A Theory of Prepayment, Managed Care, Deductibles and Copayments

Allen C. Goodman, Wayne State U.
Maia Platt, U. of Detroit – Mercy

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We are grateful for comments from seminar participants at The University of South Florida, Western Michigan, and Wayne State Universities. We absolve them of responsibility for any errors.
Various forms of pre-paid health plans have existed in the United States for close to a century, and the term “health maintenance organization” dates back to the late 1920s. However, only in the 1990s did “managed care” plans begin to supplant the so-called “fee-for-service” health provision that had characterized health services delivery in the United States.

Economists have found it difficult to formulate a comprehensive managed care model. Folland, Goodman, and Stano (2013) offer a “story” in which an affinity group (in the U.S., often defined by employer) negotiates the opportunity to purchase a managed “food and clothing (F&C)” insurance plan, rather than some alternative “fee-for-F&C” arrangement. In return for a fixed monthly payment, members must shop at a particular store or shopping center with which plan managers have negotiated lower prices for food and clothing. In this arrangement, the plan managers, along with the food and clothing providers, could limit the varieties of goods, and, possibly, total F&C expenditures.¹

The authors observe that this “managed F&C” arrangement raises a large number of questions as to whether its customers:

- Get the same quality of goods as under other arrangements.
- Do not get the goods that they “should” be getting.
- Actually reduce their total F&C expenditures.
- Are less well-fed, less healthy, less well-dressed or altogether less satisfied than before.

At the market level, they ask whether:

¹ Although this arrangement best represents a “staff model” HMO, it describes a wide variety of managed care alternatives.
• Aggregate F&C expenditures decrease, or their rate of growth decreases.
• Managed F&C plans meet consumer preferences.
• Managed F&C providers earn revenues to cover the costs of the goods they sell.
• Competition from the managed F&C plans impacts the prices that other providers charge?

No theory addresses these questions as a group, and much of the literature is inconclusive.

This paper provides a model that addresses several features of the managed care market in a unified manner.

1. In the U.S. health insurance is typically linked to the workplace, and many workers take some portion of their compensation in health insurance which generally receives favorable income tax treatment.

2. Workers may view their health insurance as “pre-payment” for services.

3. Individuals generally choose among a very small number of health insurance alternatives.

4. Managed care plans differ in both insurance deductibles and coinsurance rates – moreover, there has been substantial growth in so-called “high deductible” health insurance plan since the year 2000.

The next section examines the growth of managed care in the United States since the late 1980s. After that, there is a brief literature review, and then an analytical model.

*Manager Care and Health Benefits*

As recently as 1988, 73 percent of health plan enrollment in the United States was “fee for service,” (FFS) where the workers and/or their insurance paid for health services
on an item by item basis. By 1999, the figure had fallen to 10 percent, and by 2010 it was less than one percent. In less than 25 years, FFS enrollment has been replaced by a broad spectrum of Health Maintenance Organizations (HMOs), Prospective Payer Organizations (PPOs), Point of Service plans (POS), and most recently, High Deductible Health Plans (HDHP). Figure 1 shows that such high deductible plans accounted for 19 percent of the health plan enrollment for covered workers in 2012.

Figure 2 summarizes 2013 monthly and annual premiums for covered workers with the different types of managed care plans. Monthly single coverage premiums vary from $442 for HDHPs to $503 for PPOs, which offer consumers more freedom from gatekeeper restrictions. While the direction of the premium differential follows the coverage types from less to more generous, the magnitude of the difference ($61 per month constitutes 13.8 percent of the HDHP or 12.1 percent of the PPO), although statistically significant, is not apparently large. The difference in premiums suggests that HDHPs are either not saving their buyers very much, or that all of the bundles of employee benefits, including HDHPs, cover large bundles of services. Either possibility indicates that even the high deductible employee insurance benefit package purchases much more than pure insurance against unpredictable expenses.

_Perspectives from the Literature_

Much of the managed care literature has focused on empirical measurement rather than theory, asking whether consumers in managed care actually spend less than in fee-for-service settings, when controlling for the consumers’ selection into managed care, or for the quality of the care. In a series of papers (1994, 1997, 2002) Miller and Luft
focused largely on HMOs, and generally found the differences in services and outcomes between HMOs and Fee-for-Service (FFS) arrangements to be inconsistent.

