
Rusty Tchernis
Sharon-Lise T. Normand
Juliana Pakes
Peter Gaccione
Joseph P. Newhouse

Selection and Plan Switching Behavior

A majority of employees can choose among health insurance plans of varying generosity. They may switch plans if prices, information, or their health status change. This paper analyzes switching behavior presumptively caused by changes in health status. We show that people who move to a less generous plan have lower medical spending prior to the switch than the average for the generous plan in which they started, while those who move to a more generous plan appear to anticipate higher spending, which they delay until after the switch. This transfer of costs from a less to a more generous plan increases the burden of adverse selection. Our data suggest that switching may be more important to the level of premiums than previously documented.

Sixty percent of the U.S. population is covered by employer-sponsored health insurance. More than half of that group can choose among competing health insurance plans that vary in their generosity (Cutler and Zeckhauser 2000; Gabel 1999). Although competition usually benefits consumers by satisfying heterogeneous tastes and lowering prices, in the health insurance market it also can result in adverse selection—the tendency of sicker individuals to be disproportionately attracted to more generous plans. This can cause a welfare loss from the inability to insure against future risks, and in extreme cases can lead to insurance contracts not being offered, despite

buyers willing to pay the expected cost of their losses (Rothschild and Stiglitz 1976). One of the authors of this study has referred to this trade-off between efficiency and selection as a health care conundrum (Newhouse 2002).

Although the literature has several empirical studies of selection behavior, they do not reach uniform conclusions. In general, studies of individuals switching to a managed care plan have found a 20% to 30% prior utilization advantage relative to indemnity plans (Brown et al. 1993; Call et al. 1999; Cutler and Zeckhauser 1998; Glied 2000; Luft, Trauner, and Maerki 1985; Nicholson et al. 2004). Some of this advantage,

Rusty Tchernis, Ph.D., is an assistant professor in the Department of Economics, Indiana University. **Sharon-Lise T. Normand, Ph.D.**, is a professor in the Department of Health Care Policy, Harvard Medical School, and in the department of Biostatistics, Harvard School of Public Health. **Juliana Pakes, M.Ed.**, and **Peter Gaccione, M.A.**, are both research associates in the Department of Health Care Policy, Harvard Medical School. **Joseph P. Newhouse, Ph.D.**, is the John D. MacArthur Professor of Health Policy and Management at Harvard University, with appointments in the Department of Health Care Policy, Harvard Medical School, the Department of Health Policy and Management, Harvard School of Public Health, the Kennedy School of Government, and the Faculty of Arts and Sciences; he also is a faculty research associate at the National Bureau of Economic Research. This research was supported by the Agency for Healthcare Research and Quality (grant no. P01-HS10803) and the National Institute for Mental Health (grant no. R01-MH61434). Address correspondence to Prof. Tchernis at Department of Economics, Indiana University, Wylie Hall, 100 S. Woodlawn, Bloomington, IN 47405. Email: rtcherni@indiana.edu

however, may represent transitory components that will later regress toward the mean (Medicare Payment Advisory Commission 2000). Moreover, many studies use data from the Medicare program, but such studies typically only have data on those enrolled in traditional Medicare and lack data on the utilization of those enrolled in health maintenance organizations (HMOs). As a result, they only examine utilization in traditional Medicare prior to a switch into an HMO or following a switch out of an HMO.

We also study the behavior of people switching plans, but unlike the typical Medicare study, our data come from people under age 65 in five large employment groups, and we do have utilization data both before and after the plan change. Moreover, although we document selection behavior, we find evidence of an important asymmetry that the Medicare studies could not document because of their lack of data. Consistent with selection, those switching into a less generous plan did spend less than the average in their more generous plan of origin prior to their switch; however, after the switch they spent approximately the same amount as those in their plan of destination. On the other hand, those switching to a more generous plan not only spent more than their colleagues in the less generous plan prior to the switch, but substantially more than their colleagues in the more generous plan after the switch. Thus, they appeared to defer some transitorily high use until after they switched plans. The differential use among this latter group is disproportionately in the use of mental health services.

Much of the literature on the selection behavior of people under 65 has concentrated on switching for reasons external to the employee, in particular, changes in the relative prices of health plans (Buchmueller and Feldstein 1997; Cutler and Reber 1998; Royalty and Solomon 1999), the availability of new plans (Ellis 1989; Strombom, Buchmueller, and Feldstein 2002), or the arrival of information on plan quality (Beaulieu 2002; Chernew, Gowrisankaran, and Scanlon 2002). Unlike those papers, we concentrate on switching that is not caused by price changes or other reasons external to the employee. Our study resembles one other in the literature, with which we compare our findings (Altman, Cutler, and Zeckhauser 1998). First, however, we sketch a simple model of switching, after which we describe our data and results.

A Simple Model of Health Shocks and Switching

Following Cutler and Reber (1998), we assume that employees differ in their health status, or level of sickness, and that the employer offers two plans of varying generosity. The generous plan is more expensive, and those who expect to spend more enroll in it.

Cutler and Reber (1998) analyzed the experience of Harvard University after it changed its subsidy policy from a fixed percentage subsidy of each plan to a lump sum contribution independent of plan, thereby increasing substantially the relative price of the generous plan to the employee. As a result, the marginal (healthier) enrollees in the generous plan switched to the less generous plan, setting off a death spiral; because the average spending of the remaining enrollees in the generous plan was higher following the switch, the following year saw a further increase in premiums, which resulted in additional disenrollment of healthier enrollees from the generous plan and a further premium increase. After two years of this spiral, the generous plan was not offered.

The situation we consider differs. There are no changes in the external environment and, in particular, no changes in the employer's subsidy arrangements, but some employees experience negative shocks to their health status. After the shock is revealed, the employee can choose a health plan at the next open enrollment. The negative shock may be transitory (acute illness) or permanent (chronic illness). An employee with a transitory shock that resolves over time experiences a positive shock during the time the problem is resolving; otherwise we assume that there are no positive shocks.

