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# Effects Of Managed Care On The Health And Health-Care Of The Non-Elderly With Diabetes

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# EFFECTS OF MANAGED CARE ON THE HEALTH
# AND HEALTH-CARE OF THE NON-ELDERLY WITH DIABETES

by

**MEIHUA LU**

**DISSERTATION**

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Approved by:

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Advisor                          Date

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# DEDICATION

I dedicate this dissertation to my wonderful family, particularly to my understanding and patient husband, Jia Li, who has supported me on these many years of research, and to our precious boys, Wayne and Simon, who are the joy of our lives. I must also thank my loving mom and dad who have helped so much with baby-sitting and have given me their fullest support. Finally, I gratefully dedicate this work to my brother, Shiyong Lu, who has led me step by step from kindergarten to PH.D., and persistently encouraged me in this long journey.

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Also I would like to thank my committee members for their helpful insights, comments and suggestions. Additionally, I would like to acknowledge my senior fellows, Professor Xiao Xu and Yong Li, for their generous ideas and technical support. Furthermore, my deep gratitude goes to all of my friends for their behavioral or emotional support.

Last but not least, thanks be to God for my life through all tests during these years. During my studies there were times when work commitments and intermittent life stress made me believe that I would not be able to see this journey through. He guides me, encourages me, and blesses me always. May His name be exalted, honored, and glorified!

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**CHAPTER 1  INTRODUCTION**

**1.1     Introduction to the Problem**

Over the past two decades, there have been dramatic changes in the US health plan system. Managed care has experienced an explosive growth. In 1985, less than 8% of insured workers were covered by an HMO, and PPOs had just come into existence. By 2002, however, nearly 95% of the Americans have some form of managed care (Morrisey, Jensen, and Gabel, 2003).

In contrast to traditional fee-for-service (FFS) insurance, managed care contracts with some selected health care providers through negotiating price reductions. Managed care organizations also often employ a variety of "incentive payment" schemes, such as capitation and "gatekeeper" to shift onto the provider some of the risk if the enrollee uses large amounts of health care.

The underlying intentions of these schemes are to manage or control costs so that the care delivered is medically necessary and appropriate for the patient's condition. However, the use of price discounts, capitation, and "gatekeeper" by managers gives providers incentives to reduce costs, possibly by limiting access to health care or lowering health care services. These incentives raise quality concerns regarding health care services. Over the last two decades, numerous studies have sought to evaluate quality of care effects of managed care plans as compared with traditional FFS plans. Although many studies showed that managed care plans provided comparable quality in providing health care services (Miller and Luft, 2002, 1997, 1994), others did show lower quality of care in HMOs serving Medicare seniors,

stroke patients, and frail adults (Miller and Luft, 2002, 1997; Experton, Ozminkowski, Pearlman, Li, and Thompson, 1999; Smith, Shahar, McGovern, Kane, Doliszny, Arnett, and Luepker, 1999). One of the important reasons for this discrepancy is due to the different population subgroups used in these studies. This suggests that further research is needed for other high-risk patients, such as those with diabetes, because of their costly and specific medical needs.

Diabetes is one of the most prevalent diseases in the United States. According to Centers for Disease Control and Prevention (CDC), in 2008, 24 million people had diabetes, with a percentage of 8. Every year, diabetes alone costs $132 billion in the United States (NDIC), with approximately 16% of all hospital expenditures for people with diabetes (WHO 2010).

Diabetes is among the most common and costly chronic diseases, but it is also among the most preventable and treatable diseases. This means there is a potential room to maintain or improve health for this cohort of people by providing sufficient quantity and quality of health care. As an alternative to traditional FFS plans, managed care plans play an extremely important role in providing such sufficient health care services to these people. Therefore, it is important to understand quality of care effect of managed care on patients with diabetes.

## 1.2　Statement of Purpose

Access to, satisfaction with, and utilization of care, including diabetes care, are key measures to evaluate the quality of health care enrollees receive. Health status, however, is the outcome. In an effort to evaluate and improve the existing health care system, this study will examine the effect of managed care plans, as compared to

traditional FFS plans, on patients with diabetes in terms of the above mentioned quality of care measures, as well as health outcome.

### 1.3    Aims and Objectives of the Study

The specific aims of the study and the expected contributions are as follows:

- *Focus on patients with diabetes*. Despite the population size (eight percent, with a foreseeable increase), patients with diabetes merit more attention. Knowing better about the effect of managed care plans on diabetes subgroup is of great urgency and far-reaching importance to the existing health care system.

- *Separate HMOs from other managed care forms to compare with traditional FFSs*. Most previous studies have compared HMOs with FFS or combined HMOs with other managed care forms to make comparisons. As HMOs and other forms of managed care deliver the payment in different ways, separating HMOs from other managed care would provide more precise information to the public and policy makers.

- *Evaluate the quality of care effect of managed care from multiple dimensions.* Most previous studies evaluate quality of care effect of managed care from a single dimension or limited dimensions. To provide more comprehensive results, we try to use multiple measurements, such as diabetes care, health care access, satisfaction, utilization, as well as health outcome, to evaluate the quality of care.

- *Use up-to-date and national representative data*. We are going to use the data from Medical Expenditure Panel (MEP). MEPS provides the most complete source and up-to-date of data, a source that oversamples Blacks, Hispanics, and

diabetics. When weighted, it provides nationally representative estimates of health care access, satisfaction, utilization, quality, and insurance coverage for the U.S civilian, noninstitutionalized population. Moreover, MEPS HC (Household Components) collects detailed information for each person in the household on the following: demographic characteristics, health conditions, health status, income, and employment, etc, which provides completely ready data for our analysis.

## 1.4    Rationale

•      *Focus on patients with diabetes.* Diabetes is common and growing. As mentioned earlier, diabetes is among the most prevalent chronic (lifetime) diseases in the United States. By 2008, 24 million people have diabetes, a high percentage of 8%. Diabetes is becoming more common as more and more people become overweight and obese (Science Daily, 2009). According to Centers for Disease Control and Prevention (CDC) reports, if current trends continue, 1 in 3 Americans will develop diabetes sometime in their lifetime. Moreover, since diabetes prevalence increases with age (Wilson, Anderson, and Kannel, 1986; Halter, 1995), diabetes cases will no doubt grow substantially as the baby boomers age into the near elderly or elderly. The World Health Organization (WHO) projected a number of 30.3 million diabetes cases by the year of 2030 in the U.S.

Diabetes is deadly and disabling.  Each year approximately 25 per 100,000 population died from diabetes in the US. As the No.6 leading cause of death, diabetes is the only major disease with a death rate that is still rising (The New York Times, 2006). Risk of death for diabetics is twice that of those without diabetes, and those with diabetes will lose, on average, 10–15 years of life. In addition, diabetes is

the leading cause of new cases of blindness, kidney failure, and non-traumatic lower-extremity conditions (CDC 2003). Diabetes and its treatments can cause many other complications, such as cardiovascular disease, diabetic hyperglycemic crises, and visual impairment. People with diabetes have at least twice the risk of heart disease or stroke as other people (NDIC 2005).

Diabetes is costly. Research showed that average medical expenditures among people with diagnosed diabetes were 2.3 times higher than what expenditures would be in the absence of diabetes (NDIC 2005; Rubin, Altman, and Mendelson, 1992; Laditka, Mastanduno, and Laditka, 2001). The National Diabetes Information Clearinghouse (NDIC) estimates that diabetes costs $132 billion in the United States alone every year. In 2007, the total cost of diabetes was $174 billion, with direct medical costs of $116 billion and indirect costs (related to disability, work loss, premature death) of $58 billion. A recent analysis of health care expenditure from the WHO showed that 16% of hospital expenditure was for people with diabetes (WHO 2010).

No doubt, the foreseeable prevalence of diabetes and its unpleasant complications will pose greater challenges to the existing health care delivery system. On one hand, the continuous rise in the incidence of diabetes and its complications will definitely increase healthcare expense. Cutting health care costs and reducing the growth of health care spending are certainly among the primary goals of health care reform. On the other hand, however, producing better health results for patients is another important goal. Health is a critical indicator of quality life for patients themselves, as well as their relatives and friends.

Unfortunately, literature on quality of care effect of managed care for patients with diabetes is sparse. The existing studies are far from sufficient to address the all-around multi-effects of managed care on patients with diabetes.

- *Separate HMOs from other managed care forms to compare with traditional FFSs.* Managed care plans have at least three basic types, ranging from more restrictive to less restrictive: (i) Health Maintenance Organizations (HMOs), (ii) Preferred Provider Organizations (PPOs), and (iii) Point of Service (POS) plans. To some extent, there are similarities between these different types of managed care plans. All managed care plans involve an arrangement between the insurer and a selected network of health care providers (doctors, hospitals, etc.), and encourages policyholders to use the providers in that network. However, there are important differences between them as well (Agencyinfo).

HMO was the original managed-care plan and is typically the most restrictive type. In practice, each member is assigned a "gatekeeper", a primary care physician (PCP) who is responsible for the overall care of members assigned to him or her. Specialty services and non-emergency hospital admissions require a specific referral or pre-authorization from the PCP. Usually, services are not covered if the service provider is from outside of the network, unless it is an emergency situation as defined by the HMO. HMOs provide medical treatment on a prepaid basis, which means that HMO members would pay a fixed monthly fee, regardless of how much medical care is needed in a given month. In return for this fee, most HMOs provide a wide variety of medical services, from office visits to hospitalization and surgery. The enrollees only need co-pay for every visit.

PPO, the most common type of managed-care plan, is actually a group of doctors and/or hospitals that provides medical service only to a specific group or association. Unlike an HMO plan, which has a copayment cost share feature, a PPO generally does not have co-pay but offers a deductible and a coinsurance feature instead. The deductible represents the first dollar of coverage and is paid by the patient. After the deductible is met, the coinsurance portion applies. Generally, PPO Plans offer significantly lower deductibles and co-insurance rates compared with conventional plans if the patient uses physicians and hospitals that are part of the PPO's network of providers. PPOs also allow enrollees to receive services from providers outside the network--but at a higher price.

POS plan is a type of managed healthcare system that combines characteristics of the HMO and the PPO. Like an HMO, the enrollees pay no deductible and usually only a minimal co-payment when they use a healthcare provider within the network. A PCP is required to be responsible for all referrals within the POS network. However, if the healthcare was performed from outside of the network, POS coverage functions more like a PPO. A deductible (around $300 for an individual or $600 for a family) and a co-payment will be then applied.

Thus, managed care plans, such as HMOs, PPOs, and POSs, differ in important characteristics and performance, as do provider organizations, including in how to pay physician organizations, how physician organizations pay physicians, and how well the clinical care is organized. Putting all plans together or averages of their performance will give misleading results. Therefore, if possible, it is necessary to separate HMOs, PPOs and POSs in making a comparison with traditional FFS plans.

Due to the data constraint, our study will just separate HMOs from other managed care forms to compare with traditional FFSs.

- *Evaluate the quality of care effect of managed care from multiple dimensions.* Existing research on subgroups with chronic diseases, such as heart diseases and cancers, examined various dimensions of health care provision, such as access to, satisfaction with, and healthcare use. More specifically, for patients with heart diseases, these studies compared managed care plans and fee-for-service plans for quality of care in terms of hospital care, mortality rate, use of helpful medications and surgery, length of stay (LOS), etc (Erikson, Torchiana, Schneider, Newburger, and Hannan, 2000; Erickson, Wise, Cook, Beiser, and Newburger, 2000; Guadagnoli, Landrum, Peterson, Gahart, Ryan, and NcNeil, 2000; Bundorf, Schulman, Stafford, Gaskin, Jollis, and Escarce, 2004). For patients with cancer, most of the studies focused on prevention, early diagnosis, and treatments effect (Lee-Feldstein, Feldstein, Buchmueller, and Katterhagen, 2000; Roetzheim, Pal, Gonzalez, Ferrante, Van Durme, and Krischer, 2000). Results from these studies cannot be generalized to patients with diabetes as they need specific medical care, especially diabetes care. However, they inspire this study to try from multiple dimensions to investigate quality of care of managed care plans on patients with diabetes. Besides, most of the existing studies on the diabetes subgroup only examined from a single or very limited aspect(s) of quality of care (Retchin and Preston, 1991; Greenfield, Rogers, Mangotich, Carney, and Tarlov, 1995; Brown, Jiang, and Fong, 2005). Multiple aspects of quality of care effects are needed to provide more comprehensive results.

- *Use up-to-date and national representative data.* Most of the studies selected data which cannot be generalized to the national size of population. For example, Retchin et al. (1991) chose only 158 elderly diabetics enrolled in HMOs and 134 similar diabetics in FFS settings to make the comparison. Lee, Meredith, Whitcup, Spritzer, and Hays (1998) used only 522 individuals with diabetes enrolled in the Medical Outcomes Study (MOS). Moreover, some studies became outdated as they used very old data and were published more than ten years ago. Managed care has changed dramatically over the years (Latif 2000). There is a paucity of current data and current report to inform the public and health policymakers

Based on these considerations, updating is urgently needed. This study, therefore, by using most recently published national data, will provide some empirical evidence about quality of care effect of managed care plans on the subgroup of the diabetics. Hopefully, this study can provide useful information for the public, insurers, as well as policymakers in an effort to establish a more efficient and effective health care delivery system.

## 1.5    Description of Dissertation Organization

The rest of this dissertation is organized as follows. In Chapter two, we review the literature about quality of care effect of managed care as compared to traditional FFS plans on patients with diabetes. In Chapter three, we investigate quality of care effect of managed care in terms of access to, satisfaction with, and use of health care as compared to traditional FFS plans.  Chapter four examines quality of care effect of managed care in terms of health outcome as compared to traditional FFS plans. These two chapters fit closely together to support each other. However, each of them

is intended as a stand-alone study that addresses a specific question. They use different methods and have been structured independently. The empirical results and discussions for each model are presented separately by different chapters. Finally, Chapter five presents conclusions and future work.

