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Transition from Health Maintenance Organizations to Consumer Driven Health Plans: Measurement of Initial Impacts for Members with Chronic Conditions

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Transition from Health Maintenance Organizations to Consumer Driven Health Plans: Measurement of Initial Impacts for Members with Chronic Conditions

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

by

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ABSTRACT

TRANSITION FROM HEALTH MAINTENANCE ORGANIZATIONS TO CONSUMER DRIVEN HEALTH PLANS: MEASUREMENT OF INITIAL IMPACTS FOR MEMBERS WITH CHRONIC CONDITIONS

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A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

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New consumer driven health insurance products are designed to contain health care costs by making consumers more accountable for the care they receive through being responsible for more cost sharing, making decisions regarding health care providers they will use, and increasing exposure to and use of health information for services and providers. Potential benefits of consumer driven products include increased information regarding personal health and a more knowledgeable patient base. Potential drawbacks of consumer driven products include negative impacts on consumers with chronic and complex health conditions.

The purpose of this study was to ascertain differences in health services utilization and health status for health plan members with diagnoses that are consistent with heart failure, coronary artery disease and/or diabetes mellitus who make the transition from a

health plan Health Maintenance Organization (HMO) to a Consumer Driven Health Plan (CDHP). Health plan members who changed plans were compared to those who remained in the HMO during a one year time period (2006). Utilization measures included primary care physician visits, specialist physician visits, inpatient admissions, outpatient procedures and emergency room visits. Health status was measured by member acuity risk scores. Selection bias was partially controlled by including only members who did not have a choice between an HMO or CDHP in the study.

Logistic analysis and MANOVA were used to obtain study results. No statistically significant differences in utilization for members in the CDHP were seen for primary care visits, specialist physician visits, inpatient admissions and emergency room visits when compared to members in the HMO. Controlling for age, gender, income level, physician coinsurance levels and acuity, the utilization of outpatient procedures was significantly lower in the CDHP. The independent variable showing significance for all utilization analyses was the 2006 risk score that was used as a proxy for member acuity. Study results for comparison of changes in health status could not be obtained due irregularity in predicted 2007 risk scores for members in the CDHP.

In this initial study of the first year of CDHP experience, benefit design seemed to have limited influence on the behavior of individuals. Future studies may include longitudinal analyses and refinement of risk measurement techniques.

CHAPTER ONE: INTRODUCTION

Problem Statement

The development of new market-based health insurance models and products has been in reaction to rising health care costs and the consumer backlash against managed care products. Consumer driven health products are based on the assumption that health care cost containment and quality of care improvements will result by making consumers share greater out-of-pocket costs, expanding their decisions in choices of health care providers and providing more exposure to health information.

The purpose of this research is to study health plan members with diagnoses that are consistent with the chronic conditions of heart failure, diabetes mellitus and/or coronary artery disease who transition from a Health Maintenance Organization (HMO) product to a Consumer Driven Health Plan (CDHP) product to ascertain if actual changes in health services utilization and/or health status, and projected changes in health status, occur as a result of this switch in health plans. The policy aim is to develop recommendations regarding future CDHP care programs and product design that are based on the results of the study.

Potential benefits of consumer driven products include better consumer information regarding personal health, greater consumer responsibility for health choices and a more knowledgeable patient base (Harris, 2003). President Bush's health policies have included expanding the use of high-deductible insurance products by allowing

individuals who set up health spending accounts to deduct the premiums they pay for major medical policies from their taxes. There will be a continued push for health spending accounts as the administration believes that they will help curb healthcare spending and provide more affordable health insurance products to stem the rising tide of uninsured populations (Price Waterhouse Cooper, 2004).

There are concerns regarding increased consumer cost sharing having detrimental impacts on access to needed care, especially for those with chronic health conditions (Mays, Hurley & Grossman, 2003). The high out-of-pocket cost burden that is associated with increased cost sharing may cause lower income people with chronic conditions to forgo needed care and/or force decisions regarding cost-choice tradeoffs when they are too sick to make an informed choice (American College of Physicians, 2004).

