mistakes are frequently made, even when active choice is required and decision aids are provided (Bhargava et al., 2017; Handel and Kolstad, 2015a).

We investigate all six combinations of risk adjustment and inertia scenarios, looking forward to the 2022 plan choice year at CalPERS by leveraging the estimates of our demand model based on 2018-2020 data. We take the parameter estimates from the model estimates partially presented in Table 2.4 and estimate the choices that would have made under each of the different scenarios. To do this, we compute utility for each plan choice option as in Section 2.3, then use these utilities to predict future plan choices for subscribers.

We make predictions for the year 2022 and assume that consumers in our data (i) choose the plan in 2021 that they were enrolled in in 2020 and (ii) that their health status in 2021 is the same as estimated in 2020. For each subscriber, we simulate 50 plan choices in each scenario, in order to account for the statistical uncertainty inherent to regression models and to we mimic this predicted probability distribution estimated in the statistical model. In the scenario with full inertia, we assume that consumers have a default option of their 2021 choice when choosing for 2022. Without inertia, we assume no default option and that consumers choose from the set of 2022 options with a fresh look at plans and no

attachment to specific options. The no inertia hypothetical is extreme, as it would generally be impossible to have no default as well (as members cannot go uninsured at the end of the selection period and must be defaulted into some plan), however we present this as a good approximation of choice fluidity in an environment where consumers are required to make active choices. Therefore, we see them as offering two ends of a spectrum of possibilities.

Finally, in the scenarios that consider full risk adjustment and partial risk adjustment, we also replace the status quo three PPO options with two PPO options that are similar in terms of actuarial values to the bottom and top of the range spanned by the prior three options.

Plan Migration Results

We present our first results in Table 2.9 for scenarios involving full inertia. This table presents the migration results in terms of the numbers of subscribers who would have changed plans moving from the "status quo" scenario (no risk adjustment and full inertia) to the full risk adjustment (but still with full inertia) scenario. Thus, the transitions shown in this matrix show how enrollments would change if full risk adjustment were implemented, but no active choice scenarios were created to encourage plan switching.

Our transition matrices investigate how consumers would change from one future option to another future option as the underlying scenario changes, where rows show plans in the status quo scenario (current plan) and columns represent plans in the risk adjustment scenario (plans subscribers switch to). Both the rows and the columns represent choices in 2022, with transition matrices describing the differences between future scenarios. The total row and column show total projected enrollment under those scenarios.

Though premiums change substantially under full risk adjustment, there is limited movement across plans due to inertia. For those who would have chosen Kaiser in the status quo scenario with inertia, fewer than 10% switch to any other plan. Focusing on the plans with the biggest premium increases from one scenario to the other is illustrative. UHC Alliance HMO, which has a single-party yearly hypothetical premium increase of almost $2,000 per year, has almost 15% of it's enrollees switch out (netting out those switching in). These enrollees primarily migrate to Kaiser, both PPO plans, and Blue Shield Access+, plans that had either large reductions in premiums across the scenarios (or in Kaiser's case, flat premiums). For Sharp and Anthem Select, two other plans that have meaningful premium increases, there is little net substitution away from these plans, due to the strong effects of inertia. For the PPO options, most of these individuals stay into their new proposed default options under this analysis (PERSCare and PERS Choice into PERS Platinum; PERS Select into the Gold plan).

As we expect, in line with previous work on inertia in health insurance plan choices, though the premium changes moving from no to full risk adjustment are substantial for some plans, changes in enrollment from one scenario to the other are limited.

Table 2.9: Predicted Choices in Subscribers Between Status Quo 2022 (Rows) to Full Risk-Adjustment 2022 (Columns), **with Inertia**. Rows represent plan enrolled in in Status Quo scenario, columns represent plan enrolled in in Full Risk-Adjustment scenario. Row X Column combinations describe subscribers enrolled in that combination these future prediction scenarios.

	Full Risk Adjustment Choice												
Status Quo Choice	Anthem HMO Select	Anthem HMO Traditional	Blue Shield Access+	Blue Shield Trio	Health Net Salud y Mas	Health Net SmartCare	Kaiser	PERS Platinum	PERS Gold	Sharp	UHC Alliance HMO	WHA	TOTAL
Anthem HMO Select	10961.52	208.36	556.96	144.94	84	199.06	1219.48	894.54	423.74	70.42	346.38	68.08	15177.48
Anthem HMO Traditional	140.84	4356.36	247.78	56.54	38.1	134.88	674.86	403.56	176.64	24.68	197.68	39.32	6491.24
Blue Shield Access+	442.42	270.94	41767.46	445.3	164.86	246.78	2092.18	1422.44	701.44	150.66	678.78	165.72	48548.98
Blue Shield Trio	134.8	82.1	542.38	62.62	65.78	88.8	812.82	474.66	179.56	0.56	257.22	89.52	2790.82
Health Net Salud y Mas	77.26	46.74	199.58	66.86	2437.18	58.5	357.86	277.52	120.98	37.28	112.96	0.16	3792.88
Health Net SmartCare	179.26	168.34	277.48	80.4	57.34	6904.86	874.26	521.84	213.38	43.7	219.4	26.9	9567.16
Kaiser	1126.6	922.32	2459.24	792.98	359.28	922.14	221829.4	3421.72	1506.34	268.7	1618.5	447.56	235674.8
PERS Choice	561.58	365.72	1063.28	302.22	169.64	350.2	2203.8	45533.6	932.7	148.1	652.28	118.8	52401.92
PERS Select	395.8	238.04	838.32	176.8	123.9	224.84	1525.02	1340.86	27352.76	121.94	469.22	73.2	32880.7
PERS Care	186.36	116.34	427.54	98.34	79.58	144.2	827.92	8501.5	276.48	57.8	248.74	35.6	11000.4
Sharp	71.14	33.92	182.34	0.68	40.7	45.48	274.4	238.38	122.7	3825.4	148.52	0.46	4984.12
UHC Alliance HMO	361.74	292.26	879.28	284.76	124.56	253.62	1812.66	1120.76	509.68	156.92	24551.52	157.5	30505.26
WHA	64.16	51.28	193.78	88.84	0.2	29.86	439.32	168.3	75.3	0.42	141.4	3034.04	4286.9
TOTAL	14703.48	7152.72	49635.42	2601.28	3745.12	9603.22	234943.98	64319.68	32591.7	4906.58	29642.6	4256.86	458102.6

Table 2.10: Predicted Choices in Subscribers Between Status Quo 2022 (Rows) to Full Risk-Adjustment 2022 (Columns), **without Inertia**. Rows represent plan enrolled in in Status Quo scenario, columns represent plan enrolled in in Full Risk-Adjustment scenario. Row X Column combinations describe subscribers enrolled in that combination these future prediction scenarios..