We assume that a negative health shock will increase marginal utility from health care spending, thereby raising the likelihood the individual will switch to the generous plan if the shock has not resolved by the time of the next plan choice. The greater any negative shock received by an enrollee in the less generous plan, the greater the likelihood the employee will switch to the more generous plan. Thus, unlike the case studied by Cutler and Reber (1998), it is not just the marginal but any employee who can switch if the shock is sufficiently large and persistent.

The decision to switch will depend not only on the magnitude and persistence of the shock, but

also on the cost of switching. This includes the cost of searching for information about an alternative plan, making a decision, and possibly changing providers. If the cost of switching outweighs the expected benefit, an individual will not switch (Samuelson and Zeckhauser 1988).

If a negative shock persists into the next period and the individual has switched plans, he or she remains in the more generous plan absent any changes in price or information. If, however, the negative shock is transitory, the individual expects spending to regress toward the mean, and thus may switch back to the less generous plan.

In the case of a negative shock, an employee in the less generous insurance plan may defer treating the shock until after the next open enrollment, when the employee can obtain treatment more cheaply or with fewer restrictions by enrolling in the more generous insurance plan. In the case of a medical emergency, deferral is by definition not an option, but in non-emergencies it may be. Similarly, an individual contemplating a switch to a less generous plan because a negative shock is resolving may move some treatment forward in time so that it is reimbursed by the more generous plan. Both types of behavior will increase the amount of observed selection. The deferral option also makes clear that the period of lock-in, or frequency of open enrollment, will importantly affect the amount of selection.

When switching occurs, the average health status and hence the premiums in each plan generally will change because of the changed risk mix in each plan. Assuming the employer does not fully offset these changes by altering the subsidy, the marginal employee may switch plans, as in the Cutler and Reber model. However, in our model, unlike Cutler and Reber's, premiums in the two plans may either move closer together or drift apart because non-marginal individuals whose health status has changed switch in both directions. Thus, switching's effect on premiums depends on the relative magnitude of spending between switchers and *stayers* and the spending patterns of switchers before and after the switch. We address the magnitude of these effects in the next sections.

Data Set and Descriptive Analysis

Our sample comes from the MarketScan™ database (The Medstat Group, Ann Arbor, Mich.) for the years 1998 and 1999. The Medstat Group

collects claims information on utilization, expenditures, diagnoses, and enrollment from a number of private employers, health plans, government, and public organizations located throughout the United States. The claims data include outpatient, inpatient, and pharmacy claims. Our cohort consists of individuals who were under 65 years of age, employed full time during the years 1998 and 1999, continuously enrolled (for at least 335 days in both years) in one or more of the health insurance plans, and who elected individual rather than family insurance coverage in both years. We restrict our cohort to those with individual coverage to exclude employees who could have switched insurance plans because of changes in health status of their family members, about whom we did not necessarily have information.

Because we concentrate on switching presumably caused by shocks to health status rather than by price or information changes, we restrict the data set to five employers with comparable health insurance offerings in both years. Thus, we exclude employers who changed either the number or type of plans offered. Restricting the data set in this way means the observed switching is most likely attributable to a shock to health status.

We divide the health insurance plans offered by each employer into preferred provider organization (PPO) and non-PPO plans, the majority of which are point-of-service (POS) plans. Both the PPO and the POS plans are types of managed care that create networks of providers, but they differ in three important ways: 1) POS plans require all patients to choose a primary care provider and typically have a more restrictive network; 2) POS plans have no deductible and full coverage for services provided by in-network providers, after a copay, usually ranging from \$5 to \$15; and 3) the relative price difference between seeing a provider in- and out-of-network is much higher for the POS plans. Although a patient using in-network providers in a POS plan may have lower out-of-pocket costs, we nonetheless refer to the POS plans as less generous and to the PPO plans as more generous.

Switchers are defined as those employees who were enrolled in a plan of a different type in January 1998 and January 1999. The vast majority of switches occurred in the last quarter of the calendar year, when most companies had open enrollment. Stayers are employees who were enrolled in a plan of the same type in both years.

Table 1. Cohort in 1998

		<i>N</i>	%
Total		81,815	
Age, mean	42 (11)		
Female		43,147	53
Age, mean	44 (10)		
Plan type			
PPO		33,122	40
Switchers from		1,388	4
POS		48,693	60
Switchers from		329	.8
Diagnosis in 1998			
Cancer		1,084	1.32
CHF		543	.66
AMI		789	.96
BPAD		2,706	3.31
MDD		439	.54
SCHZ		576	.7

Note: Standard deviations are in parentheses. CHF = congestive heart failure; AMI = acute myocardial infarction; BPAD = bipolar disorder; MDD = major depressive disorder; SCHZ = schizophrenia.

From the claims data, we extract information on outpatient, inpatient, and pharmacy utilization, as well as diagnosis information on a set of serious medical conditions, including cancer, congestive heart failure (CHF), acute myocardial infarction (AMI), major depressive disorder (MDD), schizophrenia (SCHZ), and bipolar disorder (BPAD). Those with these conditions will, as a group, have higher than average future utilization. We identified all diagnoses from the *International Classification of Diseases, Ninth Revision* (ICD-9) codes in the claims data. These diagnoses are tracked to compare the health status of enrollees. However, we cannot identify the health shocks from diagnosis data, since we have no knowledge of the date of the initial diagnosis.