The focus of this study is on the health care industry transition from managed care to consumer driven health products. The emphasis of the study is on the current components of consumer driven health plans and their initial impact on consumers with chronic and complex health conditions. This population may be influenced by multiple components of consumer driven health plans, including increased cost-sharing rather than first-dollar coverage as experienced in Health Maintenance Organizations, and through more choice of network providers, increased information regarding health care conditions and increased information regarding health care providers. Impacts on these consumers will affect the long-term viability of these health plans and additional study in this area is helpful in determining potential changes to this new model for financing health care services.

This research provides an opportunity for initial evaluation of new health insurance mechanisms that are expected to become models for future coverage. Understanding the impact on people with chronic diseases and the implications for population health status will provide valuable information for future planning for both commercial insurance carriers and potential adoption of these models in government programs. This research will be especially useful if these insurance models are introduced to the elderly population where chronic disease conditions are more prevalent.

Background

Consumer driven health care is a recent phenomenon that is predicated on increased consumer involvement in the delivery and receipt of health care. While health plans have moved away from core strategies of managed care (Lesser, Ginsburg & Devers, 2003), they have also reintroduced more targeted authorization programs and have also experimented with tiered provider networks, incentive-based provider payments, intensive case management programs, predictive modeling applications and increased consumer cost sharing requirements in an effort to control premium costs (Mays, Claxton & White, 2004). Health plans have recently shifted health care costs to consumers through expansion of provider networks while passing differences in fee levels on to the consumer through their employers by way of higher premiums, deductibles and co-payments (Mays, Hurley & Grossman, 2003; Robinson, 2002). Rationales for this shift include creating reasonable consumer cost sharing to guard against unreasonable expectations for health care coverage, while also providing

information regarding appropriate care practices, treatment alternatives, cost of care and quality indicators (Klepper & Broadsky, 2003).

The concept of CDHPs is based on "defined contribution" in which employers provide a defined amount of money or contribution for eligible employee benefit coverage that will give the employee a larger stake in financial decision making regarding the health care that they receive. Some CDHPs include tiered hospital and physician networks with which include higher member financial responsibility if they do not use preferred providers. Included in the concept of CDHPs is the provision of increased consumer information regarding health care services and health care providers.

Initial surveys of consumers who purchase consumer driven products show that they are higher income employees, are less likely to have chronic health problems and are more likely to have had no recent physician visits (Davis, 2004). An early evaluation of medical care costs and utilization in a consumer driven health plan as compared to other health plans showed that enrollees in the consumer driven plans had total expenditures that were less that other plans after an initially favorable selection (Parente, Feldman & Chris, 2004). It is noted that consumers with a chronic health care condition are more likely to choose health plans with lower out-of-pocket responsibilities (Davis, 2004).

Identified potential problems associated with consumer driven products include adverse selection in other products (Harris, 2003), limited knowledge regarding the extent to which quality of care is affected by these plans, and whether or not web-based information and tools actually make patients become better consumers (LoSasso, Rice, Gabel & Whitmore, 2004). There are concerns regarding increased consumer cost

sharing having detrimental impacts on access to needed care, especially for those with chronic health conditions (Mays, Hurley & Grossman, 2003).

Purpose Statement

This study focuses on the actual utilization of health care services and health status, and projected health status, for a population with chronic health conditions that transition from a managed care plan to consumer driven health plan. This research for the effects of consumer driven health plans on health care consumers with chronic conditions changes includes the evaluation of cost-sharing and financial income variables. Outcomes include the utilization of health services and impacts on health status as a result of a combination of these factors.

Conceptual Model

The application of theory and conceptual research to the health industry transition from managed care to consumer driven health care with specific application to consumers with chronic health conditions introduces multiple behavioral and environmental factors. Social ecology theory is considered as an overarching structure for analysis of components that influence healthcare outcomes. The Andersen Behavioral Model of Health Services Use is used as a framework to develop an analytical model. A comparison of managed competition and consumerism health care models that influence consumer utilization of health care services provides detail for development of the analytical basis of the study.