**CHAPTER TWO  LITERATURE REVIEW**

**2.1    Introduction**

This chapter gives an overview of the literature on the quality of care effects of managed care plans as compared to traditional fee for service plans.  In particular, this review will focus on a few existing studies which made this comparison among patients with diabetes.

**2.2    Historical Background/Overview**

Much attention has been paid to health care quality effects of managed care as more and more people switched health plan from traditional fee-for-service to managed care. As early as in 1978, Luft tried to compare HMOs with FFSs and found that HMO enrollees had lower hospitalization rates, although no clear evidence showed that these lower rates were attributable to reductions in discretionary or "unnecessary" categories. Later in 1984, Arnould and colleagues confirmed that length of stay was not significantly different between HMO and FFS patients. However, they found that the use of surgeon visits, as well as lab charges, per patient was lower for HMO users.

Another frequently cited early study, the RAND Health Insurance Experiment (Manning, Leibowitz, Goldberg, Rogers and Newhouse, 1984) compared the performance of a staff HMO plan (1149 persons), Group Health Cooperative in Seattle, Wash, with indemnity plans (431 persons) using 1976 to 1980 data. Meanwhile, 733 prior enrollees of the Cooperative were studied as a control group. The authors found that the rate of hospital admissions in both groups at the

Cooperative was about 40 percent less than in the fee-for-service group, although ambulatory-visit rates were similar, and the number of preventive visits was higher in the prepaid groups.

Later on in the nineties, a large number of relevant studies were performed as managed care experienced an explosive expansion. The most comprehensive collections were the literature reviews conducted by Miller and Luft in 1994, 1997, and 2002, respectively.

In 1994, Miller and Luft reviewed fifty-four studies and compared the health care utilization, expenditure, quality of care, and satisfaction of enrollees in managed care and indemnity plans. Studies selected met the following criteria: data from 1980 forward, private insurance or Medicare enrollees, a comparison group, a reasonable attempt at statistical adjustment for noncomparable managed care and indemnity plan enrollees, and peer-reviewed findings. In the analysis, they found that compared to indemnity plans, HMO plans had somewhat lower hospital admission rates, 1% to 20% shorter hospital length of stay, the same or more physician office visits per enrollee, less use of expensive procedures and tests, greater use of preventive services, mixed results on outcomes, and somewhat lower enrollee satisfaction with services but higher satisfaction with costs.

In 1997, they assessed thirty-seven studies on managed care performance from the last quarter of 1993 through the last half of 1996/early 1997. Quality of care evidence from fifteen studies showed an equal number of significantly better and worse HMO results, compared with non-HMO plans: five observations from four studies showed significantly better HMO results, whereas five observations from five

studies showed significantly worse HMO results, and one important Medical Outcomes Study observation on chronically ill elderly enrollees showed significantly worse quality of care for physical health and significantly worse quality of care for mental health. In several instances, Medicare HMO enrollees with chronic conditions showed worse quality of care. Evidence comparing hospital and physician resource use showed no clear pattern, whereas evidence on more costly procedures or home health care spending showed lower use in HMO enrollees. For the overall satisfaction, it was lower among managed care enrollees. However, HMO/managed care enrollees had higher levels of satisfaction with financial aspects than did fee-for-service.

In 2002, they updated their analysis of the HMO plan performance on various dimensions from peer-reviewed literature published from 1997 to mid-2001. Results from seventy-nine studies suggested that both types of plans provide roughly comparable quality of care, while HMOs lowered use of hospital and other expensive resources somewhat. At the same time, HMO enrollees reported worse results on many resources of access to care and lower levels of satisfaction, compared with non-HMO enrollees.

Another recent body of research includes, but is not limited to the following. Newacheck, Hung, Marchi, Hughes, Pitter and Stoddard (2001) examined the impact of managed care on children's access, satisfaction, use, and quality of care, suggesting that there were no statistically significant differences in these indicators for children enrolled in managed care and traditional health plans. Barton, Dayhoff, Soumerai, Rosenbach, and Fletcher (2001) claimed that the access to care for

elderly Medicare beneficiaries in one large managed care organization in New England was as good as or better than that in FFS care in the same geographic area. Safran, Wilson, Rogers, Montgomery, and Chang (2002) compared the primary care received by seniors in Medicare HMOs with that of seniors in the traditional FFS Medicare program. They found that for 9 of 11 indicators, performance favored traditional FFS Medicare over HMOs, while financial access favored HMOs, and preventive counseling did not differ by systems.

Paramore and Elixhauser (2002) evaluated the occurrence of preventable hospitalizations among managed care (MCO) versus fee for service (FFS) populations to compare access to and appropriateness of preventive, primary, and surgical health care services. They suggested that rates of preventable hospitalizations for two of the conditions evaluated (perforated appendix and diabetes complications) were lower for MCO enrollees. For two additional indicators (immunization preventable pneumonia and low birth weight), MCO rates were no different from FFS rates, while results for pediatric asthma were inconclusive. Lee-Feldstein, Feldstein, and Buchmueller (2002) inquired whether HMOs emphasize early diagnosis of colorectal cancer to a greater extent than FFS plans and how this pertains to survival. They found that the likelihood of early stage colorectal cancer was greater for Medicare patients in nongroup model HMOs or having private FFS supplements than for those in group model HMOs, Medicare/Medicaid, or Medicare alone. All-cause and colorectal cancer mortality did not differ significantly among Medicare patients with group model HMO, nongroup model HMO, and private FFS supplements. Beatty, Hagglund, Neri, Dhont, Clark, and Hilton (2003) examined

patterns of access to a variety of specific healthcare services among people with chronic or disabling conditions. Results indicated that respondents covered by fee-for-service health plans were more likely than those covered by managed care organizations to receive needed services from specialists.

Therefore, great efforts have been made from different aspects of quality of care to evaluate the effect of managed care plans as compared to traditional FFS plans. Researchers have even tried to examine different population subgroups, both on general, special, and specific-disease populations, aiming to provide comprehensive comparative information across diverse healthcare delivery systems. Among the above-mentioned studies, at least eighteen papers evaluated quality of care effect of managed care plans on patients with heart diseases, as it is the No. 1 killer in the U.S. More than twenty studies were focusing on different kinds of cancers, the second leading cause of death. Other studies examined on subgroups with stroke, hypertension, arthritis, mental health, and etc. Surprisingly, research about the quality of care effect of managed care plans, on patients with diabetes, has been sparse. As the sixth largest killer of all children and adults in the U.S (CDC, 2010), and the only major disease with a death rate that is still rising, diabetes has attracted less attention than it should be from the perspective of quality of care in different health plans.

## 2.3 Review of Literature Summary on Diabetes

Among the few studies related to diabetes, Retchin and Preston (1991) evaluated the quality of care in HMOs for elderly diabetics in terms of many different indicators of diabetic care. Samples of both HMO and FFS Medicare patients were drawn from 8 of 27 HMOs in the National Medicare Competition Evaluation during the

years of 1983 to 1986. The authors used Student's t test to make inferential comparisons for differences in demographics or length of time followed up in the practice between HMO and FFS settings. However, for comparisons regarding evaluations, laboratory testing, and management decisions, the Cochran-Mantel-Haenszel statistic was used to control for differences. Results showed that influenza vaccinations were unfavorable to HMOs; however, indicators of urinalyses, funduscopic examinations or referrals to ophthalmologists within 2 years of diagnosis, poor diabetic control to be referred to an ophthalmologist for eye evaluations, and tolbutamide taking were favorable to HMOs. No other indicators, such as peripheral vascular examinations (as a means of evaluating vascular complications of diabetes), blood pressure checks, annual renal function evaluations (creatinine or serum urea nitrogen) and electrocardiograms within 6 months, etc (about 12 indicators as shown on the bottom table), showed significantly different in both settings. The authors concluded that most aspects of the quality of diabetic care were similar in HMO and FFS settings and were unaffected by the effort at cost containment.

Another study by Greenfield, Rogers, Mangotich, Carney, and Tarloy (1995) also examined diabetes care for Non-Insulin-Dependent Diabetes Mellitus (NIDDM). Samples were chosen from three types of health plans: 259 patients from staff-model HMOs; 61 from independent practice association (IPA), including prepaid patients of Multi-Specialty Groups (MSGs) and solo or small single-specialty practices; 212 patients from FFS, including MSGs and solo or small single-specialty groups. Mean difference and confidence intervals were computed for contrasts between HMO and FFS systems and between IPA and FFS systems by using an analysis of variance

model. Most of the indicators of quality of care including mean glycosylated hemoglobin level, mean scores for vibration sense, visual acuity, albumin excretion rate, and blood pressure, etc (about 12 indicators as shown on the bottom table ), were not statistically significant among the three systems, except significantly fewer HMO patients than FFS or IPA patients were treated by subspecialists.

Coffey, Moscovice, Finch, Christianson, and Lurie (1995) measured the quality of care for diabetic elderly Medcaid beneficiaries in terms of drug and non-drug therapy, monitoring, and access to medications. Ninety-six diabetics aged 65 years or over enrolled in the Medicaid Demonstration Project in Hennepin County, Minnesota, were randomly assigned in one of seven managed care health plans or in an FFS plan. Student's t-tests and chi-square techniques were used to compare the managed care and FFS groups. The only difference finding in this study was that, more patients in the FFS group were using human insulin after 1 year, although this may imply that managed care plans contain costs by restricting clients' access to this expensive drug. No other difference were found in terms of access to medication, referring to another practitioner for help with weight loss if they were overweighted, diet counseling, or a smoking cessation program, etc (about 6 indicators as shown at the bottom table).

Ware, Bayliss, Rogers, Kosinski, and Tarloy (1996) compared physical and mental health outcomes (measured over a 4-year period) of chronically ill adults including patients with non-insulin-dependent diabetes mellitus (NIDDM) under HMO and FFS systems. 2235 patients (18-97 years of age) from the Medical Outcomes Study with more than 1 of the 5 conditions, such as hypertension, NIDDM, acute

myocardial infarction, congestive heart failure, and depressive disorder, sampled from HMO and FFS systems in 1986 and followed up through 1990. Physical and mental health scales were constructed from the MOS 36-Item Short-Form Health Survey. The authors used multinomial logistic methods to compare categorical changes (better, same, worse) in physical and mental health across HMO and FFS systems for the total sample and for the subgroups. Then they used formal statistical tests to determine whether conclusions about differences between systems were the same across subgroups with different ages, poverty status, Medicaid coverage, and initial health.

In summary, they stated that on average, physical health declined and mental health remained stable during the 4-year follow-up period, with physical health declined larger for the elderly than for the nonelderly. Physical and mental health outcomes did not differ for the average patients, however, they did differ for subgroups of the population differing in age and poverty status. In detail, for elderly patients treated under Medicare, declines in physical health were more common in HMOs than in FFS plans. The average changes in mental health for elderly and nonelderly patients did not favor one system over the other. However, analyses of mental health change categories for elderly patients favored HMOs over FFS. This reason was that in one site (Boston), mental health outcomes were better for elderly patients in HMOs relative to FFS, but not in two other sites. For patients differing in poverty status, opposite patterns of physical health and for mental health outcomes were observed across systems; outcomes favored FFS over HMOs for the poverty group and favored HMOs over FFS for the nonpoverty group.

Lee, Meredith, Whitcup, Spritzer, and Hays (1998) assessed the health care delivery system in terms of self-reported utilization of ophthalmic services. 522 individuals with diabetes in the Medical Outcomes Study (MOS) were measured. Logistic regression results showed that the use of ophthalmic services in the preceding six months was not significantly associated with patient demographics, geographic location, physician specialty, type of practice, and finance plan (prepaid or fee-for-service). However, Goldzweig, Mittman, Carter, Klabunde, Warren, and Ballard-Barbash (1997) found significantly different in rates of cataract extraction in FFS and prepaid settings. Their study included 43387 staff-model HMO enrollees, 19050 IPA enrollees, and 47 150 FFS beneficiaries (a 5% sample of all Southern California FFS beneficiaries) aged 65 years and older. After controlling for age, sex, and diabetes mellitus status, they found that FFS beneficiaries were twice as likely to undergo cataract extraction as were prepaid beneficiaries. Yet, such investigations must assess the appropriateness of cataract surgery by evaluating its use relative to clinical need to determine whether there is overuse in FFS vs. underuse in prepaid settings.

Weller Coughlin, Shaffer, Krop, Shatin, and Anderson (1999) compared the use of health care services (physician, hospital, laboratory tests and procedures) by diabetic Medicare beneficiaries over the age of 65 enrolled in fee-for-service with those enrolled in managed care. Fee-for-service data were drawn from 1995-1996 claims data from the Health Care Financing Administration's Standard Analytic Files, while managed care data for comparable geographic areas and years were drawn from claims data from United Health Group. The use of health services examined

included physician visits, inpatient hospital admissions, emergency room visits, and three diabetic specific laboratory tests and procedures (urinalysis, lipids, and hemoglobin A1C). Preliminary findings suggested that, overall, utilization patterns are similar for aged Medicare beneficiaries with diabetes enrolled in fee-for-service compared with those enrolled in managed care. No differences existed between the two systems of care in the proportions of the study populations with at least one hospital admission during the study period or in the percent distribution of the number of hospital admissions. Similar results were found for diabetes specific laboratory tests and procedures. The only main significant finding was a larger proportion of the study population who were enrolled in managed care had at least one physician visit during the study period compared with those enrolled in fee-for-service.