Table 1 presents a summary of the cohort. The demographic information we have on the employees consists of age and sex variables. Our sample is 53% female, and they are, on average, two years older than the males (this difference persists within plan types). Most people in our sample are enrolled in the less generous plan. In addition, the majority of switchers move into the less generous plan. Although we lack information on premium differences, the premiums in the PPO plans are likely higher than in the POS plans. The larger enrollment and greater switching into the POS plans suggest that out-of-pocket expenses importantly influence plan choice.

Table 2. Health care utilization

	1998	1999
Outpatient		
Any outpatient use		
<i>N</i>	65,332	63,777
%	80	78
Mean costs for users (\$)	1,603 (4,674)	1,793 (4,514)
Inpatient		
Any inpatient use		
<i>N</i>	2,904	3,147
%	4	4
Mean costs for users (\$)	9,734 (15,408)	11,114 (22,638)
Pharmacy		
Any pharmacy use		
<i>N</i>	25,867	27,201
%*	(66)	(70)
Mean costs for users (\$)	679 (1,378)	802 (1,641)

Note: Pharmacy results summarize data from three contributing employers (47.5% of the employee-weighted sample). Standard deviations are in parentheses.

Not surprisingly, given how we defined the sample, relatively few employees switch plans. Only 4% switched to a POS plan, and less than 1% switched to a PPO plan. Altman, Cutler, and Zeckhauser (1998) report similar proportions of switching (2% and 1% to less and more generous plans, respectively).¹ Because of the small number of switchers in our data, we show later that the relative prices of plans to the employees should only have changed about 1% between the two years, barring a change in the employer subsidy arrangements. Although we do not have information on the employer subsidy, given the small number of switchers it seems improbable that there was any important change.

Summaries of utilization and spending for the whole cohort are reported in Table 2. About 80% of employees used any outpatient services in both years. Only 4% used inpatient services. Information on pharmacy use is only available for three of the five employers in 1998 and four employers in 1999. The data on pharmacy use shown in Table 2 come from the three employers that provided pharmacy information in both years; their employees comprise 48% of the employee-weighted sample. For these employers, the proportion of individuals using pharmacy services

Table 3. Comparison of transition groups, switchers to POS

	Stayers in PPO (N = 31,734)		Switchers from PPO to POS (N = 1,388)		Stayers in POS (N = 48,364)	
	%	Mean	%	Mean	%	Mean
Age in 1998		45.3* (.05)		41.0 (.28)		40.3* (.05)
Female	60*		53		48*	
Diagnoses in 1998						
Cancer	1.80		1.08		1.02	
AMI	.79		.65		.58	
CHF	1.28		1.15		.75	
MDD	2.89		2.59		3.60*	
BPAD	.54		.36		.54	
SCHZ	.80*		.22		.66*	
Spending in 1998						
Outpatient	79.45	\$1,600* (19)	74.32	\$1,163 (77)		
Inpatient	4.27	\$394 (17)	3.09	\$449 (134)		
Pharmacy	58.69	\$595* (27)	61.90	\$389 (46)		
Spending in 1999						
Outpatient			80.72	\$1,249 (94)	75.96	\$1,167 (16)
Inpatient			3.38	\$432 (103)	3.56	\$383 (21)
Pharmacy			69.82	\$464 (50)	71.13	\$539* (7)

Note: Pharmacy results summarize data from three contributing companies. All means are significantly different for stayers in PPO plans and POS plans, except for BPAD. Means and standard errors (in parentheses) are computed for all employees in each group. The standard errors are not adjusted for multiple comparisons. AMI = acute myocardial infarction; CHF = congestive heart failure; MDD = major depressive disorder; BPAD = bipolar disorder; SCHZ = schizophrenia.

* Represents variables of stayers that are significantly different from switchers at the 5% level.

slightly increased from 66% to 70% during the 1998–1999 period.

All spending data are adjusted using 1998 and 1999 per-capita private medical spending, which is a ratio of private personal health care expenditure (*Health Care Financing Review*, Statistical Supplement 2001, Table 1) to total resident population (Statistical Abstract of the United States 2002, U.S. Census Bureau). We use this measure rather than a medical price deflator in order to compare total spending across years.² Average spending on medical services increased roughly 12% (outpatient) to 18% (pharmacy) between 1998 and 1999.

Comparison of Stayers and Switchers

The data in Tables 3 and 4 summarize the demographic variables (age in 1998 and sex), diagnoses in 1998, and spending on outpatient, inpatient, and pharmacy services for stayers and switchers in each year. Table 3 shows data for the switchers to POS plans, and Table 4 shows similar data for switchers to PPO plans. Because prices of medical services vary between plan types, we focus

on medical spending for groups enrolled within the same type of plan. For example, we contrast the spending of switchers from the PPO to the POS plans with the spending of stayers in the PPO plans before the switch and with stayers in the POS plans after the switch. In other words, our comparisons of spending hold the prices of services constant, so that within-year differences in spending measure differences in the dollar-weighted use of medical goods and services.

Suggestive of selection, switchers to the less generous POS plan are substantially younger than those choosing to stay in the PPO plans, but older than those choosing to stay in the POS plans (Table 3). Both averages are significantly different at a 5% significance level. Also suggestive of selection, those who stay in the PPO plans are more likely to have diagnoses of all the serious diseases than are switchers. Consistent with both selection and moral hazard and possible price differences, spending on all types of services is higher for stayers in the PPO than for stayers in the POS.