	Full Risk Adjustment Choice												
Status Quo Choice	Anthem HMO Select	Anthem HMO Traditional	Blue Shield Access+	Blue Shield Trio	Health Net Salud y Mas	Health Net SmartCare	Kaiser	PERS Platinum	PERS Gold	Sharp	UHC Alliance HMO	WHA	TOTAL
Anthem HMO Select	1995.88	1464	2448.86	1430.16	405.36	1072.68	8230.8	4966.38	4745.96	367.12	2189.32	469.38	29785.9
Anthem HMO Traditional	1092.52	1290.08	1056.08	792.74	170.26	940.1	5617.18	2756.72	1779.92	124.88	1451.84	322.22	17394.54
Blue Shield Access+	1977.52	1192.82	3362.48	2635.64	565.74	742.2	8882.8	5419.18	4777.56	547.58	2825.46	862.78	33791.76
Blue Shield Trio	1347.52	1019.54	3155.74	5203.36	506.98	551.04	10048.12	4058.58	2701.68	15.68	2774.32	1721.32	33103.88
Health Net Salud y Mas	366.34	215.76	666.82	488.78	242.58	176.2	1858.32	1231	884.5	142.8	451.1	1.86	6726.06
Health Net SmartCare	951.1	1183.74	816.62	516.64	169.94	987.68	5159.96	2511.62	1324.76	113.72	1220.36	206.5	15162.64
Kaiser	7576.86	7220.32	10391.6	9835	1862.62	5373.32	44367.44	20596.08	13738.06	1298.38	11276.24	3474.94	137010.9
PERS Choice	2766.3	2073.08	3768.76	2304.44	721.52	1546.96	12343.24	7565.88	6203.46	624.68	3326.42	652.32	43897.06
PERS Select	4442.62	2245.72	5628.22	2702.38	915.76	1401.1	14000.36	10251.48	13159.24	837.38	3878.32	701.56	60164.14
PERS Care	1395.02	1121.5	1888.16	1270.52	385.1	798.1	6126.92	3961.44	2988.46	282.1	1691.7	295.54	22204.56
Sharp	350.26	154.12	665.84	15.7	153.06	121.62	1358.16	1038.54	859.02	346.62	595.1	4.94	5662.98
UHC Alliance HMO	2281.98	1986.74	3614.22	3072.52	519.52	1444	12859.84	6216.68	4299.56	657.2	3987.84	1328.96	42269.06
WHA	434.18	411.9	1011.06	1674.94	2.18	216.22	3442.9	1051.72	678.5	4.24	1150.32	850.86	10929.02
TOTAL	26978.1	21579.32	38474.46	31942.82	6620.62	15371.22	134296	71625.3	58140.68	5362.38	36818.34	10893.18	458102.5

The other main case that we examine in Table 2.10 presents the results for the switch from no risk adjustment to full risk adjustment, but where all where consumers make active choices (no inertia). While completely removing inertia is unrealistic in practice, this case can be seen as the most extremely example of the effects of risk adjustment, having large and powerful effects and causing consumers to enroll in different plans. We break down some of these findings by first looking at the PPO plans, then some of the more significant changes in HMO plans.

- **PPO Plans:** We find significant enrollment changes in the PPO plans. Comparing Table 2.10 to Table 2.9 shows the changes to PPO enrollment as a result of the shift from full inertia to no inertia. The changes are marked: with required active choice many more consumers (approximately 90K vs. 35K) enroll in the PERS Select plan under the status quo scenario. This suggests that many consumers never actively considered the Select plan (as they were already enrolled in another plan) but, because of its very low premiums, would switch into that plan if making an active choice.[6] This shift underscores the power of active choice policies in shaping enrollment. Under this same comparison, reduced inertia leads to similar enrollment in PERS Choice and PERS Care under the status quo scenario.

  Moving to a discussion of how risk adjustment would impact PPO plan enrollment *conditional on an environment with no inertia*, there is significant net movement into the PPO options with active choice and full-risk adjustment. For example, on net, 4,000 subscribers move over from UHC Alliance, 2,000 from Anthem HMO Select and 2,000 from Kaiser. This reflects the fact the highest actuarial value PPO, PPO Platinum under full risk adjustment, has a much smaller premium than PERS Care (which has the same AV as PERS Gold) did under no risk adjustment, since that PPO plan enrolled fewer healthy consumers than the other plans on average.

- **Kaiser:** We find significant movement out of the Kaiser plan for all scenarios involving full active choice. This reduction in enrollment is particularly stark: for scenarios with full inertia, enrollment stands at roughly 230,000 members (roughly 50% of all CalPERS members); however, this falls to 135,000 subscribers in the active choice scenarios (closer to a fourth of all enrollment). Much of this change is due to patients reconsidering other plans due to both the rising cost of the Kaiser plan (an over 60% increase in premium for Bay Area members between 2008 and 2013) and due to the introduction of many new insurance plans (with 6 total plans to choose from in 2008 and 12 choices in 2020) that consumers may not have considered previously due to inertia.