More recently, Brown, Jiang, and Fong (2005) compared rates of need for eye care among Medicare beneficiaries with network-model Medicare + Choice (MC) and fee-for-service (FFS) health insurance. 311 MC and 107 FFS respondents with diabetes who are older than 65 years of age in Los Angeles County between June 1998 and February 2000 were selected. Weighted logistic regression models were constructed to examine the main effect of type of insurance on the need for eye care within the 6 months after the examination while controlling for individual socio-demographic and clinical characteristics, such as age, sex, race/ethnicity, education, and income, Medicaid and other supplemental insurance coverage, duration of diabetes, medical co-morbidity, and health status. In terms of care utilization, results showed that in the 12 months preceding the interview, the MC participants were significantly less likely to have seen an endocrinologist, but rates of visits to an eye

care provider were high and comparable in the two groups. In both groups, over 99% had seen a primary care provider during the same time interval. With regard to health outcomes, the MC participants were less likely to report hyperlipidemia and had significantly lower PCS (Physical Component Summary) -12 scores, but the two groups did not differ in duration with diabetes or number of chronic medical conditions.

As for the diabetes care indicators, the study examination revealed no differences in blood pressure control, proteinuria, or mean hemoglobin A1C or serum creatinine levels. Relative to untreated age-related eye diseases, MC participants had significantly higher rates of cataract, but the higher rates of diabetic retinopathy and glaucoma or suspected glaucoma in MC did not reach statistical significance. There were no significant differences between the FFS and MC participants in self-reported eye disease or prior eye treatment. In the fully adjusted model, which controlled for clinical and sociodemographic characteristics and visits to an endocrinologist, ophthalmologist, or optometrist, 42% of MC participants compared with 24% of FFS participants needed further treatment or follow-up within 6 months, which means the higher level of need for care within 6 months for MC participants than for FFS participants.

Although these studies fill the gap about evaluating quality of care effect of managed care on subgroup of diabetes, and provided empirical results, the limitations were obvious. At least, there are three reasons that deserve to be addressed.

Firstly, most of the above mentioned studies focused on the comparison

between managed care and FFS plans, or HMO and non-HMO plans. For example, Retchin et al. (1991) and Ware et al. (1996) only focused on HMOs, Coffey et al. (1995) on Medcaid managed care, Weller et al. (1999) on Medicare managed care, while Lee et al. (1998) looked at prepaid plan, and Brown et al. (2005) concentrated on network Medicare + Choice. Even though Greenfield et.al (1995) included HMOs and IPAs, they excluded other managed care plans, such as PPO plans. Managed care has three basic types: HMO, PPO, and POS. There are similarities between these different types of managed care plans but there are important differences between them as well. Therefore, focusing only on HMOs or treated all managed care together would be risky. As Riley et al. (1999) cautioned, aggregate comparisons of the experiences of managed care plans and FFS enrollees may obscure important patterns within the managed care and FFS populations. Therefore, it may be necessary to separate HMOs, PPOs and POSs when compared to traditional FFS plans if possible.

Secondly, most of the studies examined the effect of managed care only on some aspects of care. Retchin et al. (1991) focused on preventive diabetes care, such as peripheral vascular examinations, blood pressure checks, annual renal function evaluations, and electrocardiograms within 6 months, etc. Greenfield et al. (1995) only contrasted mean health outcomes indicators, such as mean glycosylated hemoglobin level, mean scores for vibration sense, visual acuity, albumin excretion rate, blood pressure, functional status and well-being in 2-year or in 4-year outcomes, and average yearly mortality rates.

Ware et al. (1996) also compared health outcomes such as physical and mental health outcomes for chronically ill patients. Coffey et al. (1995) investigated on access to preventive diabetes care, such as physician referrals to another practitioner for help with weight loss if they were overweight, diet counseling, or a smoking cessation program, or referrals for counseling regarding diet and lifestyle. Weller et al. (1999) contrasted health care use, including physician visits, inpatient hospital admission, emergency room visits, and three diabetic specific laboratory tests and procedures. Lee et al. (1998) only examined on use of ophthalmic services in the preceding 6 months.

Brown et al. (2005) covered some aspects of care utilization such as endocrinologist visits and eye care provider visits; some aspects of health outcomes or complications such as PCS-12 scores and duration with diabetes or number of chronic medical conditions; and some aspects of preventive care such as blood pressure control, proteinuria, or mean HA1c or serum creatinine, to make the comparison across health plans. However, they examined the main effect of type of insurance on the need for eye care within the 6 months. Focusing on some specific measures could give us specific results from those aspects, however, multiple measures, including access to care, use of health care, especially diabetes care, and health outcomes, of health care effects are needed to provide comprehensive informative results to the public and policymakers.

Thirdly, the data used were quite limited and out of date. For example, Retchin et al. (1991) collected only 158 HMO enrollees and 134 FFS enrollees from National Medicare Competition Evaluation to make the comparison. Greenfield et al. (1995)

selected 259 patients of staff-model HMOs, 61 of IPA, and 212 of FFS 259 from the Medical Outcomes Study (MOS). Ware et al. (1996) used 2235 chronically ill patients from the MOS, whereas Lee et al. (1998) only used 522 individuals with diabetes enrolled in the MOS. Greenfield et al. (1995) selected only 259 patients for staff-model HMOs, 61 for IPA, and 212 for FFS from MOS. Brown et al. (2005) choose patients with diabetes who are older than 65 years of age in Los Angeles County.

Many studies narrowed down the study domains such as elderly diabetics, diabetic elderly Medicaid beneficiaries, diabetic Medicare beneficiaries, etc, which only represented that specific cohort. More importantly, all these data were chosen from specific regions, which cannot be generalized to national wide. Furthermore, most of the studies were conducted before 2000. Only a single paper since then, in 2005, made a comparison across health plans on patients with diabetes. This paper, however, used data only limited to Los Angeles County. Therefore, updating is needed as newly published data became available and managed care changed dramatically over years.

Therefore, this dissertation, by using most recently published national representative data, seeks to provide some empirical evidence about the effect of managed care plans on the diabetic subgroup from a multiple dimensions perspective on the issues of: 1) whether managed care plans can provide sufficient quality of care as FFS plans does; and 2) whether managed care plans can improve the health outcomes of diabetes patients as FFS plans does.

## CHAPTER THREE

## EFFECTS OF MANAGED CARE: EVIDENCE ON HEALTHCARE USE

### 3.1    Background

Because of their cost-containment potential, managed care plans have experienced explosive growth over the past two decades.  Typical methods with which managed care plans control costs include negotiating capitated rates or discounted prices with providers and strictly managing the use of medical services. The financial incentives of such plans would intentionally or unintentionally cut back on healthcare services for people with costly medical conditions, such as chronic diseases. Thus, despite potential cost savings linked to managed care plans, the public is concerned that managed care may provide insufficient quantity and quality of care for chronically ill people.

Consequently, numerous studies have attempted to evaluate the effect of managed care in terms of quantity and quality of care on subgroups with chronic diseases (Ni, 1998; Soumeraiv, 1999; Smith, 1999; Erickson, 2000; Lee-Feldstein, 2002; Shields, 2002; Beatty, 2003). However, there were very few studies in the literature that focused on patients with diabetes. Diabetes is one of the major causes of premature illness and death, and is the only major disease with a death rate that is still rising. In 2005, approximately 7% of individuals (20.8 million people) in the United States had diabetes, with 14.6 million people diagnosed and 6.2 million people undiagnosed. This prevalence will likely accelerate substantially further owing to population aging and diet during the next several decades. Moreover, many

complications, such as hypoglycemia, ketoacidosis, or nonketotic hyperosmolar coma, may occur if the disease is not adequately controlled. These complications from diabetes also result in significant morbidity and mortality.

Notably, however, it has been estimated that 50% to 85% of the acute and chronic complications of diabetes are at least treatable and to some degree, preventable. This means there is great potential to maintain and improve health for people with diabetes through providing sufficient quantity and quality of care. Therefore, it is of great importance and significance to evaluate the effect of managed care in terms of quantity and quality of health care.

The existing literature regarding the effect of managed care on patients with diabetes is sparse. Retchin et.al (1991) has evaluated the quality of care in HMOs on the treatment of elderly diabetics. Another study by Greenfield et.al (1995) focused on the mean health outcomes for patients with Non-Insulin-Dependent diabetes (also called diabetes mellitus type II, or NIDDM) among different care systems. Coffey et al (1995) measured the quality of care for diabetic elderly Medicaid beneficiaries in terms of drug and nondrug therapy, monitoring, and access to medications. More recently, Arleen et.al (2005) compared rates of need for eye care among older adults with diabetes mellitus under Fee-for-Service and Managed Medicare systems. However, most of these studies were restricted to the elderly population with diabetes. Few studies compared quality of care from multiple aspects for patients with diabetes under different health plans.

Therefore, the goal of this study is to fill the gap. By utilizing the most-recently published national representative data, we will examine the effects of managed care

for patients with diabetes on the quantity and quality of care from the multiple aspects of access, satisfaction, and use of health care, including specific diabetes care.

## 3.2 Data Source

Data for the analysis were obtained from the Medical Expenditure Panel Survey (MEPS), the most complete source of data on the cost and use of health care and health insurance coverage, cosponsored by the Agency for Healthcare Research and Quality and the National Center for Health Statistics. The sampling frame for MEPS was drawn from respondents of the National Health Interview Survey (conducted by the National Center for Health Statistics), a nationally representative sample of the U.S civilian non-institutionalized population, with over-sampling of Hispanics and African Americans. MEPS currently has two major components: the Household Component (HC) and the Insurance Component (IC). The HC collected data from individual households' interviews, and was supplemented by data from their medical providers. The IC was a separate survey of employers that provided data on employer-based health insurance. MEPS HC collects detailed information for each person in the household on the following: demographic characteristics, health conditions, health status, use of medical services, charges and source of payments, access to care, satisfaction with care, health insurance coverage, income, and employment. The panel design of the survey, which features 5 rounds of interviewing covering two full calendar years, makes it possible to determine how changes in respondents' health status, income, employment, eligibility for public and private insurance coverage, use of services, and payment for care are related. Such a wide range of data points allows us for a more comprehensive approach to analysis.

In addition, the MEPS consolidation files include "The Diabetes Care Survey". This survey contained a series of questions about diabetes management, such as the number of times respondents reported having a hemoglobin A1c test, his/her feet checked for sores or irritations, and the last time the respondent reported having an eye exam. Respondents were also asked to report on diabetes treatments, such as diet, oral medications, or insulin, and complications caused by diabetes, such as kidney or eye problems. This specific-disease survey allows us to examine the effect of health plans on patients with diabetes as they require unique health care needs.

## 3.3    Sample Selection

The data for this study were pooled from 2002 to 2006 to increase the sample size and were weighted to correctly represent the population. Specifically, we combined 2002-2006 Full Year Consolidated Data Files. We used data during this period because data after 2006 is unavailable, whereas data before 2002 was collected from different questionnaires regarding access to and satisfaction with health care use. We initially identified adults diagnosed with diabetes, and excluded the elderly population, those 65 years older, because of its near-universal coverage by Medicare. We then only collected those with at least one source of private health insurance, and excluded those with government sponsored health insurance (e.g., Medicaid, or CHAMPUS/VA) because these programs are associated with entitlement or military status, which are different in nature. Moreover, we excluded individuals who have more than one health plan in order to discern the effect from different health plans. Furthermore, we only abstracted round 1 to round 3 data due to some important variables that were unavailable in rounds 4-5. Finally, we excluded

those who changed their health plans during these rounds 1-3 to eliminate the blur effect caused from "plan switching".

Thus, due to missing data on some variables, the final sample included 1001 observations with 484 (48.35%) enrolled in HMOs, 356 (35.56%) enrolled in OMCs, and 161 (16.08%) enrolled in FFS plans in rounds 1-3.

## 3.4 Variables Description

Table 3.1 list the definitions and means of the variables used in the analysis. The independent variables included age, sex, race/ethnicity, marriage status, education background, family income status, employment status, perceived health status, perceived mental health status, functional limitations, and other commodity diseases such as hypertension or heart diseases, etc. The explanatory variable of health insurance in this study was divided into three types: HMO (Health Maintenance Organization, OMC (Other Managed Care), and FFS (Fee-For-Service). Patients with private insurance were classified as covered by an HMO if the policyholder identified any plan as an HMO. Patients with private insurance were classified as covered by an OMC plan if the person identified any plan as a gatekeeper plan or any plan that had a book or list of doctors. We then classified those with private health insurance with non-HMOs and non-OMCs as fee-for-service plan. To avoid the confusing effects from different health plans, those enrolled in any both or three of the above three types of plans would be excluded. It should be noted that while the survey permitted categorization of respondents by the type of health plan that they were enrolled in, questions regarding access and satisfaction, described below, referred to providers, not health plans.

We divided the interested dependent variables into three categories: access, satisfaction, and use of health care, which especially included diabetes care. By doing this, we hoped to make a broader comparison from more aspects for the quality of care.

*Access variables*

There are ten questions concerning a patient's access to health care: 1) whether the individual has a  usual source of health care (USC) provider; 2) how long it takes to get to USC; 3) whether USC has office hours nights/weekends; 4) how difficult it is get to USC; 5) how difficult it is to contact USC by phone; and 6) how difficult it is to contact USC after hours; 7) whether the person was unable to receive medical treatment or 8) receive a prescription ; 9) whether the person was delayed in receiving medical treatment; 10) or delayed in receiving a prescription.

*Satisfaction variables*

Eight related questions were asked concerning the patient's confidence and satisfaction with the health care provider: is the provider the person or place family members would go to 1) for new health problems; 2) for preventive health care; 3) for referrals to other health professionals; 4) to resolve ongoing health problems; and does the USC provider generally 5) listen to the patient and seek the patient's advice when choosing between treatments; 6) ask about and show respect for treatments other doctors may give the patient; 7) ask the patient to help make decisions; 8) explain options to the patient.