A comparison of the economic models of managed competition for which HMOs are based, and consumerism for which CDHPs are based are included in the study model:

1. Managed competition supports limited consumer cost sharing economic incentives at the time of seeking care with a focus on quality rather than cost. Consumerism supports substantial consumer cost sharing incentives at the time of seeking care, with strong incentives to consider cost as well as quality.
2. The preferred benefit design for managed competition is limited consumer cost sharing and comprehensive coverage with modest co-payments. The preferred benefit design for consumerism is extensive consumer cost sharing and high deductibles with health savings accounts.

Key research questions include:

1. What factors are associated with a change in health insurance coverage from HMOs to CDHPs for members with chronic health conditions?
2. If health services utilization is affected, is it increased or decreased?
3. If health services utilization is affected, what are factors regarding consumer cost sharing and income level that are correlated with health services utilization?
4. If health status changes occur, are they increased or decreased?
5. If health status changes occur, what are factors regarding consumer cost sharing and income level that are correlated with changes in health status?

Hypotheses

The hypotheses for this research study of members with diagnoses that are consistent with chronic conditions of Heart Failure (HF), Coronary Artery Disease (CAD) and/or Diabetes Mellitus (DM) will focus on outcomes differences when these

members transition from Health Maintenance Organizations (HMOs) to Consumer Driven Health Plans (CDHPs). The overall hypotheses for the study are:

1. Consumers who change to CDHPs and have been diagnosed with the conditions of HF, DM and/or CAD will have lower health services utilization when compared with consumers with these conditions who remain in HMOs.
2. Consumers who change to CDHPs and have been diagnosed with the conditions of HF, DM and/or CAD will have adverse changes in condition acuity when compared with consumers with these conditions who remain in HMOs.

Study Design

The study is completed through analysis of member claims data for a major health insurance company that administers health insurance products for four million members. The health insurance products to be included in the study are a HMO and a CDHP. The study utilized health plan claims data on a retrospective basis.

The study population includes health plan members in commercial products between 18-64 years of age who have claims that are consistent with conditions of HF, CAD and/or DM in the HMO and the CDHP health insurance products. The control group consists of a sample of the study population in the HMO with diagnoses that are consistent with HF, CAD and/or DM. The study group consists of the study population in the CDHP product with diagnoses that are consistent with HF, CAD and/or DM.

The study utilizes health plan claims data for the year 2006 and is designed to ascertain and compare initial differences in actual health services utilization and health status, and projected health status, for members in the health plan HMO and CDHP after

controlling for selection effects. Health plan members were monitored over a one-year period of time. Statistical analyses are performed to determine if differences exist in health services utilization and health status for members in the HMO and the CDHP, and if independent variables relating to the products and benefit differences affect dependent variables that are specific to measuring actual health services utilization and health status, and projected health status, of the members.

Significance of Study

The significance of this research is the opportunity to perform an initial evaluation of new health care financing and coverage mechanisms that could proliferate and become the model of health care coverage in the future. This research makes a substantive contribution in that it examined consumer driven health plans and their impact on consumers with chronic and complex health conditions. Impacts to these consumers could ultimately result in a decline in health status for this population. Understanding the impact on members with chronic diseases and the implications for population health status can provide valuable information for future planning for both commercial insurance carriers and potential adoption of these models by government programs. This research will be especially useful if similar insurance models are introduced for the elderly population where chronic disease conditions are more prevalent.

CHAPTER TWO: LITERATURE REVIEW

A health care industry transition from managed care to consumer driven health care is intended to increase consumer cost sharing, expand consumer decisions regarding health care providers and increase exposure to health care information. Strategies for consumer driven health plans are based on the belief that health care services are over-utilized and that giving financial incentives to consumers will induce them to seek lower cost providers and reduce the use of services with marginal value.