- **Blue Shield Access+:** As a result of the move from inertia status quo (Table 2.9 row to no inertia status quo (Table 2.10 row) Blue Shield Access+ sees an enrollment drop

[6] As we can see from Figure 2.3, the premiums of the PERS Select plan have remained low (other than during the risk adjustment period), while the premiums of other plans have significantly risen over the years; this in turn, would make this plan more attractive, especially if consumers have not recently made an active choice.

on net of 30%, from roughly 48,000 subscribers to roughly 34,000 subscribers. Here, we see the opposite effect as for the PERS Select plan in which in the long-run, Blue Shield Access+ had become less attractive relative to the other plan options due to rising costs but many consumers had not switched out of this plan due to inertia.

In terms of the move from no risk adjustment to full risk adjustment under no inertia 2.10, the premium reduction for Access+ under full risk adjustment would lead to a 15% increase in net enrollment from roughly 34K to 40K. This reflects the decreased premiums resulting from adjusting for the less healthy mixture of consumers enrolled in this plan.

- **Blue Shield Trio:** Many of the members that switch out of the Kaiser plan in the active choice scenarios select into Blue Shield Trio, a new plan introduced in 2020. Due to the new nature of the plan, there is low enrollment for the active choice scenario (enrollment of around 2,500), but in a scenario where all consumers must make active choices, there is substantial enrollment (roughly 30,000) due to relatively competitive premium prices. Many of these subscribers switch from the other larger HMO plans such as Kaiser, Blue Shield Access+, and UHC.

- **UHC Alliance:** There is a net reduction of approximately 40% in UHC Alliance enrollment moving from the status quo premiums with no inertia to the scenario with full risk adjustment and no inertia. This is due to the substantial premium increases for UHC Alliance due to risk adjustment transfers taxing the plan for enrolling primarily healthier consumers. Many of these consumers switch to either the PERS Gold or the Blue Shield HMO plans on net.

We also compare the partial risk adjustment scenarios, with and without inertia, to the status quo scenario. Tables 2.12 and 2.13 in the Appendix present the transition matrices for these policy comparisons.

Overall, as expected, we see small changes in enrollment patterns with inertia, but large and significant enrollment changes with full active choice. In particular, there are large changes to the enrollment of both PPO and HMO plans, although they appear to operate as if two distinct markets. In particular, we would expect to see substantial increases in the enrollment of the PERS Select and Blue Shield Trio plans under full active choice, at the expense of the Kaiser plan. On the other hand, with inertia, these changes would be minimal at most.

2.6 Discussion and Conclusion

Our empirical results illustrate the importance of non-financial characteristics in CalPERS member choices and shows the important of the combination of risk adjustment and inertia is for plan selection. We also show that even in a unique plan environment where plans are not strongly financial differentiated, our results fall in line with the rest of the health

plan choice literature in suggesting that consumers weight premiums roughly five times their predicted out-of-pocket expenses.

We also show that through basic risk adjustment descriptive statistics that there are changes in the distribution of individuals in health plans when risk adjustment is implemented, specifically that healthier patients were more likely to select into more generous plans due to risk adjustment transfers lowering the premiums of these plans. This, in turn, would lower the adverse selection in our market. However, while these results are significant, they are not large and muted due to strong inertia effects of remaining with the same plan.

Our counterfactual and future predictions likewise show that the response of consumers to big premium changes from risk adjustment is not likely to be strong, relatively speaking, when consumers have a default option and inertia. However, under the case where inertia is fully reduced, there is substantial switching and migration, moving from the status quo of no risk adjustment to full risk adjustment.

Additionally, for a given risk adjustment scenario (including no risk adjustment) moving from inertia to no inertia has creates large and significant enrollment. This has large implications for plan migration and menu design more broadly—such a change especially can greatly exasperate adverse selection issues in the patient population without adequate risk adjustment. One key conclusion is that policies that substantially increase active choice should only be considered in the presence of effective risk adjustment, which not just mutes adverse selection but allows efficient re-matching of consumers to different plans. Without effective risk adjustment, inefficient switching is common, leading to increased adverse selection, higher premiums for more generous plans that enroll sicker consumers, and a volatile plan environment.

It is important to note that our scenario involving no inertia is a very strong assumption that gives an upper bound on demand responsiveness under different active choice policies. Even the closest practical interventions including menu re-design and forced active choice and targeted defaults would likely have significantly weaker effects than our hypothetical. Simpler information interventions or website design improvements would not move the environment far from the status quo towards the no inertia scenario (see, e.g., Kling et al. (2012), Abaluck and Gruber (2016b), and Chandra et al. (2019) for an extended discussion).

Additionally, because CalPERS offers many options with strong horizontal differentiation in non-financial characteristics, the CalPERS environment broadly is not susceptible to adverse selection among the HMO plans. However, the conclusions are more relevant for adverse selection among the PPO plans offered, since those are differentiated by financial characteristics rather than non-financial ones like plan networks.

Finally, in future work, we plan to create our own risk adjustment model and explore more concerns relating to welfare, equity, and distributional consequences. We also hope to explore more relating the the interaction of inertia and risk adjustment, especially in an environment in which almost all of the differentiation is horizontally over the networks rather than generosity of coverage. We also plan to improve our demand model to a nested logit, separating out our PPO plans from HMO plans, to improve the fit on the behavior of plan subscribers.