*Utilization of health care variables*

Health care use was divided into ambulatory care visits, emergency room visits, inpatient hospital stays, and diabetes care. Ambulatory care visits included office-based visits and hospital outpatient visits with physician and non-physician settings in both categories. Non-physicians included nurse practitioners, physician assistants, chiropractors, optometrists, physical and occupational therapists. Diabetes care included management, treatment, and diabetes-related complications. Diabetes management included offering the HA1c test, checking the patient's feet for sores or irritation, and eye examination with pupil dilation. Treatment included diet modification, oral medication, and insulin injections. Diabetes-related complications mainly included kidney problems and eye problems caused by diabetes.

## 3.5    Statistical Analyses

We used bivariate and multivariate methods and conducted the analysis with Stata 8 and SAS 9.0. All data were weighted to correctly represent the population. Chi-square ($\chi^2$) tests were used to compare individual characteristics differences among HMO, OMC and FFS settings. Logistic regression was used to examine differences in access to, satisfaction with, and use of health care across the three insurance groups.    Multivariate analysis was used to account for potentially confounding variables, including age, sex, race/ethnicity, employment, health status, limitation of activity status, etc. However, because the health care utilization measures are count variables, which are usually not normally distributed and tend to have a long heavy right tail, and distributions do not satisfy the assumptions for ordinary least squares regression, we used negative binomial regression models to

analyze the health care use outcomes. Incidence rate ratios (IRRs) from negative binomial regression models were used to compare the incidence rates of health care use among different health insurance groups. For example, if the IRR for ambulatory care visits among HMO enrollees is 1.17; the interpretation is that being an HMO enrollee increases the expected number of visits compared with FFS enrollees by a factor of 1.17, holding other variables constant. In other words, being a HMO enrollee increases the expected number of ambulatory care visits by 17%.

## 3.6    Results

*Baseline Demographic Characteristics*

Table 3.2 presents demographic and health characteristics for patients with diabetes (aged 18-65) in Managed care and traditional health plans.  We find statistically significant differences across HMO, OMC and FFS enrollees in terms of ethnicity, family income, their illnesses (hypertension, heart attack,  arthritis, IADL, and ADL), and working status. The mean age of the sample was 52.06 (51.29 among HMO enrollees, 52.03 among OMC, and 54.41 among FFS enrollees). The HMO patients were more likely (11.88%) to be Hispanic than OMC (8.31%) and FFS patients (8.36%) ($P$=0.00). FFS enrollees had the highest proportion of hypertension cases (67.58%), followed by HMO (58.97%) and OMC (58.38%) ($P$=. 06).

Similarly, heart attack occurred more (12.68%) among FFS enrollees compared to HMO (6.18%) and OMC enrollees (8.73%) ($P$=0.07).  FFS enrollees were also more likely to be diagnosed with arthritis (45.23%) compared to HMO (36.3%) and OMC (32.89%). The proportion of people needing help with IADL were the highest among FFS enrollees (4.28%, $P$=0.01), while ADL were highest among

OMC enrollees (2.35%, *P*=. 01). The percentage of patients working as full time was highest among HMO enrollees (76.94%), followed by OMC (71.01%) and FFS (58.67%) (*P*=. 00). There were no statistically significant differences between managed care and traditional health plan enrollees across other variables.

*Access Characteristics*

Table 3.3 presents unadjusted access characteristics (i.e. weighted but not controlled for other factors) of enrollees in HMO, OMC, and FFS settings. Most of the patients have a USC provider, with a high average over 95%. The percentage of patients without a USC provider was lowest in HMO plan with 3.2%, followed by OMC plan with 4.38%, and FFS plan with 5.89% (P=0.08). FFS enrollees were more likely having no nights/weekends office hours (72.18%), compared to HMO (55.21%) and OMC (64.05%) enrollees (*P*=0.00). There were no other access measures significantly different among the three health insurance groups.

Table 3.4 provides the adjusted odds ratios (ORs) for access measures by different groups. After controlled for covariates, FFS enrollees were more likely to have no USC provider (OR: 0.36***) compared to HMO enrollees. Moreover, the providers in FFS settings were more likely having no nights/weekends office hours (OR, 0.42***), and were more difficult to see provider (OR: 0.50*), when compared to HMO settings.

*Satisfaction Characteristics*

Table 3.5 and Table 3.6 summarize unadjusted and adjusted satisfaction measures. Although about 20% of the patients reported that providers did not listen/seek to the patient and his or her advice, most of patients (over 97%) have the

confidence in their service provider for new health problems, preventive health care, referrals to other health professionals, and ongoing health problems.    More reassuringly, there were no significantly differences across the plans both in unadjusted and adjusted satisfaction measures.

*Utilization Characteristics*

Table 3.7 provides unadjusted utilization measures across the three health insurance groups. About 94% of patients have at least one office-based care visit(s), while less than 50% of patients have at least one outpatient visit(s). FFS plans have a significant higher rate of at least one outpatient visit(s) (45.06%) as compared to the other two groups (HMO, 33.07%; OMC, 36.8%, $P$=0.01). In addition, FFS enrollees more often have at least one discharge(s) (17.59%) compared to HMO enrollees (13.2%) and OMC enrollees (11.26%) ($P$=0.06). However, patients with at least one night(s) in hospital for discharges has a highest proportion in OMC network (25.21%), and has a lowest proportion in HMO network (11.13 ($P$=0.04). There were no other differences across the health insurance groups.

However, the adjusted incidence ratio presented on table 3.8 suggested no significant difference across the three plans for the measures of ambulatory care visits, inpatient visits, and emergency visits.

*Diabetes Care Characteristics*

Most patients (above 90%) have at least one HA1C test every year. However, only two thirds of patients have at least one feet-checked for sores. Less than 10% of patients have kidney problem caused by diabetes, and about 20% of patients has eye problems caused by diabetes. About 75% of patients take oral medication, while

about 24% of patients take insulin injection. Meanwhile, about 82% of patients follow diet modification as treatment. Most of the unadjusted diabetes care measures provide no difference across the three plans, as we can see from the table 3.9. The only significant difference is that, the proportion of patients with eye problems caused by diabetes was highest among FFS plan (24.13%), followed by OMC (18.73%) and HMO (16.88%) with a p-value of 0.02.

After controlling for confounding variables, patients treated with diet modification have a significantly higher proportion in HMO plan compared to FFS plan (OR, 1.66*).  In addition, HMO enrollees were less likely to have eye problems caused by diabetes (OR, 0.63*). No other measures were significantly different across the three plans (see Table 3.10).

## 3.7    Discussion and Conclusions

Using a nationally representative sample to examine variation across different health plans in access to, satisfaction with, and use of health care for patients with diabetes, we found that most of patients with diabetes in the United States enjoyed good access to health care and that they were generally satisfied with the health care system during the years of 2002-2006. For example, we found that over 94 percent of insured patients had a usual source of care and over 97 percent of patients have confidence in their providers for their new health problems, preventive health care, referrals to other health professionals, and ongoing health problems. Moreover, over 94 percent of patients have at least one office-based care visit and over 94 percent of them have at least one Hemoglobin A1c test per year.

Our analysis found three statistically significant differences in access to health care: 1) FFS enrollees were more likely having no USC provider than HMO and OMC enrollees; 2) The providers in FFS were more likely to have no nights/weekends office hours when compared to HMO enrollees; 3) And, FFS groups somehow had more difficulty acquiring medical treatment. These findings were slightly different from conventional views that managed care may present more restrictive access to health care. However, they were consistent with the findings from Burns et al (2009) that relative to FFS Medicaid, Medicaid managed care programs are associated with an equal or improved likelihood of having a usual source of care (USC).

In terms of satisfaction with the providers, the analysis found no significantly difference in any measures. This result may somehow reassure the public and policymakers at least for this cohort. As for the use of health care, number of nights in the hospital for discharges was significantly higher in FFS system compared to HMO system. The reason may due to the build-in cost constraint of HMO system as it uses capitation payments and referral strategy to restrict the health care. There is no such significant difference exists for OMC enrollees. Another explanation may be because HMO enrollees were healthier so that they had less hospital stays or were discharged earlier (we will test this selection bias in the next chapter). This result was slight different from the finding by Weller et al (1999) as they concluded that no differences between the two systems of care in the proportions of diabetic Medicare beneficiaries with at least one hospital admission, and a larger proportion of the study population who were enrolled in managed care had at least one physician visit during the study period compared with those enrolled in fee-for-service (96% vs. 63%). The difference

may be due to the different sample as Weller et al restricted the population to Medicare beneficiaries with diabetes in two geographic areas (one in the Midwest and one in the Northeast) because the organization of physician practices and managed care contracting are different in different areas (Carol, 1997). Or it may be due to the aggregation of managed care because it was not just managed care, but the type of managed care, affects the use of services (Reschovsky et al 2000). In addition, system may have changed during these ten years.

Two other significant findings of this study regarding to diabetes care use were: FFS enrollees were more likely to have eye problems, and HMO enrollees were more often treated with diet modification compared to FFS enrollees. Usually, patients were recommended with the conventional regimen utilized diet to control FPG (Fasting plasma glucose), unless there were hyperglycemic symptoms or FPG>15mmol/l (270mg/dl), in which case pharmacological agents were added. Therefore, the implication here may also suggest a selection bias possibility in HMO plans. No other measures were significantly different across the three plans.

The absence of significant differences in most measures of access to, satisfaction with, and use of health care among patients with diabetes enrolled in HMO, OMC and FFS merits additional discussion. This could indicate that, as managed care has evolved to become the predominant mechanism for organizing and delivering care, differences in the care provided through managed care plans and traditional plans have largely disappeared. In fact, physicians in private practice typically treat patients with a variety of different types of coverage, including managed care and traditional plans. They may be unaware of the type of coverage a

patient has during the actual visit. On the other hand, as managed care kept steady growth and rapidly penetration, fee-for-service plans were forced to become more conscious to compete with managed care (Robinson, 1996; Baker, 2000). As a consequence, the type of care delivered may not vary significantly by type of health plan.

However, this study has several limitations. First, although the survey permitted categorization of respondents by the type of health plan that they were enrolled in, questions regarding access and satisfaction, described below, referred to providers, not health plans. This may dilute the effects that different health insurance plans have on patients with diabetes, because of the providers' lack of awareness of the type of plan a patient has, as previously discussed.

Second, although we separated HMO plans, we treated all other managed care plans together and didn't distinguish PPO, POS from other managed care because of the data constraint. However, compared to others, this study presents its advantages as most previous studies only focused on HMO plans or treated all managed care together.

Third, although we tried to incorporate a broader range of outcome indicators of quality of care, our analysis was still restricted to a small set of access, satisfaction, and quality indicators. In addition, many of the indicators studied used limited response categories (e.g., very difficult, somewhat difficult, etc.) that may not be particularly sensitive in distinguishing differences among different health insurance plans.

Finally, some important factors such as the duration, type and severity of diabetes, which are critical factors for disease-severity adjustment in comparing differences in diabetes care and health care use, were not considered in the survey. However, we used self-perceived health status and co-morbidity to control for case mix.

In summary, our study found three statistically significant differences in access to, no statistically significant differences in satisfaction with, and only two statistically significant differences in the use of health care among HMO, OMC and FFS systems. No other measures were significantly different across the three plans. The majority absence of significant differences in access, satisfaction, and use of health care among patients with diabetes enrolled in HMO, OMC, and FFS plans, suggest that HMO and OMC plans can provide considerably comparable and even better health care services as compared to FFS plans.

Table 3.1: Definitions and Means of Variables (Weighted)

| Variable | Definition | Mean (Dia) |
| --- | --- | --- |

**Dependent Variables**

*Access*:

| Variable | Definition | Mean (Dia) |
| --- | --- | --- |
| Has no USC Provider | 1 if yes, 0 otherwise | 0.040741 |
| More than 30 minutes to get to USC | 1 if yes; 0 otherwise | 0.101187 |
| Provider has no nights/weekends office hours | 1 if yes; 0 otherwise | 0.612258 |
| Somewhat or very difficult to see provider | 1 if yes, 0 otherwise | 0.055459 |
| Somewhat or very difficult to contact provider by phone | 1 if yes, 0 otherwise | 0.19067 |
| Somewhat or very difficult to see provider after hours | 1 if yes, 0 otherwise | 0.326428 |
| Unable to receive medical treatment | 1 if yes, 0 otherwise | 0.033439 |
| Unable to receive medicine treatment | 1 if yes, 0 otherwise | 0.041187 |
| Delayed in receiving medical treatment | 1 if yes, 0 otherwise | 0.049442 |
| Delayed in receiving medicine treatment | 1 if yes, 0 otherwise | 0.060828 |

*Satisfaction*:

| Variable | Definition | Mean (Dia) |
| --- | --- | --- |
| Would not go for new health problems | 1 if yes, 0 otherwise | 0.010906 |
| Would not go for preventive health care | 1 if yes, 0 otherwise | 0.014003 |
| Would not go for referrals to other health professionals | 1 if yes, 0 otherwise | 0.021821 |
| Would not go for ongoing health problems | 1 if yes, 0 otherwise | 0.008547 |
| Provider not ask about other treatments | 1 if yes, 0 otherwise | 0.202114 |
| Not respect the patient | 1 if never/sometimes, 0 otherwise | 0.098575 |
| Not ask the person to help make decisions | 1 if never/sometimes, 0 otherwise | 0.155832 |
| Not explain options | 1 if yes, 0 otherwise | 0.049257 |

*Utilization*:

| Variable | Definition | Mean (Dia) |
| --- | --- | --- |
| Ambulatory care visits | | 0.944514 |