The data on spending confirm the suggestions of selection in the comparisons using demographic

Table 4. Comparison of transition groups, switchers to PPO

	Stayers in POS (<i>N</i> = 48,364)		Switchers from POS to PPO (<i>N</i> = 329)		Stayers in PPO (<i>N</i> = 31,734)	
	%	Mean	%	Mean	%	Mean
Age in 1998		40.3 (.05)		43.5 (.51)		45.3 (.05)
Female	48*		63		60	
Diagnoses in 1998						
Cancer	1.02		1.52		1.80	
AMI	.58		1.21		.79	
CHF	.75		1.21		1.28	
MDD	3.60		3.94		2.89	
BPAD	.54		.91		.54	
SCHZ	.66		.91		.80	
Spending in 1998						
Outpatient	80.21	\$1,074 (21)	82.42	\$1,277 (131)		
Inpatient	3.08	\$313 (17)	4.55	\$377 (134)		
Pharmacy	67.66	\$431* (6)	80.32	\$794 (110)		
Spending in 1999						
Outpatient			84.24	\$2,393 (232)	80.76	\$1,745* (27)
Inpatient			6.97	\$844 (236)	4.26	\$489 (31)
Pharmacy			79.77	\$917 (116)	61.72	\$714* (30)

Note: Pharmacy results summarize data from three contributing companies. All means are significantly different for stayers in PPO plans and POS plans, except for BPAD. Means and standard errors (in parentheses) are computed for all employees in each group. The standard errors are not adjusted for multiple comparisons. AMI = acute myocardial infarction; CHF = congestive heart failure; MDD = major depressive disorder; BPAD = bipolar disorder; SCHZ = schizophrenia.

* Represents variables of stayers that are significantly different from switchers at the 5% level.

and diagnosis data. Switchers out of the more generous PPO plans spent significantly less on outpatient and pharmacy services than the stayers in the PPO plans in 1998 when both groups were in the PPO plan (\$1,163 vs. \$1,600 and \$389 vs. \$595, respectively), and slightly, but not significantly, more on inpatient services. After the switch, however, the switchers to the POS plans spent statistically indistinguishable amounts from the stayers in the POS plans on both inpatient and outpatient services, and significantly less on pharmacy (bottom panel, Table 3).

Before the switch, the switchers out of the less generous POS plans spent slightly but not significantly more on outpatient and inpatient services, and much more on pharmacy benefits, than the stayers in the POS plans (Table 4). But the most striking difference is between the average spending of switchers to the PPO plans after the switch and the stayers in the PPO plans; the switchers spent about 50% more than the stayers on both outpatient (\$2,393 vs. \$1,745) and inpatient (\$844 vs. \$489) services. The differences in spending can be easily seen in Figure 1, which

compares spending on each type of service for all four groups of employees.

These results suggest that those switching to the PPO plans and those switching to the POS plans are both driven by expected spending, but in somewhat different fashion. The switchers to the POS plans change plans after their average spending already differs from others in their plan of origin (PPO), and then after the switch spend at a rate similar to the average of those in the POS plans. The switchers to the PPO plans, on the other hand, appear to delay anticipated higher spending until after the switch. To get a better understanding of switching behavior, we next examine the differences in types of outpatient services consumed by stayers and switchers.

Outpatient Spending by Provider Type

We grouped the outpatient claims into categories based on the following provider types: pathology, surgery, internal medicine, obstetrics and gynecology (Ob gyn), radiology, anesthesiology, mental health, facility, miscellaneous, and total