2.7 Appendix

Additional Analyses, Figures, and Tables

Table 2.11: Total claims and enrollment by year

Year	Total Claims	Total Enrollment
2008	48,434,052	1,334,118
2009	51,542,246	1,382,047
2010	54,135,634	1,403,463
2011	55,983,773	1,440,388
2012	55,580,955	1,453,747
2013	63,595,722	1,466,406
2014	77,342,225	1,486,686
2015	72,331,287	1,506,709
2016	71,719,816	1,528,554
2017	69,542,085	1,541,162
2018	79,066,570	1,561,933
2019	80,345,265	1,589,680
2020	18,346,457	1,515,686
Total	797,966,087	19,210,579

PEMHCA Historical Premiums (Single) 2020 Preliminary

	Premiums																			
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Basic																				
Bay Area - Region 1																				
Anthem Select	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	$657.33	$662.41	$721.79	$783.46	$856.41	$831.44	$868.98
Anthem Traditional	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	728.41	827.57	855.42	990.05	925.47	1,111.13	1,184.84
Blue Shield Access+	$201.17	$216.66	$267.25	$315.22	$389.96	$425.50	$484.21	$532.93	$560.57	$577.33	$675.51	$711.10	$784.63	836.59	928.87	1,016.18	1,024.85	889.02	970.90	1,127.77
Blue Shield Trio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	833.00
Blue Shield NetValue	n/a	n/a	n/a	n/a	n/a	n/a	n/a	478.22	495.50	500.35	581.24	611.59	670.21	704.01	870.60	1,033.86	n/a	n/a	n/a	n/a
Health Net SmartCare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	808.44	733.29	863.48	901.55	1,000.52
Kaiser	202.21	210.17	259.21	305.42	354.69	389.38	431.17	470.67	508.30	532.56	568.99	610.44	668.63	742.72	714.45	746.47	733.39	779.86	768.25	768.49
United Healthcare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	764.24	850.67	955.44	1,062.26	1,371.84	n/a	899.94
Western Health Advantage	n/a	181.65	208.90	280.41	322.47	354.07	395.85	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	792.56	767.01	731.96
Anthem EPO Del Norte	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	861.18
PERS Choice	214.00	249.00	296.00	349.41	369.74	404.59	455.18	482.48	482.48	508.74	563.40	574.15	667.03	690.77	700.84	798.36	830.30	800.27	866.27	861.18
PERS Select	n/a	n/a	n/a	n/a	n/a	n/a	n/a	467.18	453.16	474.93	492.68	487.39	487.20	661.52	690.43	730.07	736.27	717.50	543.19	520.29
PERSCare	361.00	449.00	548.00	544.77	619.93	680.43	769.50	749.83	749.83	868.17	893.95	1,029.23	1,083.11	720.04	775.08	889.27	932.39	882.45	1,131.68	1,133.14
PORAC - Region 1	250.00	299.00	363.00	399.00	399.00	399.00	439.00	452.00	484.00	484.00	527.00	556.00	581.00	634.00	675.00	699.00	699.00	734.00	774.00	774.00
Sacramento - Region 1																				
Anthem Select	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	$750.27	$811.14	$902.07	$907.08	$942.29	$946.14	$868.98
Anthem Traditional	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	840.43	940.16	1,112.54	1,286.41	1,054.62	1,178.79	1,184.84
Blue Shield Access+	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	$519.57	$609.14	$636.92	$702.75	734.87	809.22	885.33	859.42	806.71	881.01	1,127.77
Blue Shield Trio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	833.00
Blue Shield NetValue	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	473.48	541.43	553.09	606.11	618.39	758.45	900.73	n/a	n/a	n/a	n/a
Health Net SmartCare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	747.55	672.66	980.82	n/a	1,000.52
Kaiser	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	502.56	524.51	562.69	613.42	681.59	660.96	695.11	690.56	703.96	687.99	768.49
United Healthcare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	643.34	623.45	686.36	756.78	831.42	928.85	899.94
Western Health Advantage	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	744.79	696.68	731.96
Anthem EPO Del Norte	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	861.18
PERS Choice	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	458.36	524.04	534.10	620.49	665.99	679.26	727.58	723.47	735.38	798.58	861.18
PERS Select	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	427.90	458.27	453.39	453.21	637.85	669.16	665.35	641.47	684.90	508.68	520.29
PERSCare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	782.19	831.50	957.44	1,007.54	694.26	751.21	810.40	812.40	797.61	1,027.99	1,133.14
PORAC - Region 1	250.00	299.00	363.00	399.00	399.00	399.00	439.00	452.00	484.00	484.00	527.00	556.00	581.00	634.00	675.00	699.00	699.00	734.00	774.00	774.00
Other Northern California - Region 1																				
Anthem Select	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	$706.20	$728.65	$839.10	$892.13	$910.90	$592.23	$868.98
Anthem Traditional	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	767.36	838.48	964.91	1,169.87	954.75	1,334.38	1,184.84
Blue Shield Access+	$201.17	$216.66	$267.25	$315.22	$394.26	$431.91	$491.50	$540.94	$569.01	$586.02	$685.67	$704.69	$777.53	729.76	804.34	879.96	954.51	894.43	976.81	1,127.77
Blue Shield Trio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	833.00
Blue Shield NetValue	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	664.15	614.13	753.82	895.17	n/a	n/a	n/a	n/a
Health Net SmartCare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1,000.52
Kaiser	202.21	210.17	259.21	305.42	362.58	398.03	440.77	481.14	519.62	539.49	574.32	616.14	671.68	745.30	716.98	755.27	733.99	795.43	783.13	768.49
United Healthcare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	659.06	677.35	794.80	882.35	1,205.55	n/a	899.94
Western Health Advantage	n/a	181.65	208.90	280.41	322.47	354.07	395.85	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	744.79	696.68	731.96
Anthem EPO Del Norte	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	656.08	795.57	820.38	813.96	866.95	861.18
Anthem EPO Monterey	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	656.08	795.57	820.38	910.90	n/a	n/a
PERS Choice	214.00	249.00	296.00	349.41	384.38	420.61	473.20	501.59	501.59	492.41	548.78	559.25	649.78	641.08	656.08	795.57	820.38	813.96	866.95	861.18
PERS Select	n/a	n/a	n/a	n/a	n/a	n/a	n/a	485.68	471.10	459.69	479.90	474.74	474.61	613.99	646.35	727.47	727.45	691.78	511.34	520.29
PERSCare	361.00	449.00	548.00	544.77	644.48	707.37	799.97	779.53	779.53	840.31	870.76	1,002.53	1,055.10	668.27	725.54	886.15	921.24	866.93	1,085.83	1,133.14
PORAC - Region 1	250.00	299.00	363.00	399.00	399.00	399.00	439.00	452.00	484.00	484.00	527.00	556.00	581.00	634.00	675.00	699.00	699.00	734.00	774.00	774.00

Figure 2.6: Historical single tier premium information by plan and year for Bay Area, Sacramento, and Los Angeles.