Feldman and colleagues have concentrated more on the market impacts of managed care, again in an empirical framework. In a 1990 work, they found that HMOs did not generally extract major discount from hospitals, but rather affiliated based on hospital location and range of services.

Melnick and colleagues (1992) looked at a large California PPO. They found, all else equal, that (1) the PPO paid higher prices to hospitals in less competitive markets; (2) PPOs with more market power paid lower hospital prices; (3) the more dependent the PPO was on the hospital, the higher the price it paid; and (4) hospitals with high occupancy rates in markets with high occupancy rates, charged the PPOs higher prices.

More theoretical treatments have examined managed care supply in game theoretic models to address the price competition among monopolistic providers. Ellis (1998) considered provider competition in a game theoretic framework, predicting important distinctions between managed care and fee-for-service with respect to the competition for customers. Brekkea and colleagues (2010), as well as Olivella and Vera-Hernández (2007) also formulated game theoretic models of competition among differentiated health plans. Goodman and Stano (2000) performed an analysis rooted in public finance, to look at supply decisions in the presence of a health externality that cannot be captured by managed care providers who are paid through capitation methods.

No analysis, however, has examined the consumer insurance/choice of care decision. The managed care market is one in which consumers buy insurance that is often bundled into a wage package, and paid for through capitation, copayments, and
deductibles. These features provide important distinctions between managed care and many other consumer purchases.

**Health Insurance as Prepayment for Health Care**

One can characterize a health insurance premium as having at least three portions. The first is a standard form of indemnity against harm that characterizes all insurance. The insured person wishes to be “made whole” in the event that he or she contracts an expensive illness. The literature includes Arrow (1963) who worried about the ability to write appropriate health insurance contracts, and Pauly (1968) who first brought moral hazard in health insurance to the attention of health economists.

Nyman (1999) defined a second portion of health insurance, a part of the policy that purchases an option for an income transfer. The income transfer allows the insured person to purchase care that he or she could not have otherwise afforded. His work argues that much of what some analysts view as welfare-reducing moral hazard, others may interpret as welfare-increasing impacts of income transfers.

One can characterize yet a third portion of an insured’s health insurance premium as prepayment for health services. The first two portions are largely risk related and are used intermittently for random events. In contrast, many consumers, particularly those who seek “well-care”, those with chronic conditions, or those with young children, can predict at least some of their expenditures. The ability to take advantage of risk pooling from a group (i.e. the workplace) not created solely for insurance, as well as the ability to benefit from payment with pre-tax dollars, will lead to explicit employee preferences for insurance, as well as preferences among plans that will manage the care that the insurance can provide. This paper argues that the prepayment aspect can influence
consumer choice among health care plans offered by a single firm, and/or among firms that offer different single managed care options.

Figure 3, following Lee (1996), starts the labor market analysis at equilibrium \((w^*, L^*)\), with no health insurance. Here, if employees negotiate a benefit package that costs employers \(z_D\) per hour, the demand for labor must fall by \(z_D\). If employees value the benefit (at the margin) by \(z_S\) per hour, the labor supply curve must fall by \(z_S\). Assuming that employees do not negotiate a benefit they do not value, one can start with \(z_D = z_S = z\). The resulting total compensation is the same as at the beginning, with the real wage of \(W^* = W^{**} + z\). Lee provides numerous instances where \(z_D\) does not equal \(z_S\). If \(z_D\) always equals \(z_S\), there is little deadweight loss, since the employees are buying what they want.\(^2\) If \(z_S < z_D\), however, the negotiated benefit acts like a payroll tax; employment falls, and a deadweight loss related to the departure from efficient employment level \(L^*\) occurs.

**Purchasing the Managed Care**

How do the employees direct the purchasing power of their health benefits? The forthcoming analysis will assume a limited number of discrete managed care options available. The employee, representing a household, must enroll in a managed care organization, and cannot combine two or more managed care organizations without fully enrolling in each.