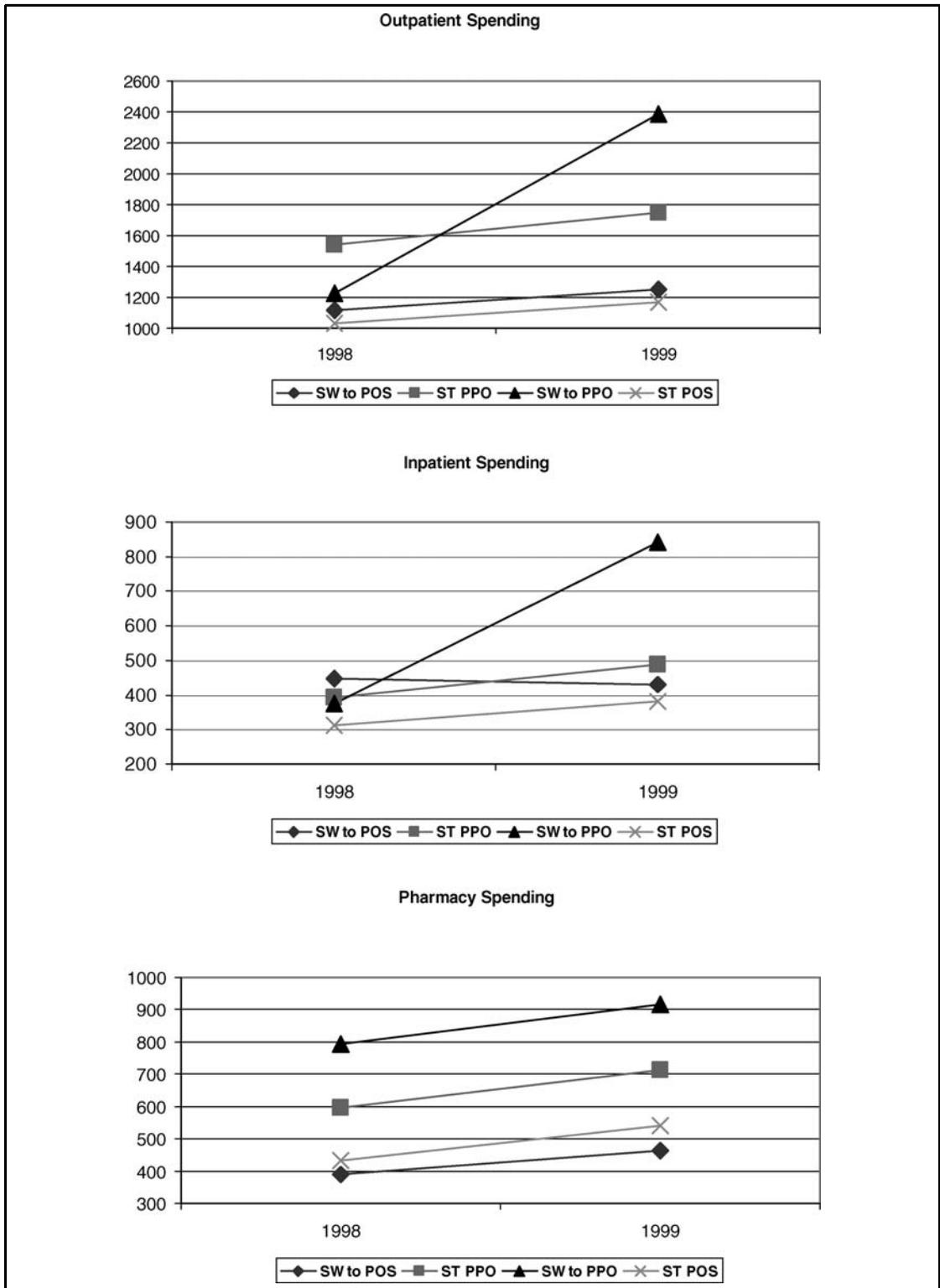


Figure 1. Spending of switchers (SW) vs. stayers (ST) (see Tables 3 and 4 for significance levels)

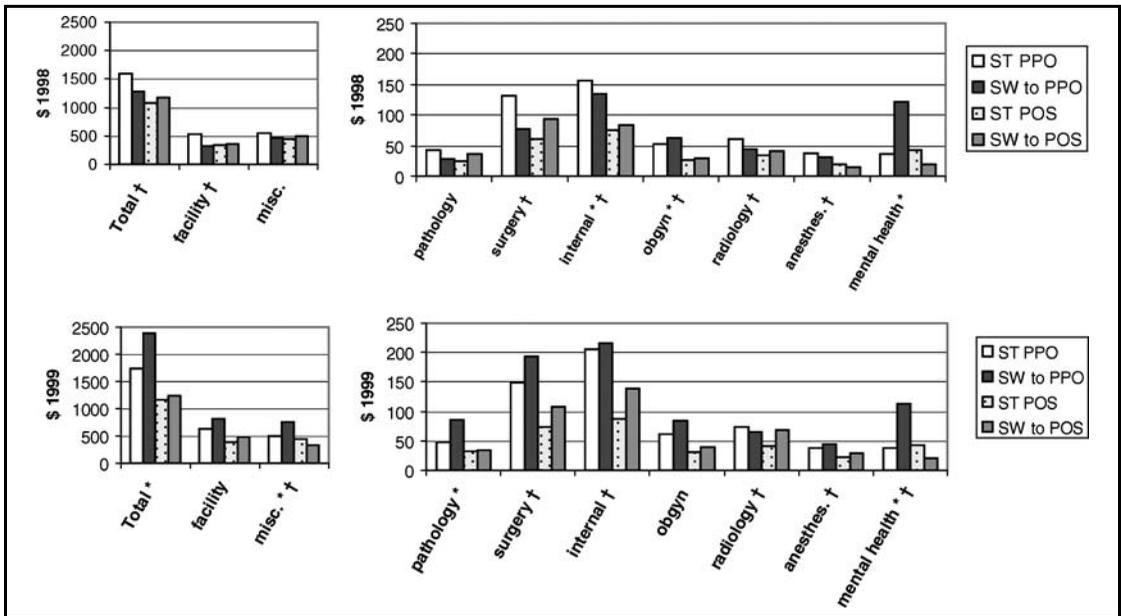


Figure 2. Average spending of switchers and stayers by provider categories (all means are significantly different for stayers in PPO and POS. * and † represent means that are significantly different at the 5% level for switchers relative to the appropriate comparison group of stayers. ST PPO = stayers in PPO; SW to PPO = switchers from POS to PPO; ST POS = stayers in POS; SW to POS = switchers from PPO to POS)

outpatient spending. The facility category consists primarily of claims associated with hospital outpatient departments, but also includes services such as transportation and home health agencies. The miscellaneous category includes allergy, dermatology, emergency medicine, family practice, physical medicine and rehabilitation, preventive medicine, and podiatry.

Figure 2 presents mean annual spending in these categories, identifying the categories in which spending is significantly different for switchers and stayers enrolled in the same type of plans. The three categories with higher spending—total outpatient spending, facility, and miscellaneous—are presented on a separate set of axes.

Mental health spending stands out because of the contrast between the spending of switchers to the PPO plans and that of all other groups. The switchers to the PPO plans spent almost three times more on mental health than the stayers in the POS plans in 1998, and almost three times more than the stayers in the PPO plans in 1999. Not only do the switchers to the PPO plans have the highest spending on mental health, they also have the highest levels of post-switch spending in every category except radiology.

These findings are consistent with individuals who anticipate high mental health spending and defer that use until they join a more generous plan. They are also consistent with service-level selection, or the tighter rationing of mental health services in less generous plans to deter bad risks from joining (Cao 2003; Frank, Glazer, and McGuire 2000).

The foregoing results, however, have not controlled for multiple covariates, nor the clustering of our data from five distinct companies. We next present a multivariate model of plan switching that accounts for the clustering by including employer fixed effects.