PEMHCA Historical
Premiums (Single)
2020 Preliminary

	Premiums																			
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Basic																				
Other Southern California - Region 2																				
Anthem Select	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	$536.99	$653.97	$634.75	$659.03	$659.69	$625.07	$654.04
Anthem Traditional	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	592.20	743.12	710.79	799.15	735.08	830.89	934.95
Blue Shield Access+	$201.17	$216.66	$267.25	$315.22	$323.25	$357.67	$407.02	$447.97	$471.18	$485.29	$567.87	$583.60	$644.68	543.21	598.66	654.87	778.45	695.97	760.04	909.87
Blue Shield NetValue	n/a	n/a	n/a	n/a	n/a	n/a	n/a	401.98	416.49	420.59	488.62	501.93	550.03	457.17	561.09	666.35	n/a	n/a	n/a	n/a
Health Net Salud y Más	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	489.82	520.59	535.98	473.46	461.56	427.81	435.14
Health Net SmartCare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	568.51	579.88	596.98	537.20	607.68	642.71	719.26
Kaiser	202.21	210.17	259.21	305.42	308.24	320.55	360.60	393.63	425.11	454.99	477.95	512.76	558.95	602.79	579.80	605.05	599.54	666.80	628.63	645.24
Sharp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	538.59	564.57	561.34	614.46	618.14	593.66	606.02
United Healthcare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	521.01	449.10	493.99	549.76	616.66	646.65	671.60
PERS Choice	214.00	249.00	296.00	349.41	351.44	384.56	432.64	458.59	458.59	472.83	516.28	526.19	611.30	612.25	594.40	683.71	714.43	698.96	721.11	736.28
PERS Select	n/a	n/a	n/a	n/a	n/a	n/a	n/a	444.05	430.72	441.41	451.48	446.68	446.49	586.32	585.58	625.20	633.46	654.74	462.71	451.54
PERSCare	361.00	449.00	548.00	544.77	589.24	646.74	731.40	712.71	712.71	806.89	819.18	943.26	992.61	638.22	657.32	761.50	802.24	733.50	907.29	986.66
PORAC - Region 2	250.00	299.00	363.00	399.00	399.00	399.00	439.00	452.00	484.00	484.00	527.00	556.00	581.00	634.00	675.00	699.00	699.00	734.00	774.00	749.00
Los Angeles Area - Region 3																				
Anthem Select	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	$475.86	$493.40	$543.47	$592.78	$660.17	$627.07	$619.93
Anthem Traditional	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	549.76	631.62	610.64	713.69	784.72	878.48	902.63
Blue Shield Access+	$201.17	$216.66	$267.25	$315.22	$287.75	$312.98	$356.17	$392.01	$412.35	$424.69	$496.93	$510.72	$530.75	469.91	517.87	566.53	675.98	613.29	669.75	813.17
Blue Shield Trio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	624.93
Blue Shield NetValue	n/a	n/a	n/a	n/a	n/a	n/a	n/a	351.77	364.49	368.06	427.58	439.25	453.35	395.50	485.41	576.46	n/a	n/a	n/a	n/a
Health Net Salud y Más	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	425.44	430.71	466.11	414.79	404.32	356.50	392.31
Health Net SmartCare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	542.71	568.47	585.39	526.73	577.15	584.27	648.42
Kaiser	202.21	210.17	259.21	305.42	294.78	306.54	329.14	359.30	388.02	413.17	434.00	465.63	502.40	541.79	521.18	543.83	573.89	642.70	618.64	664.39
United Healthcare	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	487.76	458.74	492.24	545.71	602.78	669.61	668.31
PERS Choice	214.00	249.00	296.00	349.41	344.12	376.55	423.63	449.04	449.04	452.41	496.15	505.63	587.46	599.19	585.18	598.75	637.53	620.39	654.50	710.29
PERS Select	n/a	n/a	n/a	n/a	n/a	n/a	n/a	434.80	421.75	422.35	433.87	429.22	429.08	573.83	576.49	547.55	565.33	573.21	420.77	435.74
PERSCare	361.00	449.00	548.00	544.77	576.96	633.27	716.17	697.87	697.87	772.05	787.24	906.39	953.90	624.59	647.11	666.91	715.88	673.73	843.78	931.12
PORAC - Region 3	250.00	299.00	363.00	399.00	399.00	399.00	439.00	452.00	484.00	484.00	527.00	556.00	581.00	634.00	675.00	699.00	699.00	734.00	774.00	699.00
Out of State																				
Kaiser/OOS	$273.12	$309.72	$355.67	$426.93	$475.92	$527.31	$577.82	$625.52	$660.32	$724.69	$785.28	$816.47	$876.46	$917.20	$922.78	$930.29	$940.67	$957.05	$964.68	$995.19
PERS Choice	214.00	249.00	296.00	349.41	402.69	440.64	495.74	525.47	525.47	579.58	636.97	649.16	754.21	706.40	653.58	625.31	675.61	661.45	630.41	709.66
PERSCare	361.00	449.00	548.00	544.77	675.17	741.06	838.07	816.65	816.65	989.07	1,010.68	1,163.70	1,224.67	736.32	722.74	696.49	758.69	718.98	813.47	882.03
PORAC - Out of State	250.00	299.00	363.00	399.00	399.00	399.00	439.00	452.00	484.00	484.00	527.00	556.00	581.00	634.00	675.00	699.00	699.00	734.00	774.00	899.00

Figure 2.7: Historical single tier premium information by plan and year for Other Northern California and Other Southern California.

Premium Contribution Calculation Details

Contributions for State Employees

For state employees, the primary modification made to the blanket "80-20" rule is that we used the more precise rule actually employed by CalPERS which is:

1. In a given year, take the average total premium for the top 4 statewide health plans by statewide market share. Do this separately for each of the three dependent tiers (single, spouse, family).