In this model the health insurance will essentially pre-pay for well-care, and some expected illness. Households may also need additional insurable care with probability \(\phi\). How do they choose among MCO plans?

\(^2\) This analysis is similar to those of property taxes, which may serve as user fees for bundles of public services that accompany a housing purchase. The decisions of single firms would generally treat the supply of labor as infinitely elastic.
Suppose that an employer offers three plans \( n \), where \( n = i, j, k \), with:

\( \phi = \) probability of needing insurable care

\( E_i, E_j, E_k = \) expenditures necessary if care is needed.

\( b_i, b_j, b_k = \) coinsurance rate faced by household

\( R_i, R_j, R_k = \) deductible faced by household

\( S_i, S_j, S_k = \) out of plan expenditures

The household pays annual fees \( F_i, F_j, F_k \) for levels of care \( v_i, v_j, \) and \( v_k \) respectively. Let \( v_i = v_k < v_j \).

Begin with the employee/consumer (E/C) whose employer is providing no health insurance, point \( C \) in Figure 4. The E/C’s budget can be spent on health care, measured as visits (the X-axis), or all else (the Y-axis). Part of any insurance policy involves protection from catastrophic risk. This is a pure income effect, shifting the budget constraint in a parallel manner.

In this first example, the E/C has a choice among three managed care plans. Plans \( i \) and \( k \) offer prepaid numbers of visits \( v_i = v_k \) at expenditure levels \( E_i = E_k \). Plan \( j \) offers prepaid numbers of visits \( v_j \) at expenditure level \( E_j \). The E/C’s utility would be maximized by an MCO offering a package at point \( A \). The discussion leads to Proposition 1.
**Proposition 1**: Criterion for choosing among MCOs – “less than or equal.”

*Unless a MCO matches an E/C’s preferences (point A) for prepaid care exactly, with number of visits \( V_d \), the E/C will pick one that provides less care.* Unlike food and clothing, the E/C can purchase additional health care out-of-plan, but it cannot sell surplus care.

With the current preferences, then, plans \( i \) and \( k \) dominate plan \( j \). The insured may or may not choose to purchase additional care out of pocket. Using either of these plans the insured gets care level \( \bar{v}_i = \bar{v}_k \). An E/C wishing to reach point \( A \) could purchase \( v_d - \bar{v}_i \) additional units of care “out-of-pocket”. As noted above, the insured cannot sell \( \bar{v}_j - v_d \) units of care from MCO \( j \).

This formulation demonstrates the potential attractiveness of high-deductible health plans. Ignoring the possibilities that MCOs can exert market power to negotiate lower prices, by buying into MCO \( i \) or MCO \( k \), the insured can buy a high-deductible health plan that would lead to point \( A \) directly. The various coinsurance rates that might accompany this high deductible policy are also noted in Figure 4.

A “supply-side” literature (for example, Ellis 1998, Goodman and Stano, 2000) has suggested that the capitation payments characterizing managed care compensation may provide managed care organizations with incentives to skimp on care. The model presented here provides an important demand-side incentive for the MCOs to offer more austere packages, in that the consumers can buy more if they need more, but they cannot sell the extra care for which they have paid in advance.

The second proposition involves consumer sorting into managed care plans in which deductibles and coinsurance rates represent plan characteristics. The genesis of
this proposition is Platt’s (2006) dissertation work which related utilization and expenditures to deductibles. In contrast to a considerable literature (summarized, for example, in Newhouse et al. 1993) that has found increased coinsurance rates related to decreased utilization and expenditures, Platt found almost no correlation between deductibles and utilization/expenditures. The discussion above suggests that deductibles serve as a form of prepayment for services.

Proposition 2: Consumer sorting into MCOs

Consumers sort themselves into MCOs based on expected need for insurable care, and on the characteristics of the MCOs as defined by coinsurance rate and deductible.

- In empirical testing looking across large numbers of MCOs, higher deductibles may very well be related to higher levels of utilization or expenditures rather than lower levels.
- In contrast, lower coinsurance rates for consumers, holding deductibles constant, will always, in this model, lead to more utilization and expenditures.