The literature review includes the major topics of health maintenance organizations (HMOs), the backlash against HMOs, changes in health care economic models, consumer driven health plans (CDHPs), health care consumer attitudes, consumer use of medical information, consumer use of health and wellness information, and managed/non-managed care effects on chronic conditions. The literature review provides direction for study of the health care industry transition from HMOs to CDHPs with a focus on impacts to populations with chronic health care conditions of congestive heart failure, diabetes mellitus and/or coronary artery disease. A study of cost sharing impacts on this population will help to fill to research gaps for new consumer driven health products and can provide direction for future studies.

Health Maintenance Organizations (HMOs)

Health maintenance organizations (HMOs) provided a dramatic change for the health care industry in the 1980s by providing an alternative to fee-for-service (FFS) indemnity plans through managed care arrangements (Morrison & Luft, 1990). Managed care encompasses a variety of arrangements that attempt to coordinate the use of health care related services by utilizing primary care physicians to act as gatekeepers for access to specialty services through restrictions placed on reimbursements for specialty services (Institute of Medicine, 2000). Managed care tools to contain health care costs include selective contracting to exclude inefficient providers from networks and capitation contracting methodologies to transfer financial risk to providers, while providing comprehensive benefit packages with limited consumer-cost sharing to attract members and reduce financial barriers to routine health care that may alleviate the need for more intensive services (Mays, Hurley & Grossman, 2003).

Managed care can be traced to a series of alternative health care arrangements that appeared in various communities across the country as early as the 19th century. The goal of these arrangements was to help meet the health care needs of select groups of people, including rural residents and workers and families in the lumber, mining and railroad industries by having enrollees pay a set fee to physicians who then delivered care under the terms of their agreement (Tufts Managed Care Institute, 1998).

The growth of HMOs was stimulated by the Health Maintenance Organization Act of 1973, which provided federal funds for the establishment and expansion of new HMOs. Support for the growth of HMOs included the belief that prepaid medical care, as an alternative to traditional fee-for-service practice, would stimulate competition

among health plans and enhance efficiency, which would slow the rate of health care expenditures (Shi & Singh, 2001, p. 316).

Organized medicine has historically opposed prepaid plans. The American Medical Association (AMA) was opposed to the "corporate practice" of medicine and worked to suppress the growth of prepaid plans and cooperatives through expelling physicians that participated in managed care plans from local medical societies, prevented them from obtaining consultations and referrals, and persuaded hospitals to deny them admitting privileges (Tufts Managed Care Institute, 1998). As a result of these actions, the AMA was indicted in 1947 and convicted of violating the Sherman Antitrust Act in its efforts to suppress the new plans (Tufts Managed Care Institute, 1998).

Provider concerns with HMOs include the oversight and potential limitation of tests and referrals, time constraints with patients due to limited reimbursement and limited identified benefits of managed care restrictions (Bovbjerg & Miller, 1999). Provider questioning of trustworthiness of health plans has been especially noted in for-profit plans that are affiliated with multi-state corporations (Schlesinger, Quon, Wynia, Cummins & Gray, 2005).

Consumer concerns regarding HMOs include perceptions of potential inadequate access to health care services and lower quality of care as compared to indemnity fee-for-service health plans (Hennessy, J., 1999; Reschovsky, Kemper & Tu, 2000; Shi & Singh, 2001, p. 343; Wilensky, 1999). One study notes that enrollees in managed care plans are less likely to cite financial barriers to care but are more likely to perceive problems in provider access, convenience and organizational factors (Reschovsky,

Kemper & Tu, 2000). Patients polled between 1995 and 1997 in a survey designed by researchers at the Henry J. Kaiser Family Foundation and Harvard University revealed that 51% of patients believed that their plan decreased the quality of care for sick patients and 55% believed that their plan might consider cost savings more important than optimal medical care if they became ill (Hennessy, 1999).