(continue on next page)

| | | |
|---|---|---|
| Physician visits | 1 if at least 1 visit, 0 otherwise | 0.924583 |
| Non-physician visits | 1 if at least 1 visit, 0 otherwise | 0.542485 |
| Outpatient | | 0.363715 |
| Physician visits | 1 if at least 1 visit, 0 otherwise | 0.182872 |
| Non-physician visits | 1 if at least 1 visit, 0 otherwise | 0.263919 |
| # Nights in hospital for discharges | 1 if at least 1 visit, 0 otherwise | 0.128063 |
| # Hospital discharges | 1 if at least 1 visit, 0 otherwise | 0.131352 |
| Emergency room visits | 1 if at least 1 visit, 0 otherwise | 0.186599 |

*Diabetes care*
Management

| | | |
|---|---|---|
| Hemoglobin A1c | 1 if at least 1 visit, 0 otherwise | 0.936283 |
| Feet check | 1 if at least 1 visit, 0 otherwise | 0.715153 |
| Eye examination | 1 if at least 1 visit, 0 otherwise | 0.09756 |

Complication

| | | |
|---|---|---|
| Kidney problems | 1 if yes, 0 otherwise | 0.074747 |
| Eye problems | 1 if yes, 0 otherwise | 0.187259 |

Treatment

| | | |
|---|---|---|
| Diet modification | 1 if yes, 0 otherwise | 0.820978 |
| Oral medication | 1 if yes, 0 otherwise | 0.756242 |
| Insulin | 1 if yes, 0 otherwise | 0.240024 |

<u>Independent Variables</u>

*Type of Health Plan*

| | | |
|---|---|---|
| FFS (reference category) | 1 if Yes; 0 otherwise | 0.15569 |
| HMO | 1 if Yes; 0 otherwise | 0.464018 |
| Other Managed Care Plans | 1 if enrolled in other plans; 0 otherwise | 0.384747 |

*Social Demographics*

| | | |
|---|---|---|
| Age | Years of age | 52.058 |

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| Male | 1 if Male; 0 otherwise | 0.509579 |
| Black | 1 if Black; 0 otherwise | 0.03734 |
| Hispanic | 1 if Hispanic; 0 otherwise | 0.099578 |
| Education1 | 1 if High School and Less; 0 otherwise | 0.77397 |
| Education2 | 1 if AA or Some College; 0 otherwise | 0.22603 |
| Married | 1 if Married; 0 otherwise | 0.721663 |
| Poor (family income as % of poverty line) | 1 if Yes; 0 otherwise | 0.033679 |
| Near Poor | 1 if Yes; 0 otherwise | 0.022911 |
| Low Income | 1 if Yes; 0 otherwise | 0.08542 |
| Middle Income | 1 if Yes; 0 otherwise | 0.34318 |
| High Income | 1 if Yes; 0 otherwise | 0.51481 |

*Health Characteristics*

| Overweight | 1 if overweight (BMI>=25) | 0.88931 |
| Physical activity | 1 if moderate/vigorous physics activity per week | 0.461846 |
| Smoking Status | 1 if Yes; 0 otherwise | 0.174622 |
| Hypertension | 1 if Yes; 0 otherwise | 0.600794 |
| Coronary Heart Disease | 1 if Yes; 0 otherwise | 0.107758 |
| Heart Attack | 1 if Yes; 0 otherwise | 0.081701 |
| Heart Condition/disease | 1 if Yes; 0 otherwise | 0.090442 |
| Stroke | 1 if Yes; 0 otherwise | 0.037309 |
| Emphysema | 1 if Yes; 0 otherwise | 0.014385 |
| Asthma | 1 if Yes; 0 otherwise | 0.146605 |
| Angina | 1 if Yes; 0 otherwise | 0.065928 |
| Arthritis | 1 if Yes, 0 otherwise | 0.363914 |
| Joints (pain/aching) | 1 if Yes; 0 otherwise | 0.490076 |
| Perceived health status | 1 excellent; 2 very good; 3 good; 4 fair; 5 poor | 3.109677 |
| Mental Health index | 1 if Yes; 0 otherwise | 2.089975 |
| Functional Limitation(s) | 1 if Yes; 0 otherwise | 0.232853 |
| Need Help w/ADL | 1 if Yes; 0 otherwise | 0.013692 |
| Need Help w/IADL | 1 if Yes; 0 otherwise | 0.029516 |

_____

Table 3.2: Characteristics of Enrollees, by Plan Type

| | FFS | HMO | OMC | P-value |
|---|---|---|---|---|
| N | 161 | 484 | 356 | |
| Mean Age | 50.68 | 51.3 | 52.12 | 0.7134 |
| Sex | | | | 0.6622 |
| Female | 47.49 | 48.5 | 50.31 | |
| Male | 52.51 | 51.5 | 49.69 | |
| Race | | | | 0.5556 |
| Non-Black | 95.79 | 96.15 | 96.6 | |
| Black | 4.21 | 3.85 | 3.4 | |
| Origin | | | | <.0001 |
| Non-Hispanic | 91.64 | 88.12 | 91.69 | |
| Hispanic | 8.36 | 11.88 | 8.31 | |
| Education | | | | 0.9399 |
| High School | 79.28 | 76.73 | 77.43 | |
| Some College and + | 20.72 | 23.27 | 22.57 | |
| Marital Status | | | | 0.2138 |
| Non-Married | 31.04 | 27.99 | 26.35 | |
| Married | 68.96 | 72.01 | 73.65 | |
| Family Income as Percent of Poverty Line | | | | 0.0159 |
| Poor | 13.68 | 5.03 | 8.03 | |
| Near Poor | 0.96 | 1.09 | 1.32 | |
| Low Income | 0.27 | 1.2 | 0.82 | |
| Middle Income | 2.15 | 3.82 | 2.57 | |
| High Income | 5.4 | 16.1 | 12.83 | |
| Smoke Status | | | | 0.141 |
| No | 75.3 | 81.77 | 86.39 | |
| Yes | 24.7 | 18.23 | 13.61 | |

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| | | | | |
|---|---|---|---|---|
| Physical Activity | | | | 0.1735 |
| No | 49.66 | 52.91 | 56.56 | |
| Yes | 50.34 | 47.09 | 43.44 | |
| | | | | |
| Overweight | | | | 0.1061 |
| No | 17.42 | 10.11 | 9.56 | |
| Yes | 82.58 | 89.89 | 90.44 | |
| | | | | |
| Checked Blood Pressure | | | | 0.4106 |
| No | 0.56 | 1.46 | 2.48 | |
| Yes | 99.44 | 98.54 | 97.52 | |
| | | | | |
| Hypertension | | | | 0.0578 |
| No | 32.42 | 41.03 | 41.62 | |
| Yes | 67.58 | 58.97 | 58.38 | |
| | | | | |
| Coronary Heart Disease | | | | 0.1301 |
| No | 85.76 | 91.76 | 87.6 | |
| Yes | 14.24 | 8.24 | 12.4 | |
| | | | | |
| Heart Attack | | | | 0.0655 |
| No | 87.32 | 93.82 | 91.27 | |
| Yes | 12.68 | 6.18 | 8.73 | |
| | | | | |
| Other Heart Disease | | | | 0.8856 |
| No | 92.48 | 92.86 | 88.06 | |
| Yes | 7.52 | 7.14 | 11.94 | |
| | | | | |
| Stroke | | | | 0.7741 |
| No | 96.02 | 95.76 | 96.97 | |
| Yes | 3.98 | 4.24 | 3.03 | |
| | | | | |
| Angina | | | | 0.2694 |
| No | 92.25 | 92.85 | 94.55 | |
| Yes | 7.75 | 7.15 | 5.45 | |
| | | | | |
| Emphysema | | | | 0.9751 |
| No | 98.21 | 98.72 | 98.51 | |
| Yes | 1.79 | 1.28 | 1.49 | |

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| | | | | |
|---|---|---|---|---|
| Asthma | | | | 0.9711 |
| No | 88.78 | 85.33 | 83.96 | |
| Yes | 11.22 | 14.67 | 16.04 | |
| | | | | |
| Joints (Pain/Aching) | | | | 0.4619 |
| No | 46.51 | 51.02 | 52.78 | |
| Yes | 53.49 | 48.98 | 47.22 | |
| | | | | |
| Arthritis | | | | 0.0393 |
| No | 54.76 | 63.65 | 67.11 | |
| Yes | 45.24 | 36.35 | 32.89 | |
| | | | | |
| Self-Reported Health Status | | | | 0.1334 |
| Excellent | 10.57 | 7.27 | 5.75 | |
| Very Good | 22.44 | 19.43 | 16.88 | |
| Good | 32.33 | 37.88 | 43.45 | |
| Fair | 25.98 | 26.75 | 22.92 | |
| Poor | 8.67 | 8.66 | 11 | |
| | | | | |
| Mental Health Index | | | | 0.2813 |
| Excellent | 42.6 | 37.84 | 35 | |
| Very Good | 19.76 | 23.42 | 30.45 | |
| Good | 27.65 | 29.77 | 27.38 | |
| Fair | 9.99 | 6.92 | 6.76 | |
| Poor | 0 | 2.05 | 0.41 | |
| | | | | |
| Need Help W/IADL | | | | 0.0059 |
| No | 95.72 | 98.55 | 95.8 | |
| Yes | 4.28 | 1.45 | 4.2 | |
| | | | | |
| Need Help W/ADL | | | | 0.007 |
| No | 98.22 | 99.59 | 97.65 | |
| Yes | 1.78 | 0.41 | 2.35 | |
| | | | | |
| Functional Limitations | | | | 0.3409 |
| No | 77.2 | 77.48 | 75.61 | |
| Yes | 22.8 | 22.52 | 24.39 | |
| | | | | |
| Working Status | | | | 0.0018 |

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| | | | | |
|---|---|---|---|---|
| Non-Full Time | 41.33 | 23.06 | 28.99 | |
| Full Time | 58.67 | 76.94 | 71.01 | |
| | | | | |
| Total Amt Paid by Self/Family | | | | 0.4536 |
| $ 0-1000 | 50.66 | 56.1 | 50.51 | |
| $ 1001-2,000 | 24.67 | 27.65 | 28.37 | |
| $ 2,001-3,000 | 11.75 | 7.31 | 9.32 | |
| $ 3,001 and Above | 12.92 | 8.93 | 11.8 | |
| | | | | |
| Total Health Care Exp | | | | 0.3644 |
| $ 0-1000 | 6.4 | 13.38 | 7.15 | |
| $ 1001-2,000 | 22.03 | 14.3 | 11.13 | |
| $ 2,001-3,000 | 8.92 | 10.24 | 13.25 | |
| $ 3,001 and Above | 62.65 | 62.08 | 68.47 | |

Notes: Table represents pooled data from MEPS in the years of 2002-2006 with diabetes.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$, statistical significance for the difference of each specified characteristic variable among HMO, PPO, and FFS enrollees (Reference category: FFS)

Table 3.3: Unadjusted Access Characteristics of Enrollees in HMO, OMC, FFS

| Access Characteristics | Percent | | | | |
|---|---|---|---|---|---|
| | FFS | HMO | OMC | Total | P-value |
| Has no USC Provider | 5.89 | 3.2 | 4.38 | 4.07406 | 0.0848 |
| More than 30 minutes to get to USC | 12.19 | 8.77 | 10.91 | 10.11874 | 0.1557 |
| Provider has no nights/weekends office hours | 72.18 | 55.21 | 64.05 | 61.22583 | <.0001 |
| Somewhat or very difficult to see provider | 8.13 | 3.15 | 7.4 | 5.54588 | 0.1226 |
| Somewhat or very difficult to contact provider by phone | 19.21 | 16.31 | 22.33 | 19.06704 | 0.3877 |
| Somewhat or very difficult to see provider after hours | 33.64 | 31.91 | 33.24 | 5.54588 | 0.9888 |
| Unable to receive medical treatment | 2.85 | 2.08 | 5.06 | 3.34392 | 0.6168 |
| Unable to receive medicine treatment | 5.36 | 3.24 | 4.67 | 4.11866 | 0.2842 |
| Delayed in receiving medical treatment | 3.66 | 5.33 | 5 | 4.94423 | 0.7677 |
| Delayed in receiving medicine treatment | 4.75 | 6.27 | 6.4 | 6.08277 | 0.5316 |

Table 3.4: Adjusted Access Characteristics of Enrollees in HMO, OMC, FFS

|  | Odds Ratio | | |
| Access Characteristics | FFS | HMO | OMC |
| --- | --- | --- | --- |
| Has no USC Provider | ref | 0.36** | 0.5 |
| More than 30 minutes to get to USC | ref | 0.88 | 1.35 |
| Provider has no nights/weekends office hours | ref | 0.42 *** | 0.73 |
| Somewhat or very difficult to see provider | ref | 0.50* | 1.06 |
| Somewhat or very difficult to contact provider by phone | ref | 1 | 1.32 |
| Somewhat or very difficult to see provider after hours | ref | 1.09 | 1 |
| Unable to receive medical treatment | ref | 0.81 | 2.15 |
| Unable to receive medicine treatment | ref | 0.53 | 1.07 |
| Delayed in receiving medical treatment | ref | 0.82 | 0.64 |
| Delayed in receiving medicine treatment | ref | 0.96 | 1.7 |

Table 3.5: Unadjusted Satisfaction Characteristics of Enrollees in HMO, OMC, FFS

| Satisfaction Characteristics | Percent | | | | |
|---|---|---|---|---|---|
| | FFS | HMO | OMC | Total | P-value |
| Would not go for new health problems | 0.69 | 1.39 | 0.89 | 1.0906 | 0.5344 |
| Would not go for preventive health care | 1.39 | 2.32 | 0.3 | 1.4003 | 0.1518 |
| Would not go for referrals to other health professionals | 1.13 | 2.53 | 2.19 | 2.1821 | 0.3296 |
| Would not go for ongoing health problems | 0.43 | 0.77 | 1.13 | 0.8547 | 0.8706 |
| Provider not listen/ seek to the person and his advice | 15.89 | 19.78 | 22.49 | 0.2021 | 0.6194 |
| Not respect the patient | 7.81 | 11.68 | 8.48 | 9.8575 | 0.2743 |
| Not ask the person to help make decisions | 12.05 | 18.51 | 13.4 | 15.583 | 0.1724 |
| Not explain options | 1.8 | 5.62 | 5.34 | 4.9257 | 0.3075 |