2. Classify subscribers into one or two groups: those whose status implies and "80-80" rule and those whose status implies an "85-80" rule. The "85-80" rule implies that a subscriber gets 85% of the total single premium as their own subsidy, but their dependents get 80% of the subsidy difference between the tier in question (spouse or family) and the single tier. The "80-80" subscribers get an 80% subsidy for the entire set of family members, including themselves. So, for "80-80" subscribers you multiply the output of 1) above by 0.8 to get the subsidy, while for "85-80" you multiply the subscriber contribution for the single tier by 0.85 and the incremental premium to get to the family premium average by 0.8, then add these two contributions together.

3. The state employee subscriber premium contribution is then equal to (Total Premium – Fixed Subsidy). If this number is negative, their premium contribution is set to 0.

It is also important to note that supervisor manager state employees receive lump sum subsidies that follow a slightly different structure than that specified above. Lump sum subsidies for these employees apply to health, dental and vision benefits bundled together. For simplicity, we assume that these employees receive subsidies following the "80-80" rule as specified above.

We have integrated datasets that tell us which (i) families are in which bargaining units and (ii) provide historical data on tier-specific plan subsidy contributions for bargaining units. The final dataset we provide with this report on premium contributions subsumes this information.

Retired State Employees & CSU Employees

In the current report, we now assume that every retired state employee is under a "100-80" rule, meaning that the retired employee themselves receives 100% of the premium average of the top four plans as a lump sum contribution while their dependents receive 80%. Note that this is the rule for employees who have been employed with the state for a period of time equal to 20 years or more. Thus, the rule we assume is a maximum contribution rule for these retirees and some may receive lower subsidies than what our model assumes.[7]

[7]We verified, using data on premiums paid for retired employees from 2012-2020, that our approach is close to correct for these employees. We extended the data to pre-2012 using the following formula.

Another key group with a different contribution formula is CSU employees. According to CalPERS staff, for one of the union groups their contributions are the same as the retired state employees (with maximum service) in 2020. Consequently, we use the formula for premium contributions for retired employees and apply it in our data to all CSU employees across the different CSU unions.

Non-State Public Agency Employees

This group of CalPERS beneficiaries is harder to model because their premium contributions depend on the specific contribution amounts used by the non-state public employer in question. To model premium contributions for these employees, we use some estimates of local agency contributions made by CalPERS that has some characteristics of employers. To do this we:

1. Use the employee contributions from employer agencies that provide fixed premium contributions that apply to all plans in a choice set.
2. Take the weighted mean across these fixed agency-specific contributions, where the weights are the number of employees in each agency. We treat PA and School categories separately.
3. Since contributions for the two party tier (subscriber with one family member) are not included in this resource, we need to estimate these numbers. We do this using the rule listed in the footnote here, where "Actives" implies an 80-80 rule.[8]
4. Extrapolate numbers to years before 2020 using between-year ratios of fixed contributions from state employees following the "80-80" rule.

$$(Contribution\ for\ Retired\ in\ 2012) \times \frac{Contribution\ for\ Actives\ in\ Year\ 2010/11}{Contribution\ for\ Actives\ in\ 2012}$$

[8]

$$\begin{aligned}
&(\text{PA/School } Contribution\ for\ Region\ X\ Tier\ 2\ in\ 2020) \\
&\qquad = (\text{PA/School } Contribution\ for\ Region\ X\ Tier 1\ in\ 2020) \\
&\times \frac{(Contribution\ for\ Actives\ Tier\ 3\ in\ Year\ 2020) - (Contribution\ for\ Actives\ Tier\ 2\ in\ Year\ 2020)}{(Contribution\ for\ Actives\ Tier\ 3\ in\ Year\ 2020) - (Contribution\ for\ Actives\ Tier\ 1\ in\ Year\ 2020)} \\
&\qquad + (\text{PA/School } Contribution\ for\ Region\ X\ Tier 3\ in\ 2020) \\
&\times \frac{(Contribution\ for\ Actives\ Tier\ 2\ in\ Year\ 2020) - (Contribution\ for\ Actives\ Tier\ 1\ in\ Year\ 2020)}{(Contribution\ for\ Actives\ Tier\ 3\ in\ Year\ 2020) - (Contribution\ for\ Actives\ Tier\ 1\ in\ Year\ 2020)}
\end{aligned}$$

While this contribution model is coarser, since we don't observe the specific local public agency each employee works for, we use this model to better hone in on broad categories of non-state employees and assess a contribution value that is likely to be closer to their true contributions than a blanket application of the state employee rule.

Risk Adjustment Details

Figure 2.8: This figure presents average member amount allowed over time, by health plan.