Consider MCO\textsubscript{i} and MCO\textsubscript{k}, in Figure 5. Prepaid care levels are equal. However, MCO\textsubscript{i} offers a high deductible \(R_i\), and a lower coinsurance rate than does MCO\textsubscript{k}. Employee/consumers who expect to spend greater (lesser) amounts, would choose MCO\textsubscript{i} (MCO\textsubscript{k}), with the higher (lower) deductible, lower (higher) coinsurance rate pair.

Not surprisingly, as noted in Figure 5, consumers would prefer lower deductibles and lower coinsurance rates. At any deductible, lower coinsurance rates would lead to higher real income, more utilization and more spending. However, there could be
substantial sorting among seemingly equivalent MCOs (in terms of services), by the (coinsurance, deductible) combination.\(^3\)

There are almost certainly returns to scale in creating MCOs, due to the requisite information systems, or the use of advertising, so there will be small numbers of them. What if there is only one MCO available geographically, or alternatively the consumers’ employer offers only one alternative? This leads to Proposition 3.

**Proposition 3**: There may be heterogeneous preferences within individual MCOs.

In Figure 6, suppose that only 2 MCOs are available, MCO\(_i\) and MCO\(_j\), and there are two consumers as noted. As shown by Proposition 1, both consumers will prefer MCO\(_i\) to MCO\(_j\). As drawn, however, Consumer 1 will prefer a low deductible and a high coinsurance rate at point \(A_1\) while Consumer 2 will prefer a higher deductible and a lower coinsurance rate at point \(A_2\).

At the lower deductible \(R_k\) and higher coinsurance rate \(b_k\), Consumer 1, if faced with an insurable event will purchase \(v_i^{1+}\) visits, while Consumer 2 would purchase \(v_i^{2+}\) visits. By inspection, we can see that with a higher deductible \(R_i\) and a lower coinsurance rate \(b_i\) Consumer 1 will be worse off, whereas Consumer 2 will purchase \(v_i^{2++}\) visits and be better off. If entry conditions were suitable, an alternative MCO\(_k\), offering the same prepayment, but a different (coinsurance, deductible) combination, could separate out two consumers.

How does this model relate consistently to labor markets in which some employers offer no health insurance, others offer only one plan, and most offer no more

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\(^3\) Steve Spurr offers that these analyses bear some similarities to cellular phone packages, although there appear to be no applications to health insurance. See, for example, Bar-Gill and Stone (2012).
than a small number of options? Moreover, is it not costly to change employers in search of a different set of health care plans, as search costs and pre-existing conditions may impose sizable transactions costs?

Note that this model is similar to a consumer’s joint purchase of housing services and the accompanying public goods. Moving to a preferred package in this case may also impose substantial transactions costs. However, it is likely that in the longer term, employees will seek to work for firms that offer desirable health benefits packages. Firms, also, will seek to tailor their plans so as to make them attractive (as part of the compensation package) to get the productive employees that they desire.

*Observations*

Students of public finance will recognize a public good base to the model. Indeed many aspects of insurance resemble public goods. Insurance policies, like public goods, transfer resources from those who do not use the good, to those who do. Purchasers of insurance, like those of local public goods, may be thought to shop among a limited number of choices.

Numerous observers of managed care organizations suggest that MCOs will tend to “under-supply” services. Goodman and Stano (2000) attribute the under-supply to the MCOs’ inabilities to reap cost-reducing health externalities or cost reduction due to high tech options, if consumers move among plans. The model presented here suggests a demand side reason why MCOs may “under-provide” services. Consumers do not want to pay for a bundle of goods that they might not use. Recognizing the demand aspect suggests ways to model the willingness to pay for insurance, and the structures of copayments and deductibles.
The model suggests potential extensions. For example:

- Given the taste and income distributions what is the optimal number of MCOs?
- Can the model provide insights into:
  - Merging of MCOs?
  - Disintegration of one MCO into 2 or more?
- Can the model provide insights into sorting behavior under the Affordable Care Act?

Testing the model empirically encounters issues that are similar to testing the Tiebout (1956) Hypothesis with respect to property taxes, or the provision of health insurance into employee wages (Figure 3 in this manuscript). Since the hypotheses brought forward here are “newer” the tests are less well formulated.