Table 3.6: Adjusted Satisfaction Characteristics of Enrollees in HMO, OMC, FFS

| Satisfaction Characteristics | Odds Ratio | | |
|---|---|---|---|
| | FFS | HMO | OMC |
| Would not go for new health problems | ref | 0.68 | 0.69 |
| Would not go for preventive health care | ref | 0.87 | 0.35 |
| Would not go for referrals to other health professionals | ref | 4.27 | 3.07 |
| Would not go for ongoing health problems | ref | 1.63 | 1.69 |
| Provider not listen/ seek to the person and his advice | ref | 1.25 | 1.36 |
| Not respect the patient | ref | 1.17 | 0.79 |
| Not ask the person to help make decisions | ref | 1.48 | 1.09 |
| Not explain options | ref | 2.38 | 1.41 |

Table 3.7: Unadjusted Utilization for Enrollees in HMO, OMC, FFS

| Utilization Characteristics (At Least One) | Percent | | | | |
|---|---|---|---|---|---|
| | FFS | HMO | OMC | Total | P-value |
| Office-based care visit(s) | 95.25 | 93.63 | 95.1 | 0.9445136 | 0.1124 |
|     Physician visit(s) | 92.05 | 92.28 | 92.84 | 0.9245829 | 0.2492 |
|     Non-physician visit(s) | 55.92 | 50.55 | 58 | 0.5424848 | 0.132 |
| Outpatient | 45.06 | 33.07 | 36.8 | 0.3637148 | 0.0127 |
|     Physician visit(s) | 19.91 | 16.57 | 19.68 | 0.1828717 | 0.1203 |
|     Non-physician visit(s) | 31.2 | 25.76 | 32.02 | 0.2639193 | 0.2198 |
| Night(s) in hospital for discharges | 12.72 | 11.13 | 25.21 | 0.1280628 | 0.0395 |
| Hospital discharge(s) | 17.59 | 13.2 | 11.26 | 0.131352 | 0.059 |
| Emergency room visit(s) | 18.12 | 20.32 | 16.9 | 0.1865985 | 0.8308 |

Table 3.8: Adjusted Utilization for Enrollees in HMO, OMC, FFS

| | IRR | | |
| --- | --- | --- | --- |
| Utilization Characteristics | FFS | HMO | OMC |
| Office-based care visits | ref | 1.04 | 1.02 |
|     Physician visits | ref | 1.01 | 0.95 |
|     Non-physician visits | ref | 1.2 | 1.3 |
| Outpatient | ref | 0.79 | 0.92 |
|     Physician visits | ref | 0.92 | 0.91 |
|     Non-physician visits | ref | 0.7 | 0.87 |
| # Nights in hospital for discharges | ref | 0.56* | 0.7 |
| # Hospital discharges | ref | 0.65 | 0.76 |
| Emergency room visits | ref | 0.85 | 0.79 |

Table 3.9: Diabetes Care for Enrollees in HMO, OMC, FFS

| Diabetes Care Characteristics | Percent | | | | |
|---|---|---|---|---|---|
| | FFS | HMO | OMC | Total | P-value |
| Management | | | | | |
| At least one Hemoglobin A1C | 93.72 | 91.79 | 95.67 | 0.9362834 | 0.3368 |
| At least one feet check | 66.38 | 74.33 | 70.14 | 0.7151526 | 0.2131 |
| Never had eye examination | 11.06 | 8.96 | 10.18 | 0.0975602 | 0.7479 |
| Complication | | | | | |
| Kidney problems | 6.23 | 7.72 | 7.69 | 0.074747 | 0.9822 |
| Eye problems | 24.13 | 16.88 | 18.73 | 0.187259 | 0.0202 |
| Treatment | | | | | |
| Diet modification | 80.83 | 84.46 | 79.8 | 0.820978 | 0.1845 |
| Oral medication | 71.39 | 75.45 | 77.53 | 0.7562416 | 0.5098 |
| Insulin | 25.66 | 24.5 | 22.74 | 0.240024 | 0.455 |

Table 3.10: Diabetes Care for Enrollees in HMO, OMC, FFS

| unless indicated | | Odds Ratio | | |
|---|---|---|---|---|
| Diabetes Care Characteristics | FFS | HMO | OMC | |
| Management | | | | |
| Hemoglobin A1C | ref | 1 | 1.04 | IRR |
| Feet check | ref | 1.09 | 1.02 | IRR |
| Never had dilated-eye examination | ref | 0.91 | 1.2 | |
| Complication | | | | |
| Kidney problems | ref | 1.59 | 1.33 | |
| Eye problems | ref | 0.63* | 0.72 | |
| Treatment | | | | |
| Diet modification | ref | 1.66* | 1.25 | |
| Oral medication | ref | 0.92 | 1.1 | |
| Insulin | ref | 0.91 | 0.9 | |

## CHAPTER FOUR  EFFECTS OF MANAGED CARE:
## EVIDENCE ON HEALTH STATUS OUTCOME

### 4.1    Background

Health outcomes directly affect the length or quality of a people's lives. Health plans, as a tool to delivery health care, play an important role to provide sufficient quantity and quality of care to maintain and improve the enrollees' health outcomes. An extensive literature has emerged to examine the effect of health plans on the quantity and quality of health services provision by comparing managed care plans and traditional FFS plans (Miller and Luft, 1994, 1997, 2002; Soumerai, 1999; Potosky , 1999; Riley, 1999; Roetzheim, 2000; Lee-Feldstein, 2002; Retchin , 1991; Smith, 1999; Beatty, 2003). However, there were very few studies examined the quality of care effect of managed care plans in terms of health outcomes.

In particular, literature about the health outcomes effects from different health plans for patients with diabetes have been extremely limited. By using the Medical Outcome Study (MOS), which restricted population size to three cities of Boston, Los Angeles, and Chicago, Greenfield et al (1995) compared the outcomes of patients with hypertension and diabetes for three different systems of care (FFSs, HMOs, IPAs) with follow-up at three periods: 2-year, 4-year, and 7-year. They found that, relative to functional status and well-being, there were no statistically significant differences among the three systems of care in 2-year outcomes or in 4-year outcome in the 317 patients.  The adjusted mortality rates were also similar among systems in 7-year follow up period. Using the same data source of the MOS, Ware et

al (1996) contrasted physical and mental health outcomes for patients with diabetes and other four chronic diseases under different health plans (HMOs vs FFSs) with a 4-year (1986-1990) follow up observational study of 2235 patients. The authors demonstrated that physical and mental health outcomes did not differ for the general patient populations.

However, for elderly patients treated under Medicare, declines in physical health were more common in HMOs than in FFS plans. Since these studies restricted samples to three cities, the results could not be generalized to general patients with diabetes. Moreover, since these studies were conducted 15 years ago, updating is needed because of their older data, as well as managed care's persistent changing over years.

This current study, therefore, attempts to explore the health outcome effect from different health plans for patients with diabetes. By using the most-recently published national representative data as in chapter 3, researchers, policymakers, clinicians, and the general public may benefit from objective, comparative information across diverse health care delivery systems on health outcome for patients with diabetes.

## 4.2    Model Specification

The model of health production function employed here follows Grossman's (1972) theoretical model. The main idea of this model was to treat social, economic, and environmental factors as inputs of the health production system. The modified model specification is as follows:

$$H_{i,t} = \beta_0 + \beta_1 HI_{i,t} + \beta_2 X_{i,t} + \beta_3 HC_{i,t} + \beta_4 HB_{i,t} + \beta_6 Year + \varepsilon_{i,t},$$

where an individual's health in period t ($H_{i,t}$) is determined by his/her health plan type (HI $_{i,t}$); a vector of socio-demographic variables such as age, gender, race, marital status, education level, and household wealth; his/her health conditions, such as chronic diseases and functional limitations; a vector of lifestyle behaviors, such as smoking and physical exercise; and the year of the survey.

For the dependent variable, we use self-perceived health status ($H_{i,t}$) because this is an overall evaluation of an individual's degree of wellness or illness with reference to morbidity, impairments, anthropological measurements, mortality, and indicators of functional status and quality of life. It has five categories, with which 1 means excellent, 2 means very good, 3 means good, 4 means fair and 5 means poor.

As the explanatory variable of interest, health insurance plan (HI $_{i,t}$), were divided into three categories: HMO, OMC (Other Managed Care), and FFS as defined in chapter three. We then created two dummy variables, HMO and OMC, to indicate the individual's health plan type, with the reference category of FFS plan. If the coefficient on HMO or on OMC differs significantly from zero, it suggests that plan affect health outcome significantly different from FFS plan. Recall that we excluded individuals who have more than one health plan in order to discern the effect from different health plans. In addition, we abstracted only round 1 to round 3 data due to some important variables that were unavailable in rounds 4-5. We excluded those who changed their health plans during these rounds 1-3 to eliminate the blur effect caused from "plan switching".

Finally, there is one concern that the health outcome is not an "instantaneous effect". That is, only if the individual enrolled in one plan for an extended period of

time could we conclude that whether that plan will benefit or contribute to his/her health outcome or not. However, since we used those patients who were staying the same health plan during the 1st and 3rd rounds, which guaranteed us at least for a certain period of time (approximately 1 year) that they were staying at the same health plan. In addition, for most of the respondents, they have been in their plan for a while by the time they responded to the 1st round survey due to the annual open enrollment policies from employers for private health insurance. This, to some extent, could justify the health status as an outcome of the health plan.

## 4.3    Model Validity

Since the dependent variable of self-perceived health status is ordinal (with 1 excellent, 2 very good, 3 good, 4 fair, and 5 poor), a natural approach is ordinal logistic models. Such models, however, assume that cumulative odds ratios are homogeneous across different levels of the dependent variable, i.e., the effects of predictors are invariant to the choice of cut-point category (proportional odds assumption). That is, only if this assumption holds, results produced from an ordered logistic model are valid (DeMaris, 1992).

Table 4.1: Score Test for the Proportional Odds Assumption

_____

| Chi-Square | DF | Pr > ChiSq |
|------------|-----|------------|
| 7557324.53 | 99 | <.0001 |

_____

The Chi-Square Score test for the proportional odds assumption from the analysis rejected the null hypothesis, which means the violation of the assumption.

Therefore, application of ordinal logistic models to this study may yield misleading results. We then use a less restrictive model, i.e., general multinomial logistic regression models, to do the estimation. As the dependent variable of health status also can be treated as a categorical variable and multinomial logistic regression is an example of such a model, it should be sufficient to satisfy the research purpose here.

## 4.4    Selection Bias

The assumption underlying the basic OLS (Ordinary Least Square) regression model described in the above equation is that the right-hand-side variables are uncorrelated with the error term and that the error term is well-behaved (i.e., homoskedastic and no autocorrelation).  However, as we indicated in chapter 3, there may be a selection bias of health plan. That is, as many researchers have also suspected, healthier people may prefer to enroll in HMO or other managed care plans because they were more affordable.  This possibility increased as we observed (from table 3.2) that people enrolled in managed care plans, especially HMOs, seemed to have lower percentages on most of diseases such as hypertension, heart diseases, heart attack, etc. If this is true, a biased and inconsistent estimate would be produced if simple ordinary least squares estimation is used in case of selection bias. In other words, the ignorance of adequate control for this selection bias in different health plans could threaten the validity of findings regarding to the discrepancies in health outcomes across plans.

To control selection bias and to get an unbiased and consistent estimation, we choose a set of instruments to do diagnostic tests and formal Durbin-Wu-Hausman tests (Davidson and MacKinnon, 1993) to test for the endogeneity (selection bias) of

health plan type. We would then modify the health production estimation methods accordingly to account for the endogeneity of plan type if test results justify it.

## 4.5 Instrumental Variables Identification and Hausman Test

In order to test for the endogeneity of health plan type, reduced form equations are required to specify the demand for each type of plans. Only if there are adequately valid instrumental variables (IVs) for the model can we get reliable estimation of the health production functions. Instrumental variables are variables that are correlated with the endogenous variables, but not correlated with the error term of the structural equation in the production function. In general, adequacy and validity of instruments should be diagnostically tested (through F-statistic and Sargan test) before the endogeneity test, because if the diagnostic test fails, in particular the Sargan test, then the endogeneity test is invalid, since the model is not properly identified (Larcker and Rusticus, 2010).

We first identified instrumental variable candidates based on theory and prior literature. As theory predicts, many studies of health plan choice have found price having a negative and significant effect on the probability of enrolling in a health plan (Scanlon, 1997). Deductible, co-insurance, or copay amount were also among the primary variables that may affect the choice of health plan type. Expected out-of-pocket costs, however, is a more integrated consideration that associated with health plan choice (Schoenbaum, Spranca, Elliott, Bhattacharya, 2001). Since expected out-of-pocket costs were only known to the consumers and unprocurable, we used actual out-of-pocket costs instead. Other variables such as health plan choice (Hellinger, 2000), and individuals' attitudes toward health insurance were also

considered as our initial set of instrumental variables candidates. Thus, we consider four groups of instrumental variable candidates:

• Out of pocket costs: Respondents' self-reported total out-of-pocket payment for the individual or family. We divided total out-of-pocket payment into four categories: 1. $0-1000; 2. $1000-2000; 3, $2000-3000, 4, greater than $3000.