Consumer concerns regarding managed care resulted in the introduction of legislation regarding increased oversight of HMOs. A Kaiser/Harvard/Princeton Survey Research Associates survey found that most insured Americans were satisfied with their health insurance plan but a majority of Americans favored government regulation of managed care, even if it raised costs (Blendon, Brodie, Benson, Altman, Levitt, Hoff and Hugick, 1998). A slight majority (52%) believed that government should protect consumers of managed care, while 40% said that such intervention is not worth the increased costs that would result. Fifty-nine percent said that managed care plans have made it harder for people who are sick to see specialists, and 55% said that they are at least "somewhat worried" that their health plan would be more concerned about saving money than what is the best medical treatment (Blendon et al., 1998). The literature also suggests that some HMO plans resisted market-improving legislation, in part because they may have benefited from market imperfections that allowed them to attract healthy populations while avoiding sick populations, and contributed to negative perceptions regarding the managed care industry (Enthoven & Singer, 1998).

Other reasons for member dissatisfaction with HMOs include feelings of loss of access and freedom when having to switch to a managed care plan involuntarily and not seeing health insurance premiums decrease on an individual level (Shi & Singh, 2001, p.

343). Legal reaction coupled with deteriorating relationships between plans and health care providers caused HMO plans in many communities to loosen controls on provider utilization, thus causing a decline in managed care results in containing health care costs (Lagoe, Aspling & Westert, 2005).

The literature indicates that a media bias for a negative tone of reporting and a focus on isolated incidents of poor outcomes contributed to negative consumer perceptions of HMOs (Blendon et al., 1998; Bovbjerg & Miller, 1999; Shi & Singh, 2001, p. 343; Wilensky, 1999). A public backlash against HMOs was fueled by relatively rare events that were experienced by a small number of consumers (Blendon et al., 1998). It was noted that the tone of media coverage became more critical over time, and the most visible media sources had negative stories in more than half of their coverage of managed care (Wilensky, 1999).

The literature shows that a fundamental flaw in managed care was to attempt to control health care costs behind the scenes, as consumers were offered comprehensive benefit coverage but interpreted cost-control strategies as barriers to access (Robinson, 2001). The literature suggests that the managed care backlash represented the views and perceptions of providers and the media, with consumers voicing their concerns and causing health plans to change the structure of HMOs (Marquis, Rogowski & Escarce, 2004).

While media and provider negativism regarding HMOs has been documented, positive aspects of HMOs included a greater emphasis on primary and preventive care, reduced infant mortality, implementation of disease management programs and reduction of Caesarean sections and hysterectomies in unwarranted cases (Shi & Singh, 2001, p.

343). It is noted that, while there was a modest decline in member enrollments in HMOs in the late 1990s, the consumer backlash against HMOs did not result in a large number of consumers switching to other insurance plans (Marquis, Rogowski & Escarce, 2004).

Measurement of cost differences between HMOs and FFS indemnity plans is difficult due to the need to account for potential favorable selection in HMO plans. A study found that Medicare HMO beneficiaries in California had 18 percent lower inpatient days than enrollees in the traditional Medicare FFS plan. The analysis indicated that managed care practices accounted for 30% of the reduction in inpatient days with 70% of the reduction being accounted for by favorable selection, and concluded that Medicare HMOs in California were able to reduce inpatient utilization (Dhanani, O'Leary, Keeler, Bamezai & Melnick, 2004). Another study found that the use of health care services by Medicare HMO enrollees was about four percent lower than use by similar traditional Medicare enrollees (Shinogle, 1997).

Health plans have moved away from core strategies of managed care as a result of tight labor markets that made employers responsive to employee demands for fewer restrictions on access to health care, and providers gaining leverage relative to managed care plans (Lesser, Ginsburg & Devers, 2003). Movement away from managed care core strategies include expansion of provider networks, changing provider reimbursement mechanisms from capitation to FFS methodologies and increased consumer cost-sharing mechanisms (Robinson, 2002). Declines in the use HMO utilization management mechanisms to limit unnecessary care have also been seen as a result of potential litigation (Enthoven, 2003).