- Prepayment – Are health care spending and utilization predictable? Can we show that an identifiable group of people have predictable year-to-year spending and utilization patterns? Health economists would hope so, because they have premised health care demand on identifiable factors common to most demand analyses.
- Are plan types, deductibles and copays structured the way that the model suggests? Careful analysis of the exchanges under the Affordable Care Act could provide useful insights into this question.
- Can we look at people who switch plans to verify the hypotheses brought forward? Do “plan changers” choose plans the way the theory suggests?

There is lots to do!
Exhibit 5.1
Distribution of Health Plan Enrollment for Covered Workers, by Plan Type, 1988-2013

<table>
<thead>
<tr>
<th>Year</th>
<th>Conventional</th>
<th>HMO</th>
<th>PPO</th>
<th>POS</th>
<th>HDHP/HDRO</th>
</tr>
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<tbody>
<tr>
<td>1988</td>
<td>73%</td>
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<td>1993</td>
<td>46%</td>
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<td>27%</td>
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</tr>
<tr>
<td>2013</td>
<td>1%</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Information was not obtained for POS plans in 1988. A portion of the change in plan type enrollment for 2005 is likely attributable to incorporating more recent Census Bureau estimates of the number of state and local government workers and removing federal workers from the weights. See the Survey Design and Methods section from the 2005 Kaiser/HRET Survey of Employer-Sponsored Health Benefits for additional information.

Figure 2

<table>
<thead>
<tr>
<th></th>
<th>Monthly</th>
<th>Annual</th>
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<tbody>
<tr>
<td><strong>HMO</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single Coverage</td>
<td>$502</td>
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<tr>
<td>Family Coverage</td>
<td>$1,379</td>
<td>$16,543</td>
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<tr>
<td><strong>PPO</strong></td>
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<td></td>
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<tr>
<td>Single Coverage</td>
<td>$503</td>
<td>$6,031</td>
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<td>Family Coverage</td>
<td>$1,389</td>
<td>$16,671</td>
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<td><strong>POS</strong></td>
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<tr>
<td>Single Coverage</td>
<td>$498</td>
<td>$5,972</td>
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<td>Family Coverage</td>
<td>$1,369</td>
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<tr>
<td><strong>HDHP/SO</strong></td>
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<tr>
<td>Single Coverage</td>
<td>$442*</td>
<td>$5,306*</td>
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<tr>
<td>Family Coverage</td>
<td>$1,269*</td>
<td>$15,227*</td>
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<td><strong>ALL PLAN TYPES</strong></td>
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<tr>
<td>Single Coverage</td>
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<td>$5,884</td>
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<tr>
<td>Family Coverage</td>
<td>$1,363</td>
<td>$16,351</td>
</tr>
</tbody>
</table>

* Estimate is statistically different from All Plans estimate (p < .05).


Figure 3 – Who Pays for Health Insurance?
Figure 4: Proposition 1 – Less than or equal

Initial Income

Out of Plan, or Deductible (coinsurance rate = 1)

High Deductible

High deductible – 0 coinsurance rate

Higher coinsurance rates

Pure Risk Premium

\( \bar{v}_i = \bar{v}_k \)

\( v_A \)

\( \bar{v}_j \)

Visits
MCO\textsubscript{i}, MCO\textsubscript{k} provide same basic care.
MCO\textsubscript{i} – higher deductible and lower coinsurance rate
MCO\textsubscript{k} – lower deductible, higher coinsurance rate.

Figure 5 Proposition 2 – Sorting into MCOs

Plan Annual Cost

Other Goods

\[ \overline{v}_i = \overline{v}_k \]

\[ \overline{v}_i^+ \]

\[ \overline{v}_j \]

\[ \overline{v}_k \]

Visits

\[ \phi \]
Figure 6 - Proposition 3 – Heterogeneous preferences

$A_1$ and $A_2$ represent optimal amounts of prepaid care from the standpoints of Consumers 1 and 2.
References


Miller, Robert H. and Harold S. Luft, “Does Managed Care Lead to Better or Worse Quality of Care?” *Health Affairs* 16 (1997): 7-25.