• Health plan choice

• Individuals' attitudes towards health insurance: individuals' assessment about the statements "do not need health insurance" , "health insurance is not worth the money it costs", "Am more likely to take risks than the average person", 'Can overcome illness without help from a medically trained person", on a 5-point Likert scale ranging from 1 = disagree strongly to 5 = agree strongly.

Then we applied diagnostic tests to ensure the quality of instruments and to select acceptable instruments. The relevance property was examined by checking the significance level of individual instruments from the first-stage equation, the F-statistic on the joint significance of all instruments as a whole. The validity property was examined by conducting a Sargan test of over-identifying restrictions.

The detailed process of instrument selection is not reported in this dissertation. However, diagnostic tests results, including the tests of relevance (through F-statistic) and over-identifying restriction (through the Sargen test), are presented in table 4.2. Finally, three instrumental variables passed the validity and relevance criteria: health plan choice, individuals assessment about the statement "health insurance is not worth the money it costs", and total out-of-pocket payment in the range of $1000-2000.

Table 4.2: F-statistic Test Result and Sargen Test Result

| | | |
|---|---|---|
| F-statistic: | F (3, 424) = 4.80 | Prob > F = 0.0027 |

Note: significant at 1% critical value, which means relevant.

Sargan test: $NR2 = 472*0.0007 = 0.3304 \sim \chi^2 (2) = 5.99$

Note: insignificant at 1% critical value, which means well-identified.

The relevance and validity of selected instruments justified us to continue to the formal Durbin-Wu-Hausman test for the endogeneity of health plan. Table 4.3 reports the results from the formal Durbin-Wu-Hausman test for endogeneity. The insignificance of health plan residual indicates no endogeneity existing, that is, we can just treat health plan as an exogenous predictor of the dependent variable - health status.

Table 4.3: Durbin-Wu-Hausman Test Result

Wu-Hausman F test:       F (1, 451) = 0.42

Prob > F = 0.5170

Theoretically, however, this result suggests that no selection bias of health plan exists among patients with diabetes. That is, there is no evidence showing that HMOs or OMCs were more favorable than FFSs among healthier/unhealthier patients. This is consistent with other evidences of no selection bias existing among privately insured nonelderly population (Banthin, 1996; Reschovsky 1999/2000; Liang, 2004). Although there were some evidences of favorable selection bias in

Medicare HMOs (Eggers, 1982; Cox, 1997; Greenwald, 1998), the absence of selection bias seemed reasonable in this study since there were about 50% of enrollees didn't have a choice of health insurance. Choice of health plans is one condition must to be met for selection bias to exist (Hellinger, 2000). In addition, there is no significantly difference among the adjusted percentages of self-perceived health status across the three types of health plans (Table 3.2).

**4.6     Results**

Table 4.4 compares the mean changes of several health outcome measures across the three types of health plans from round 1 to round 3 (approximately 1 year). These health outcome measures included self-perceived health status, perceived mental health status, functional limitations, ADL, and IADL. Surprisingly, for OMC enrollees, all means (except for perceived mental health status) declined (recalling that higher scores indicate worse health), which means better health during this period. However, for FFS enrollees, the opposite is true: all means increased, which indicates worse health. HMO enrollees, however, exhibited no clear pattern: perceived mental health status, ADL, and IADL showed worse health outcome, while perceived health status and functional limitations reported better in health.

Table 4.5 displays self-perceived health status and mental status change in numbers and percentages among different plans. FFS enrollees had higher percentage (23.60%) of getting worse in health status during round 1-3 as opposed to OMC (19.38%) and HMO (19.63%) enrollees. More HMO enrollees reported better in health status during this period. As regard to mental health, however, more HMO enrollees indicated better and worse compared to FFS and OMC enrollees.

The results from these tables only show that there were some differences in health outcomes under different health plans for people with diabetes. We cannot make any conclusion about the effect of these plans though, because there were too many other confounding factors (such as age, race, other health conditions, etc.) that may be involved. More important, if there existed a selection bias, we might give misleading remarks if we draw conclusion simply based on this observation. Therefore, we proposed a methodology as described in sections 4.2-4.5 that controlled for the confounding factors and selection bias.

Since no evidence of selection bias was revealed in this study, however, type of health plan was treated as exogenous in the health production function. Table 4.6 provides the results from the multinomial logistic regression for self-perceived general health status for patients with diabetes aged 18-65 years. When predicting health status, the reference category for the dependent variable is "good" health, while the reference category for the interested explanatory variable of health plan is "FFS". To facilitate the interpretation of results, all estimated coefficients have been transformed into odds ratios to reflect the ratio of the probability of falling in one health outcome category over the probability of falling in the reference category.

We found that: compared with similar FFS enrollees, people enrolled in HMOs have an odds ratio of 7.773 falling in "excellent" health category compared to "good" health (P=0.018). That is, HMO enrollees were more likely (7.773 times higher) fallen in the category of "excellent" health than "good" health, which means HMO plans resulted in better health outcome. Although compared to FFS enrollees, PPO enrollees were also more likely to fall in category of "excellent" health and HMO

enrollees were more likely to fall in category of "very good" health, while both types of enrollees were less likely to fall in categories of "fair" and "poor" health, they were not statistically significant.

There were some other differences across the health plans among non-elderly people with diabetes. Men were more likely (with odds ratio of 1.5822) to be in "fair" health than women. Men were also shown insignificantly more likely to be in "poor" health and less likely to be in "excellent" health. This was consistent with the reports from American Diabetes Association that men with diabetes suffer more from some diabetes-related health problems, such as retinopathy, peripheral vascular disease, or amputation, than women (Diabetes Monitor, 2004). Therefore, it might be beneficial to bring awareness of this difference of diabetes-related health problems in men and women.

African American and Hispanics were more likely to be unhealthy than other people. This is not new. DHHS (U.S. Department of Health & Human Services, 2005) reported that the death rate and chronic diseases were more common among African American and Mexican American than white peers. This may due to the difference in genetic factors or lifestyle. Differences in access to healthcare may also play a role in these health disparities even though all samples here were insured. Smedley, Stith, and Nelson (2003) claimed that even at equivalent levels of access to care, racial and ethnic minorities experienced a lower quality of health services and were less likely to receive even routine medical procedures than white Americans. The government has long been aware of racial and ethnic health disparities, and has set the goal of eliminating disparities in diabetes health outcomes by the year 2010

(DHHS, 2000). However, further interventions should be taken more effectively and heavily to achieve this unmet challenge.

Educational attainment too had different effects on health. Contrary to traditional views that education improves health by allowing people to develop healthy lifestyles and prosperity (Mirowsky and Ross, 2003; Karter et al., 2007), our finding shows that people with diabetes were significantly more likely to be in the category of "excellent" health for those with high school education attainment or less than those who have higher education. The exact reason remains unknown; however, one explanation may be that those with high school education attainment or less were more likely to do more physically demanding work rather than sedentary work than those who have more educational attainment.

Physical activity, defined as spending half hour or more in moderate to vigorous physical activity at least three times a week, had a significant and beneficial impact on general health. The odds of having "fair" and "poor" health were insignificantly lower for exercisers than non-exercisers (0.97931 and 0.48512 respectively). The odds of having "very good" health for exercisers was insignificantly higher (1.005353), and the odds of having "excellent" health was significantly higher than non-exercisers (2.479505). Therefore, it is most important to promote and advocate more for policies or programs about developing healthy lifestyle, such as choosing healthy food and physical activities, to prevent or control chronic diseases and improve health outcomes.

## 4.7    Discussion and Conclusions

By using the most recently published national representative data, as was done in chapter 3, we examined the health outcome effect under different health plans for patients with privately insured nonelderly patients with diabetes. Greenfield et al. (1995) found that no evidence that favored for any one system of care for 2-year or 4-year outcomes over others for patients with NIDDM. I find that compared to FFS enrollees, HMO enrollees were more likely to fall in the category of "excellent" health as opposed to "good" health category. Since no selection bias detected in the study, in some extent, this suggests HMO plans resulted in healthier outcome.

The underlying reason may be due to HMOs' providing relative more preventive health services, which prevent patients early enough from health status deterioration. Given the preset capitation rates, HMOs have an incentive to rely considerably on preventive services and chronic disease management so that various conditions get diagnosed and treated before complications develop. Studies have demonstrated that HMO enrollees are more likely than their FFS counterparts to be diagnosed at earlier stages of breast, colorectal, skin, and prostate cancer, all of which are amenable to screening (Loue, 2008). Similarly, if patients with diabetes in HMO plans were more likely or repeatedly to be recommended such preventive care as diet modification (as was the case in chapter 3) or physical exercise, they were more likely or easier to maintain and improve their health status. This may in part explain why HMO enrollees had lower percentages in many of co-morbidities. As for the different conclusions with Greenfield et al. (1995), the reason may be due to their different samples and wider age range for the samples. Equally important, we found no other statistically significant difference across the three types of health plans.

These findings have important policy implications. As managed care plans trying to save money by restricting expensive health care uses, many researchers began to worry whether or not they could provide sufficient quality and quantity of health care, as well as bring forth good health outcome. This study indicates that overall, HMOs, as well as OMCs, could provide comparable quality of health care and result in comparable health status outcomes. This should reassure the public, providers and policymakers who have expressed concerns that managed care, especially HMOs, provide insufficient and poor health care to some vulnerable or frail subgroups.

More importantly, our significant finding suggests that, as important as it is to provide sufficient quantity and quality of health care to needy and frail patients, it is also important to pay attention to those who were in good health status. Being provided with sufficient and early enough preventive care, patients in relatively good health could maintain and even improve their health status. If our healthcare system can effectively prevent new diseases from developing, the costs of future treatments could be avoided and substantial healthcare resources could be saved. Early detection and treatment of diseases before any complications progresses are of great importance for patients' health, as well as for lowering health care costs. Peters et al (1998) mentioned that lack of adequate preventive care will lead to an increased risk of the development of the acute and chronic complications of diabetes, creating an even greater future burden on the health care system and negative consequences for patients. Dawson et al (2002) also noted that the preventive management of diabetes should receive priority attention, and the prevention of cardiovascular disease in

patients with diabetes should become an imperative. Therefore, increasing effective preventive care today may improve health outcomes and save money for future.

It is worth mentioning that we tried to "purge" the endogenous component of health plan for its selection bias. Consistent with other recent evidence (Banthin, 2000; Reschovsky 1999/2000; Liang, 2004), however, we found no selection bias existing among privately insured nonelderly population. Although there was some evidence of favorable selection bias in Medicare HMOs (Eggers, 1982; Cox, 1997; Greenwald, 1998), the absence of selection bias seemed reasonable in this study since about 50% of enrollees did not have a choice of health insurance. Choice of health plans is one condition must to be met for selection bias to exist (Hellinger, 2000).

In addition, individuals with public coverage were excluded from the sample and most of the remaining persons had open enrollment once a year. Thus, they could not switch between plans any time they wanted to. Therefore, concerning the questions we issued at chapter 3, the absence of selection bias suggests that other explanations may apply. For example, compared to FFS enrollees, fewer hospital nights for HMO enrollees, and more HMO enrollees with treated with diet modification, may result from the build-in cost constraint strategy of HMO system as it uses capitation payments and referral strategy to restrict the expensive health care.

However, the method in our study is not perfect. Without direct randomization, it is impossible to establish from direct observation whether HMOs experience selection bias, because we cannot directly observe the conduct of enrollees both in the setting that they chose and the setting that they did not choose (Hellinger, 2000).

There may still other factors we could not capture. For example, genetic traits and good childhood health induced by parental economic resources or healthy parenting styles that persist into adulthood, and good lifestyle such as physical exercises and refraining from smoking were all known to patients that made decisions on health plans, but not observed by the researchers and health plan providers. In addition, selection bias may also occur across jobs, (e.g., jobs with poor health insurance may attract healthier workers), types of health plans (e.g., HMOs may attract healthier enrollees than FFS plans), and among health plans of the same type (e.g., some HMOs may attract sicker enrollees and others may attract healthier enrollees) (Hellinger, 2000). We could not capture all of these in a model because of its complexity and data constraint.

Another limitation of our study is we followed up only 1 year follow-up for health status outcome. We were concerned that the health outcome differences might emerge larger subsequently. Follow-up periods longer than 1 year may be required to detect differences in outcomes for groups differing in chronic condition (Ware, 1996). In addition, our measure of health status was based on self-perceived reports that were not validated by medical records and may be subjective. Also, the dichotomous coding of health status was unable to capture patients' exact evaluation of health status outcome. We also call for caution that our results and findings were only limited to non-elderly patients and could not be generalized to all patients with diabetes. Results may vary as one uses different age range of the samples. For example, Ware et al. (1996) found no difference between HMOs and FFSs among nonelderly patients with diabetes; however, they found that for elderly patients (those

aged 65 years and older) treated under Medicare, declines in physical health were more common in HMOs than in FFSs.

To conclude, we found no selection bias among privately insured non-elderly patients with diabetes based on our methodology. No statistically significant difference among relative unhealthy patients in health status by type of health plans. However, compared with FFS plans, HMO plans resulted in better health outcome for relatively good health patients.