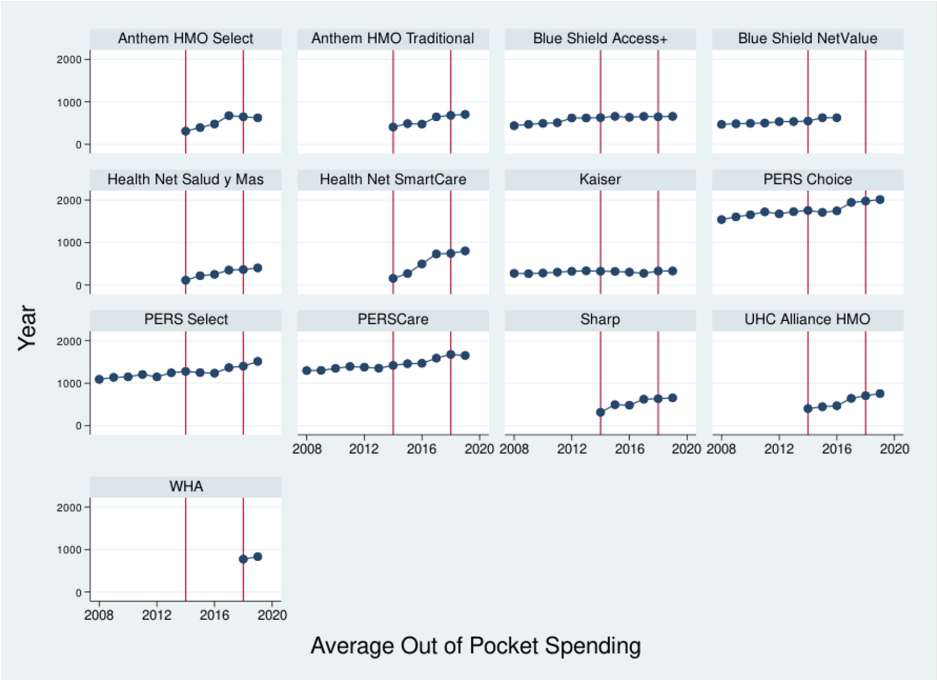

Figure 2.9: This figure presents average member out of pocket spending over time, by health plan.

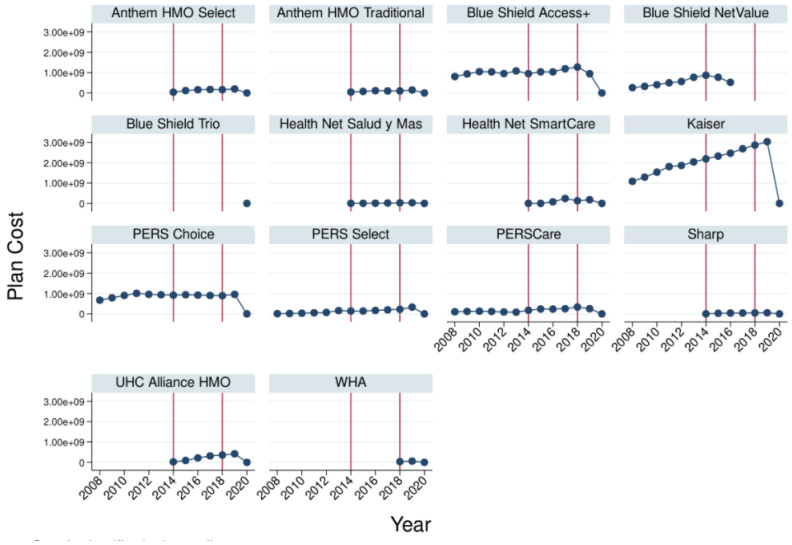

Figure 2.10: This figure presents the total plan cost by health plan over time.

Figure 2.11: This figure presents the total plan cost by health plan over time, with the Kaiser plan omitted.

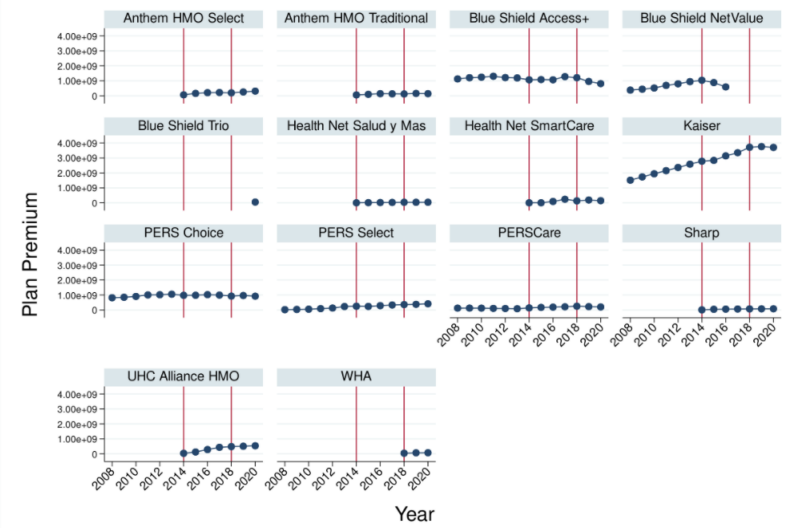

Figure 2.12: This figure presents the total premiums paid by CalPERS and subscribers, by plan, over time.

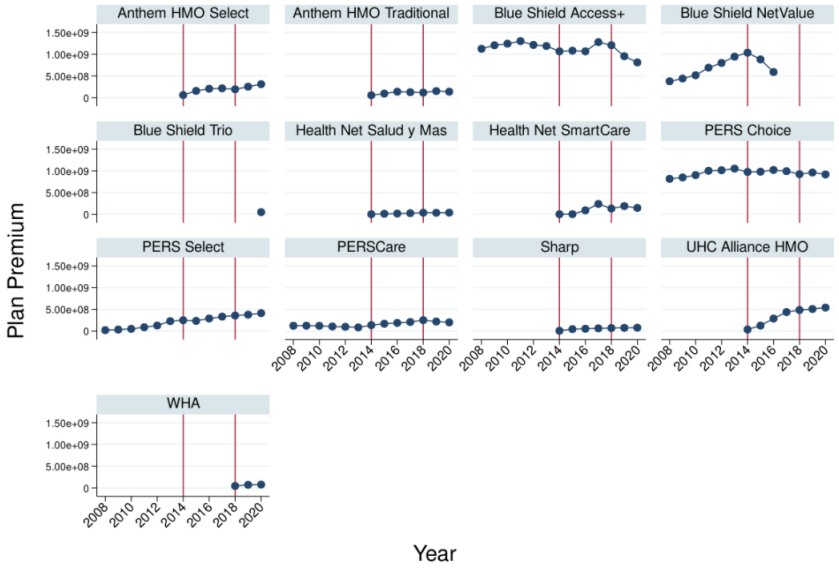

Figure 2.13: This figure presents the total premiums paid by CalPERS and subscribers, by plan, over time, with the Kaiser plan omitted.