Results from a Switching Model

In this section, we formalize the relationship between information observed prior to the switch and the probability of plan switching. The probability of switching to a different plan is specified by a probit equation as follows:

$$\begin{aligned} \Pr(\text{Sw}_{ij} = 1 | P) & \\ &= \Pr(\text{Diagnoses}_{98i} * \beta + \text{Costs}_{98i} * \gamma \\ &\quad + X_i * \alpha + u_{ij} > 0), \end{aligned}$$

Table 5. Marginal effects for switchers to POS (N = 33,122)

	(1)	(2)	(3)	(4)
Age in 1998	-.0010** (.0001)	-.0010** (.0001)	-.0010** (.0001)	-.0010** (.0001)
Female	.0048** (.0016)	.0056** (.0016)	.0058** (.0016)	.0066** (.0016)
Diagnoses				
Any diagnosis	-.0050 ⁺ (.0027)	-.0023 (.0030)		
Cancer			.0003 (.0070)	.0003 (.0069)
CHF			.0091 (.0094)	.0088 (.0093)
AMI			.0022 (.0094)	.0018 (.0092)
BPAD			.0064 (.012)	.012 (.013)
MDD			-.0019 (.0043)	.0015 (.0049)
SCHZ			-.020** (.0037)	-.020** (.0038)
Costs (per \$1,000)				
Inpatient costs 1998		.0004 ⁺ (.0002)	.0003 (.0002)	.0003 (.0002)
Outpatient costs 1998		-.0015** (.0003)	-.0015** (.0003)	
Outpatient costs in 1998 by category (per \$100)				
Facilities				-.0000 (.0001)
Miscellaneous				-.0002** (.0001)
Pathology				-.0010 ⁺ (.0006)
Surgery				.0001 (.0001)
Internal medicine				-.0002 (.0002)
Ob gyn				-.0011* (.0006)
Radiology				.0000 (.0003)
Anesthesiology				-.0006 (.0007)
Mental health				-.0012** (.0004)
Pseudo R-squared	.1315	.1338	.1347	.1371

Note: Standard errors are in parentheses; company dummies are not shown. AMI = acute myocardial infarction; CHF = congestive heart failure; MDD = major depressive disorder; BPAD = bipolar disorder; SCHZ = schizophrenia.

⁺ Significant at 10%.

* Significant at 5%.

** Significant at 1%.

where $\Pr(\text{Sw}_{ij} = 1|P)$ is the probability that employee i employed by employer j switched plans, conditional on being enrolled in plan P in 1998; X_i consists of a constant, age, female, and company dummies; and $u_{ij} \sim N(0; 1)$. The cost variables consist of spending in the various categories of outpatient services and total inpatient spending in 1998. The pharmacy data are omitted from this vector because of the large proportion of missing data. The diagnoses are parameterized as a vector of dummy variables, and the demographic variables consist of age, specified as a continuous linear variable, and gender.

The model is estimated in Stata, using a maximum likelihood estimator. Because switching to a more or to a less generous plan is driven by different reasons, we estimate the model separately for the subsample of employees enrolled in the PPO plans and employees enrolled in the POS plans in 1998.

Table 5 presents the results for switchers to the POS plans, and Table 6 presents the results for

the switchers to the PPO plans. The numbers shown for age, gender, and the diagnoses are probabilities; for example, the $-.0010$ in the upper left of Table 5 indicates that each year of age reduces the probability of a switch to a POS plan by .001 (.1 percentage points), and the number below it indicates that females are about half a percentage point more likely than males to switch to a POS plan. The numbers for costs in columns 2, 3, and 4 indicate how the probability of a switch changes as costs change. For example, the $-.0012$ coefficient in the lower right hand corner indicates that for each \$100 of spending on mental health services by those in PPO plans, the probability of a switch to a POS plan drops by .0012 (.12 percentage points).

The results of the regression model are broadly similar to the results presented in Tables 3 and 4. Those leaving the PPO plans for the less generous POS plans (Table 5) are on average younger than those staying and have lower outpatient spending, especially lower mental health spending.

Table 6. Marginal effects for switchers to PPO ($N = 48,693$)

	(1)	(2)	(3)	(4)
Age in 1998	.0001** (.0000)	.0001** (.0000)	.0001** (.0000)	.0001** (.0000)
Female	.0022** (.0006)	.0022** (.0006)	.0022** (.0006)	.0020** (.0006)
Diagnoses				
Any diagnosis	.0011 (.0011)	.0010 (.0011)		
Cancer			.0010 (.0026)	.0010 (.0027)
CHF			.0004 (.0029)	.0008 (.0031)
AMI			.0032 (.0043)	.0033 (.0043)
BPAD			.0027 (.0046)	.0011 (.0037)
MDD			.0005 (.0015)	-.0006 (.0013)
SCHZ			.0020 (.0044)	.0014 (.0040)
Costs (per \$1,000)				
Inpatient costs 1998		.0000 (.0001)	.0000 (.0001)	-.0000 (.0001)
Outpatient costs 1998		.0000 (.0000)	.0000 (.0000)	
Outpatient costs by category (per \$100)				
Facilities				-.0000 (.0000)
Miscellaneous				.0000 (.0000)
Pathology				-.0000 (.0002)
Surgery				-.0000 (.0001)
Internal medicine				.0000 (.0000)
Ob gyn				.0002 ⁺ (.0001)
Radiology				-.0000 (.0001)
Anesthesiology				.0001 (.0002)
Mental health				.0002** (.0000)
Pseudo R -squared	.0586	.0586	.0589	.0634

Note: Standard errors are in parentheses; company dummies are not shown. AMI = acute myocardial infarction; CHF = congestive heart failure; MDD = major depressive disorder; BPAD = bipolar disorder; SCHZ = schizophrenia.

+ Significant at 10%.

* Significant at 5%.

** Significant at 1%.

Those leaving the POS plans (Table 6) are on average older than those staying and have higher mental health costs. Interestingly, women are more likely to switch in both directions, controlling for age and spending, which is consistent with men having a larger status quo bias.

Plan-Level Effects of Adverse Selection

We next show the effects of adverse selection on the average spending in the POS and PPO plans. We then compare our results to Altman, Cutler, and Zeckhauser (1998), hereafter referred to as ACZ, who use data from the Group Insurance Commission (GIC) of Massachusetts for the years 1994–1995.