### Table 4.4: Mean Changes in Health Outcomes Across the Three Types of Health Plans from Round 1 - 3

| Variable | Definition | Weighted Mean (Round1) | | | Weighted Mean (Round3) | | | Mean Changes During Round 1-3 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | FFS | HMO | OMC | FFS | HMO | OMC | FFS | HMO | OMC |
| *Health Characteristics* | | | | | | | | | | |
| Perceived health status | 1 excellent; 2 very good | 2.997 | 3.101 | 3.166 | 3.092 | 2.934 | 3.030 | 0.095 | -0.167 | -0.135 |
| | 3 good; 4 fair; 5 poor | | | | | | | | | |
| Perceived Mental Health stat | 1 excellent; 2 very good | 2.050 | 2.119 | 2.071 | 2.261 | 2.320 | 2.223 | 0.211 | 0.201 | 0.152 |
| | 3 good; 4 fair; 5 poor | | | | | | | | | |
| Functional Limitation(s) | 1 if Yes; 0 otherwise | 0.228 | 0.225 | 0.244 | 0.262 | 0.179 | 0.231 | 0.034 | -0.046 | -0.012 |
| Need Help w/ADL | 1 if Yes; 0 otherwise | 0.018 | 0.004 | 0.023 | 0.026 | 0.015 | 0.018 | 0.008 | 0.011 | -0.006 |
| Need Help w/IADL | 1 if Yes; 0 otherwise | 0.043 | 0.015 | 0.042 | 0.057 | 0.031 | 0.027 | 0.014 | 0.016 | -0.015 |

Table 4.5: Number and Percentages Changes in Health Outcomes
Across the Three Types of Health Plans from Round 1 - 3

| Health status changes : In number | | | | In percentage: % | | |
|---|---|---|---|---|---|---|
| | the same | better | worse | | | |
| Total | 501 | 298 | 202 | | 50.05 | 29.77 | 20.18 |
| FFS | 85 | 38 | 38 | | 52.80 | 23.60 | 23.60 |
| HMO | 225 | 164 | 95 | | 46.49 | 33.88 | 19.63 |
| OMC | 191 | 96 | 69 | | 53.65 | 26.97 | 19.38 |
| | | | | | | |
| Mental health changes: In number | | | | In percentage: % | | |
| | the same | better | worse | | | |
| Total | 463 | 319 | 219 | | 46.25 | 31.87 | 21.88 |
| FFS | 82 | 49 | 30 | | 50.93 | 30.43 | 18.63 |
| HMO | 205 | 160 | 119 | | 42.36 | 33.06 | 24.59 |
| OMC | 176 | 110 | 70 | | 49.44 | 30.90 | 19.66 |

Table 4.6: Multinomial Logistic Regression Results Reported in Odds Ratios.
(Dependent Variable= Self-reported General Health Status)

| Variable | Excellent | Very Good | Fair | Poor |
| --- | --- | --- | --- | --- |
| HMO | 7.7734** | 1.5335 | 0.8999 | 0.6453 |
| PPO | 2.9999 | 0.9266 | 0.9194 | 0.8365 |
| | | | | |
| *Social Demographics* | | | | |
| Age | 1.0388 | 1.0102 | 0.9861 | 0.9517** |
| Male | 0.5279 | 1.1022 | 1.5822** | 1.2802 |
| Black | 1.0694 | 0.2682* | 1.3184 | 1.0506 |
| Hispanic | 0.4263 | 0.7429 | 1.7248* | 1.3077 |
| Education1 | 4.4925 | 0.6718 | 0.7982 | 0.4471 |
| Married | 0.5285 | 0.7091 | 1.2001 | 0.9828 |
| Income1 | 2.9964 | 0.7572 | 0.6269 | 0.7578 |
| Income2 | 0.0000 | 1.4350 | 1.3730 | 1.0259 |
| Income3 | 3.2044 | 0.9044 | 1.4507 | 1.1600 |
| Invome4 | 0.3964 | 0.7282 | 1.2423 | 1.5423 |
| Total health expenditure (0-1000$) | 0.3531 | 0.6491 | 0.4104 | 1.2428 |
| Total health expenditure(1000-2000$) | 0.4327 | 1.2042 | 0.4589 | 2.4638 |
| Total health expenditure(2000-3000$) | 0.0763 | 0.8565 | 0.6548 | 1.1134 |
| | | | | |
| *Personal lifestyle Behavior* | | | | |
| Smoke | 1.5122 | 1.4008 | 1.4423 | 2.1222 |
| Physical Activity | 2.4795* | 1.0054 | 0.9793 | 0.4851 |
| | | | | |
| *Health Characteristics* | | | | |
| Overweight | 0.3248 | 0.4157*** | 0.4168** | 0.6898 |
| Hypertension | 0.2037*** | 0.6382** | 1.0514 | 1.4349 |
| Coronary Heart Disease | 0.8399 | 0.6906 | 1.1873 | 2.2783 |
| Heart Attack | 16.3217** | 1.0495 | 2.5774 | 2.0257 |
| Heart Condition/disease | 0.8721 | 2.4339 | 1.7683** | 1.6175 |
| Stroke | 0.0000 | 0.9695 | 0.4984 | 0.1093** |
| Emphysema | 0.0000 | 2.6526 | 0.4616 | 0.4884 |
| Angina | 0.4942 | 1.0822 | 0.4434 | 0.9589 |

(Continue on next page)

| | | | | |
|---|---|---|---|---|
| Asthma | 0.3425 | 1.0613 | 0.7363 | 1.1205 |
| Arthritis | 1.4719 | 1.3874 | 1.0140 | 1.4373 |
| Joints (pain/aching) | 0.3761* | 1.1172 | 1.1698 | 1.9829 |
| Need Help w/ADL | 0.0000 | 1.5209 | 1.1391 | 5.2180 |
| Need Help w/IADL | 0.0000 | 9.4748 | 7.6305 | 7.9100 |
| Functional Limitations | 0.0000 | 0.5604 | 2.7866*** | 2.5940** |

Notes: The reference category of the dependent variable is "good" health status.

$^*$ $p<0.10$; ** $p<0.05$; and *** $p<0.01$, statistical significance.

# CHAPTER 5

## SUMMARIES, IMPLICATIONS, AND RECOMMENDATIONS

### 5.1    Summaries

This study has used up-to-date data from MEPS, a nationally representative survey, to examine the effect of managed care plans (as compared with traditional fee-for-service plans, or FFS) on the health care use and health outcome of patients with diabetes. It bears significance at the time that anger and frustration with managed care continue to grow and people become more concerned about the quality of health care provided to patients with high-risk disease(s).  With the increase in diabetes in the U.S., and the growing reliance on managed care plans, understanding the effects of different plans on health care utilization and health status is important to consumers, employers, and policymakers. In particular this study:

(1) Focuses on patients with diabetes, as they make up about 8% (24 million) of the population, a rate that will escalate dramatically for the foreseeable future;

(2) Separates HMOs from other managed care forms to compare with traditional FFSs as HMOs and other managed care plans delivery the payment in different ways;

(3) Evaluates the effect of managed care from multiple dimensions so as to provide more comprehensive results;

(4) Uses up-to-date and national representative data from the most complete source - Medical Expenditure Panel Survey (MEPS).

In addition, this study controls for the self-selected nature of persons in different health plans. One of the problems plaguing much of the research in this area is the possibility of systematic selection bias into managed care plans. Not controlling adequately for this selection bias in different health plans could threaten the validity of findings regarding to the discrepancies in health outcomes across plans. This study, therefore, has its methodological advantage in providing valid results and its policy implications.

The main empirical findings in this study provide favorable evidence for the performance of managed care plans. Most of the measures used to evaluate the quality of health care of managed care plans exhibited comparable or even better levels than traditional FFS plans. Specifically, in terms of access to care: 1) HMO enrollees were more likely having USC provider than FFS enrollees; 2) The providers in HMOs were more likely to have nights/weekends office hours when compared to FFS enrollees; 3) and, managed care groups made it easier to see providers. OMC plans exhibited no significant difference from FFS plans in any access measures. With regard to satisfaction with the providers, the analysis found no significant difference in any measures across the three types of plans.

As for the use of health care, number of nights in the hospital for discharges was significantly lower in HMO system compared to FFS system. HMO enrollees were more often treated with diet modification compared to FFS enrollees. In regards to health outcome, HMO enrollees were more likely fallen in category of "excellent" health as opposed to "good" health category when compared to FFS enrollees, which means use of HMO plans related to even healthier outcomes for

patients. OMC plans have no significant difference from FFS plans in the use of healthcare and health outcome. Therefore, to some extent, managed care plans came to mature, they could provide comparable or even better quality of care when compared with traditional FFS plans.

## 5.2    Implications

The empirical findings presented here carry important implications for the current health care system. On the one hand, the results of comparable quality of care from managed care plans among non-elderly patients with diabetes should reassure customers, policymakers, and insurers. Some recent research showed that managed care provided less quality of care for the elderly or those with high-risk diseases (Miller and Luft, 2002; Experton et al., 1999; Smith et al., 1999). People from different sides began to suspect that managed care may skimp on care services, especially specialty care, in exchange for lower costs. The perception does not hold here in this study, at least not for the services we examined. Managed care plans should be looked at more objectively.

On the other hand, HMO enrollees were more likely fell in the category of "excellent" health as opposed to "good" health category when compared to FFS enrollees, which means HMO plans resulted in even healthier outcome for relative good health patients. Generally, HMO plans charge lower copays than OMC plans, and have no deductible or less deductible than traditional FFS plans, so enrollees may more easily obtain primary and preventive care. Better use of primary and preventive care may contribute to this success of HMOs among relatively healthy patients. The Patient Protection and Affordable Care Act (PPACA) signed into law

this March by President Barack Obama includes that "effective by 2018, all existing health insurance plans must cover approved preventive care and checkups without co-payment". This may serve to provide more primary and preventive care opportunities to enrollees and thus eliminate the discrepancy across plans.

Another implication of the study is that even though both managed care and traditional FFS plans provided relatively good health care services to non-elderly patients with diabetes, almost 20% of patients deteriorated in health within one year. Although age may play a role, lack of a systematic way to achieve better outcomes may be another important reason. Therefore, future plans, both managed care and traditional FFS plans, may consider to provide diabetes management (DM) program to patients with diabetes.

By definition, a DM program is an "integrated system of interventions, measurements, and refinements of health care delivery designed to optimize clinical and economic outcomes within a specific (diabetic in this study) population" (Gurnee 1997). Several studies (Aubert 1998; Peters 1998) have demonstrated the value of DM efforts. Rubin et al (1998) also showed that patients in the program were more likely to get HbA1c tests, foot exams, eye exams and lipid measurements. Meanwhile, the program achieved gross economic adjusted savings of $50 per diabetic member per month (12.3 percent). Admissions per 1,000 diabetic member years decreased by 18 percent and bed days fell by 21 percent.

However, for health plans, it should be noted that benefits such as these often require a long-term commitment to a DM protocol. Because the savings in treatment costs are often years into the future, diabetes DM programs can cost more than they

may save in the short term (Marcille, 2000). It is true that these programs require front-end funds, which can be difficult to sustain, and necessitate continued support. It might be worthwhile in the long run, however, not only for patients' health, but also for future medical expenses.

This recommendation echoes "standards of medical care in diabetes -2010" set by the American Diabetes Association (ADA). It recommended that "People with diabetes should receive medical care from a physician-coordinated team…… A variety of strategies and techniques should be used to provide adequate education and development of problem-solving skills in the various aspects of diabetes management" (ADA, 2010). Recently, news (Renée, 2010) reported that Walgreens' Diabetes Management Program sparked interest of health plans, and several health plans and employers were considering offering it to enrollees. Therefore, future plans are recommended to provide a systematic way, such as DM program, to achieve better health outcomes for diabetic subgroup.

## 5.3    Recommendations

This study has taken a significant step toward answering an important research question: compared to traditional FFS plans, did managed care provide comparable health care services and resulted in the same health outcome among nonelderly patients with diabetes? However, several other aspects deserve future research to help clarify this issue further.

First, follow-up periods longer than one year may better detect differences in health outcomes. We followed up only one year for health status outcome. The health outcome differences might emerge over longer periods of time.

Second, further exploration of specialty care use among nonelderly patients with diabetes may provide more comprehensive results.  Although this study covered a wide range of measures of health status and care utilization, we do miss some other specialty care use, such as blood glucose control, urine protein or creatinine determination, or other diabetes management, due to data unavailability. This may be an important measure to examine across plans and certainly deserves further investigation.

Finally, it would be also worthwhile to take a look at other subgroups with diabetes, such as those in Medicaid or Medicare.  There could be differences in the way that managed care affects those patients.  Trying to take an objective look with all-around perspective may help to identify the strengths and the weaknesses of the entire system.

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**ABSTRACT**


**EFFECTS OF MANAGED CARE ON THE HEALTH
AND HEALTHCARE OF THE NONELDERLY WITH DIABETES**


by

**MEIHUA LU**

**May 2011**


**Advisor**:     Dr. Allen C. Goodman

**Major**:        Economics

**Degree**:     Doctor of Philosophy

This dissertation attempts to examine the quality effect of managed care plans (as compared with traditional fee-for-service plans, or FFS) on the health outcome and health care use of patients with diabetes. As the number of diabetics is growing rapidly with many of them are relying on managed care plans, knowing better the effects of different plans on health status and health care utilization is of great interest and significance to consumers, employers, and policymakers, especially at a time that universal health care is under being implemented.

Using up-to-date data from MEPS, a nationally representative survey, I compared 484 HMO patients, 356 OMC patients, with 161 patients (who presented with diabetes) in terms of access to, satisfaction with, utilization of care (including diabetes care), and health status, to evaluate the quality of health care enrollees receive and their health outcome.

The main empirical findings in this study provide favorable evidence for the performance of managed care. Most of the measures we used to evaluate the quality of health care of managed care plans exhibited comparable level or even better to traditional FFS plans. Specifically, in terms of access to care,: 1) HMO enrollees were more likely having USC provider than FFS enrollees; 2) The providers in HMOs were more likely to have nights/weekends office hours when compared to FFS enrollees; 3) And, HMO enrollees were much easier to see providers. With regard to satisfaction with the providers, the analysis found no significant differences in any measures across the three types of plans. As for use of health care, HMO enrollees have lower number of nights in hospital for discharges and were more often treated with diet modification compared to FFS enrollees. In regards to health outcome, HMO enrollees were more likely fallen in category of "excellent" health when compared to FFS enrollees. OMC plans exhibited no difference from FFS plans.

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