Additional Counterfactual Scenarios

Table 2.12: Predicted Choices in Subscribers Between Status Quo 2022 (Rows) to Partial Risk-Adjustment 2022 (Columns), **with Inertia**. Rows represent plan enrolled in in Status Quo scenario, columns represent plan enrolled in in Partial Risk-Adjustment scenario. Row X Column combinations describe subscribers enrolled in that combination these future prediction scenarios.

	Partial Risk Adjustment Choice												
Status Quo Choice	Anthem HMO Select	Anthem HMO Traditional	Blue Shield Access+	Blue Shield Trio	Health Net Salud y Mas	Health Net SmartCare	Kaiser	PERS Platinum	PERS Gold	Sharp	UHC Alliance HMO	WHA	TOTAL
Anthem HMO Select	11050.42	193.66	535.18	142.44	81.12	193.2	1207.32	865.06	416.74	71.38	354	66.94	15177.46
Anthem HMO Traditional	153.68	4263.8	243.58	62.22	39.6	137.02	716.54	408.8	186.26	25.92	213.58	40.26	6491.26
Blue Shield Access+	469.32	267.14	41496.54	477.78	171.8	255.98	2177.48	1435.9	728.44	155.78	734.02	178.84	48549.02
Blue Shield Trio	138.06	79	535.32	64.68	67.48	86.44	815.94	472.74	180.18	0.78	259.94	90.26	2790.82
Health Net Salud y Mas	78.26	45.66	193.04	66.7	2446.66	57.04	356.72	270.62	123.36	37.1	117.54	0.18	3792.88
Health Net SmartCare	186.44	158.48	274.36	85.26	56.62	6882.42	890.58	518.84	215.42	44.46	225.86	28.42	9567.16
Kaiser	1148.26	861.04	2394.72	805.12	362.46	911.28	221915.8	3354.14	1516.8	274.84	1686.96	443.32	235674.7
PERS Choice	586.22	340.82	1046.58	320.34	173.62	347.68	2259.28	45403.08	955.6	154.58	693.38	120.72	52401.9
PERS Select	402.58	220.4	812.12	175.72	126.44	221.08	1527.56	1310.48	27400.3	122.82	485.08	76.1	32880.68
PERS Care	192.62	108.28	418.56	104.12	79.2	146.94	845.12	8461.72	286.32	59.06	261.28	37.18	11000.4
Sharp	71.36	31.04	174.48	0.8	39.34	45.9	273.22	229.4	122.32	3845.68	150.12	0.46	4984.12
UHC Alliance HMO	363.54	272.54	839.1	277.36	119.84	248.98	1765.5	1082.74	505.1	153.2	24726.86	150.5	30505.26
WHA	65.36	48.16	190.64	91.3	0.1	28.58	440.64	165.92	75.16	0.44	144.56	3036.04	4286.9
TOTAL	14906.12	6890.02	49154.22	2673.84	3764.28	9562.54	235191.7	63979.44	32712	4946.04	30053.18	4269.22	458102.6

Table 2.13: Predicted Choices in Subscribers Between Status Quo 2022 (Rows) to Partial Partial Risk-Adjustment 2022 (Columns), **without Inertia**. Rows represent plan enrolled in in Status Quo scenario, columns represent plan enrolled in in Partial Risk-Adjustment scenario. Row X Column combinations describe subscribers enrolled in that combination these future prediction scenarios.

	Partial Risk Adjustment Choice												
Status Quo Choice	Anthem HMO Select	Anthem HMO Traditional	Blue Shield Access+	Blue Shield Trio	Health Net Salud y Mas	Health Net SmartCare	Kaiser	PERS Platinum	PERS Gold	Sharp	UHC Alliance HMO	WHA	TOTAL
Anthem HMO Select	2104.96	1324.88	2286.6	1452.16	410.04	1055.7	8346.12	4815.22	4788.72	372.8	2353.02	475.72	29785.94
Anthem HMO Traditional	1123.42	1210.12	1023.5	809.36	171.1	936.38	5653.5	2710.64	1787.94	123.38	1517.14	328.12	17394.6
Blue Shield Access+	2041.66	1115.04	3184.8	2693.76	566.74	728.62	8938.16	5288.32	4841.58	561.14	2977.34	854.62	33791.78
Blue Shield Trio	1420.94	924.84	2928.54	5300.4	506.4	547.48	10102.56	3925.8	2743.76	14.98	2966.02	1722.14	33103.86
Health Net Salud y Mas	396.56	193.88	630.62	496.84	243.34	174.08	1874.84	1183.06	899.08	149.1	483	1.66	6726.06
Health Net SmartCare	1005.2	1083.5	771.14	531.72	165.14	968.26	5201.2	2447.2	1348.54	114.68	1318.44	207.64	15162.66
Kaiser	7985.72	6558.78	9702.66	9996.66	1878.34	5325.18	44747.22	19867.1	13982.12	1329.14	12159.26	3478.7	137010.9
PERS Choice	2910.98	1890.68	3530.02	2342.86	725.18	1534.16	12471.82	7316.14	6289.54	647.66	3592.76	645.28	43897.08
PERS Select	4660.64	2057.34	5273.14	2754.66	905.6	1384	14136.94	9911.36	13349.56	860.32	4167.5	703.08	60164.14
PERS Care	1429.06	1064.34	1833.92	1277.9	386.72	795.76	6159.8	3882.2	3020.84	288.44	1766.48	299.12	22204.58
Sharp	364.26	139.22	625.06	16.8	152.88	120.36	1358.44	996.88	874.38	360.56	649.88	4.26	5662.98
UHC Alliance HMO	2414.96	1816.08	3379.62	3138.26	517.5	1425.06	12922.82	6002.92	4374.7	667.86	4294.48	1314.8	42269.06
WHA	455.24	376.78	941.72	1702.28	1.9	212.28	3454.36	1004.38	686.76	4.78	1238.24	850.3	10929.02
TOTAL	28313.6	19755.48	36111.34	32513.66	6630.88	15207.32	135367.78	69351.22	58987.52	5494.84	39483.56	10885.44	458102.6

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