To compute the effect of selection on average plan spending, we compared the observed average spending during 1999 in each type of plan to an estimate of spending in the absence of switching, assuming that the switchers would have spent the same amount relative to the

stayers in both years had they stayed in their plans (i.e., that there was no switching). Specifically, to estimate spending in 1999 in the absence of switching we computed the average spending for switchers had they not switched as:

$$sw99\hat{=} st99 * \frac{sw98}{st98},$$

where $sw98$, $st98$, and $st99$ correspond to average total spending of switchers in 1998, stayers in 1998, and stayers in 1999, respectively. We then assigned this spending to switchers, assigned them to their original plan, and computed an average. We carried out this calculation for everyone in the plan for 20 age-sex cells and then aggregated over those cells. We omitted pharmacy spending from these calculations because of the missing pharmacy information for half the sample. The difference between estimated average plan spending keeping the switchers in their original plan and actual average spending is

our estimate of how much selection affected spending.

The assumption that switchers spend the same proportion relative to the stayers in both years is only an approximation. In fact, we have just showed that switchers to the more generous plan spent more than our calculation assumes. This biases down our calculation of how much selection affected the difference in spending between the two plans.

Table 7 shows our calculations and compares them with ACZ's. Because ACZ's results are in 1995 dollars, we deflated our results to 1995 dollars using per-capita private medical spending. The entries in Table 7 show both the absolute and percentage change in average plan spending attributable to switching. ACZ reported that because of switching, the average spending of the more generous plan (indemnity in their sample) was \$16 (1%) higher, while spending in the less generous plan (HMO) was \$9 (1%) lower, resulting in a net selection effect of \$25.

Although our results show the same \$25 net effect (and also small percentage effects), they in fact indicate greater selection because in addition to the downward bias in our calculation just noted, the comparison in Table 7 does not adjust for a number of differences between the two studies. First, unlike ACZ, we included only employees with individual coverage. Including other employees would increase substantially the absolute dollar amounts because the scale of spending is typically more than double for family coverage. The absolute amount of selection would not be expected to double, however, because any health shocks would be averaged over all family members. Second, unlike ACZ, we did not include pharmacy spending in our calculations. Had we done so, and assuming that those who anticipated spending more on pharmacy would have been more likely to opt for the generous plan, our values would have been greater. Third, we analyzed switching between POS and PPO plans, whereas ACZ analyzed switching between HMOs and an indemnity plan. Because POS and PPO plans are more similar than HMO and indemnity plans, the same absolute difference is indicative of greater selection. Finally, ACZ analyzed data from Massachusetts, which has the highest level of per capita medical spending of any state, whereas our sample was distributed nationally among all states. Thus, an adjustment for geogra-

Table 7. Average plan-level effects of adverse selection

	Higher option		Lower option		Net (\$)
	\$	%	\$	%	
ACZ (indemnity-HMO)	16	1	-9	1	25
This study (PPO-POS)	26	1.3	1	.08	25

Note: The ACZ (Altman, Cutler, and Zeckhauser 1998) data include 171,000 employees and family members of the Massachusetts Group Insurance Commission in 1994–1995. To maintain comparability all results in this table are in 1995 dollars, using per capita private medical spending nationally to deflate.

phy would also have increased our values relative to those of ACZ.

Why might our results differ? ACZ suggest that findings will vary across studies for three reasons: 1) the provisions and managerial ability among the plans in the sample; 2) the heterogeneity of the populations; and 3) the length of time plans have been offered. To this list we would add differences in turnover in the groups, given ACZ's finding that new enrollees differ in their choices. And of course results can differ from random variation, given that we and ACZ both study relatively small numbers of switchers (around 1,000 of each type in ACZ's case).

Superficially, the results of our study appear similar to those of Nicholson et al. (2004), but in fact the studies are not comparable. Most importantly, Nicholson et al. use a household sample rather than a sample of employers; some of their sample likely switched plans because of a job change or because the same employer offered a different menu of plans or because the same employer changed the subsidy policy. These factors were held constant both in our sample and in ACZ's.³

Summary and Conclusions

Using an administrative data set for the years 1998 and 1999, we quantified the amount of selection resulting from choice among PPO and POS plans. We showed that switchers out of more generous plans exhibited lower medical spending prior to the switch than stayers, while switchers out of a less generous plan appear to anticipate higher spending and delay that higher spending until after the switch. This transfer of costs from a less to a more generous plan in-

creases the burden of adverse selection. In addition, we showed that the switchers to a more generous plan have spent disproportionately more on mental health services, which is consistent with service-level selection by the less generous plans. Furthermore, because a majority of the employees in our sample enrolled in the less generous plan and because most of the switching was toward the less generous plan, out-of-pocket expenditure appears to be an important determinant of plan choice.

That the two types of plans in our analysis attracted differentially healthy employees is not necessarily a problem for the existence of equilibrium, though that equilibrium may not be efficient (Miller 2005). Specifically, Miller shows that an equilibrium certainly exists as long as the employer fully cross subsidizes the costs of a more generous plan from the premiums for a less generous plan. But it is not feasible for an employer to compute an appropriate subsidy in real time, because the subsidy must be set before the switching behavior is observed. Moreover, trial and error by the employer does not necessarily

converge to the optimal subsidy because the amount of switching will vary from year to year as random health shocks vary within an employment group. Risk adjustment could reduce plan incentives to seek good risks, but whether it leaves differences in employee premiums across plans reflecting only moral hazard—and therefore leaves no welfare loss from the inability to insure future health risk—is an open question.

In sum, our analysis suggests that switching may be more important to the level of premiums than previously documented, and that some amount of welfare loss from selection is inevitable with competing health plans. The only remedy for this welfare loss is a single universal plan, which would have its own welfare losses from the administered prices it would use. Moreover, if there were literally only one plan, there also would be welfare losses assuming heterogeneous tastes for risk protection and coverage. For this reason, a single plan would likely allow supplementation, as in the case of traditional Medicare, which again, of course, would introduce some potential welfare loss from selection.

Notes

The authors are grateful to David Cutler and Tom McGuire for helpful discussions, to Sean Nicholson for clarifying some points, and to two referees, the editor, and seminar participants at the NBER Summer Institute, the BU/Harvard/MIT health economics seminar, and Indiana University for helpful comments.

- 1 Nicholson et al. (2004) report a much higher rate; of a total sample of 6,235 persons, 609 switched to an HMO and 838 switched from an HMO to a non-HMO (S. Nicholson, private communication). But their results are not comparable with ours for reasons described later.

- 2 Medical price indices also have many well known biases (Berndt et al. 2000).

- 3 Consistent with this inference, the rates of switching in the Nicholson et al. study are much higher, over 20%, than in either our study or ACZ's (S. Nicholson, private communication). There are other important differences. Relative to both ACZ and us, Nicholson et al. have an order-of-magnitude smaller sample, 6,235 persons, and they compare switching into and out of HMO and non-HMO plans rather than into and out of indemnity (ACZ) or between POS and PPO.

References

- Altman, D., D. M. Cutler, and R. J. Zeckhauser. 1998. Adverse Selection and Adverse Retention. *American Economic Review* 88(2): 122–126.
- Beaulieu, N. D. 2002. Quality Information and Health Plan Choice. *Journal of Health Economics* 21(1): 43–63.
- Berndt, E. R., D. M. Cutler, R. G. Frank, Z. Griliches, J. P. Newhouse, and J. E. Triplett. 2000. Medical Care Prices and Output. In *Handbook of Health Economics, Volume 1A*, A. J. Culyer and J. P. Newhouse, eds. Amsterdam: Elsevier.
- Brown, R. S., D. G. Clement, J. W. Hill, S. M. Retchin, and J. W. Bergeron. 1993. Do Health Maintenance Organizations Work for Medicare? *Health Care Financing Review* 15(1): 7–23.
- Buchmueller, T. C., and P. J. Feldstein. 1997. The Effect of Price on Switching Among Health Plans. *Journal of Health Economics* 16(2): 231–247.
- Call, K. T., B. Dowd, R. Feldman, and M. Maciejewski. 1999. Selection in Medicare HMOs: Pre-Enrollment Expenditures. *Health Care Financing Review* 20(4): 197–209.

- Cao, Z. 2003. Comparing the Pre-HMO Enrollment Costs Between Switchers and Stayers: Evidence from Medicare. Dissertation. Boston: Boston University.
- Chernew, M. E., G. Gowrisankaran, and D. P. Scanlon. 2002. Learning the Value of Information: The Case of Health Plan Report Cards. Cambridge: National Bureau of Economic Research.
- Cutler, D. M., and S. J. Reber. 1998. Paying for Health Insurance: The Tradeoff Between Competition and Adverse Selection. *Quarterly Journal of Economics* 113(2): 433–466.
- Cutler, D. M., and R. J. Zeckhauser. 1998. Adverse Selection in Health Insurance. In *Frontiers in Health Policy Research*, A. Garber, ed. Cambridge, Mass.: MIT Press.
- . 2000. The Anatomy of Health Insurance. *Handbook of Health Economics, Volume 1A*, A. J. Culyer and J. P. Newhouse, eds. Amsterdam: Elsevier.
- Ellis, R. P. 1989. Employee Choice of Health Insurance. *Review of Economics and Statistics* 71(2): 215–223.
- Frank, R. G., J. Glazer, and T. G. McGuire. 2000. Measuring Adverse Selection in Managed Health Care. *Journal of Health Economics* 19(6): 829–854.
- Gabel, J. 1999. Job-Based Health Insurance, 1977–1998: The Accidental System Under Scrutiny. *Health Affairs* 18: 62–74.
- Glied, S. A. 2000. Managed Care. In *Handbook of Health Economics, Volume 1A*, A. J. Culyer and J. P. Newhouse, eds. Amsterdam: Elsevier.
- Luft, H. S., J. B. Trauner, and S. C. Maerki. 1985. Adverse Selection in a Large, Multiple-Option Health Benefits Program: A Case Study of the California Public Employees' Retirement System. In *Advances in Health Economics and Health Services Research*, R. M. Scheffler and L. F. Rossiter, eds. Greenwich, Conn.: JAI Press.
- Medicare Payment Advisory Commission. 2000. Report to the Congress: Improving Risk Adjustment in Medicare. Washington, D.C.: Medicare Payment Advisory Commission.
- Miller, N. 2005. Health Benefits and Wages: Minimizing Total Compensation Cost. *Journal of Health Economics* 24(5): 931–949.
- Newhouse, J. P. 2002. *Pricing the Priceless: A Health Care Conundrum*. Cambridge, Mass.: MIT Press.
- Nicholson, S., K. Bundorf, R. M. Stein, and D. Polsky. 2004. The Magnitude and Nature of Risk Selection in Employer-Sponsored Health Plans. *Health Services Research* 39(6): 1817–1838.
- Rothschild, M., and J. Stiglitz. 1976. Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information. *Quarterly Journal of Economics* 90(4): 629–650.
- Royalty, A. B., and N. Solomon. 1999. Health Plan Choice: Price Elasticities in a Managed Competition Setting. *Journal of Human Resources* 34: 1–41.
- Samuelson, W., and R. J. Zeckhauser. 1988. Status Quo Bias in Decision Making. *Journal of Risk and Insurance* 1(1): 7–59.
- Strombom, B. A., T. C. Buchmueller, and P. J. Feldstein. 2002. Switching Costs, Price Sensitivity and Health Plan Choice. *Journal of Health Economics* 21(1): 89–116.