However, HMO cost containment strategies that were scaled back have re-emerged due to large increases in health care costs that are coupled with an economic slowdown. Health plans have reintroduced more targeted authorization programs, and have also experimented with tiered provider networks, incentive based provider payments, intensive case management programs, predictive modeling applications and increased consumer cost sharing requirements in an effort to control premium costs (Mays, Claxton & White, 2004). These actions indicate that health plans will change their use of managed care tools as the nature of health plan competition relating to price, choice of providers and convenience changes (Mays, Hurley & Grossman, 2003). The results of these strategies will depend on how they mature over a more extended time period (Mays, Claxton & White, 2004).

Key-points in the literature review include that managed care offers the potential to control health care costs and HMOs have been successful in initiating a greater emphasis on primary and preventative care, and reduction of unwarranted services. Provider concerns with HMOs include oversight and potential limitation of tests, time constraints, questions of benefits for managed care limitations and a lack of trustworthiness of health plans that administer HMOs. Consumer concerns regarding HMOs include perceptions of inadequate access to health care services, potential lower quality of care and limited experience with a resulting decrease in premiums. Attempts to control health care costs "behind the scenes" were interpreted as limitations in access to care, which was fueled by a negative media bias. As a result of provider and perceived consumer dissatisfaction, health plans have moved away from managed care strategies, and have shifted to alternative health care models.

Contrasting Models: Managed Competition Versus Consumerism

The literature review includes research regarding health care economic models. New models are being discussed and developed in reaction to perceived inadequacies in the current managed competition model for which HMOs are based.

Robinson (2005) describes supply-side/managed competition incentives in insurance network designs as including the contractual structure of provider relationships that form provider payment and administrative oversight mechanisms resulting in a provider-centric focus. Financial incentives should be directed primarily at providers rather than consumers. Network designs are intended to balance reimbursing providers adequately to promote quality and innovation while motivating them to search for efficient and less costly forms of treatment. The managed competition framework raises skepticism concerning the consumer ability to make good financial decisions at the time of illness and highlights the uneven distribution of medical expenditures, where a majority of costs are incurred by a minority of very ill patients (Robinson, 2005).

Research and publication of the Community Tracking Study, a longitudinal study that tracks changes in local health care systems nationwide, identifies the barriers to efficient health systems in the managed competition model. These barriers include providers having excess market power over payers, the absence of potentially efficient provider systems due to consumer demands for large provider networks, and insufficient health plan competition due to higher fixed costs and legal barriers to entry for HMOs (Nichols, Ginsburg, Berenson, Christianson & Hurley, 2004).

Robinson (2005) describes demand-side/consumerism incentives in insurance benefit designs as attempting to balance protecting consumers from unforeseen medical

expenditures while stimulating consumer choice resulting in a patient-centric focus. Health insurance is socially beneficial for the purpose of spreading costs of unpredictable illness, but also undermines consumer cost conscious choice among providers and procedures. Robinson (2005) states that consumerism holds an optimistic view of consumer ability to make cost and quality choices at the time of seeking care and is skeptical concerning the role of intermediary organizations such as physician groups, hospital systems, vertically integrated health plans and corporate purchasers of health benefits. Robinson (2005) notes that the optimal consumerism insurance benefit design is a high-deductible indemnity umbrella, which is supported by a health services account that can be used for non-catastrophic expenses.

Health plans have increased health care costs to consumers through higher premiums, deductibles and co-payments (Mays, Hurley & Grossman, 2003; Robinson, 2002). Rationales for this shift include creating reasonable consumer cost sharing to guard against unreasonable expectations, while also providing information regarding appropriate care practices, treatment alternatives, cost of care and quality indicators (Klepper & Broadsky, 2003).

The development of new market-based health insurance models and products has been in reaction to rising health care costs and the consumer backlash against managed care products. Health care costs grew about eight times as rapidly as everything else in the economy in 2002 and 2003 respectively, causing many businesses to raise employee health care contributions to levels that have forced some employees and dependents to drop from enrollment or to become underinsured (Klepper & Broadsky, 2003). In

reaction to this, many new product designs have included narrower benefit structures and higher employee cost-sharing (Sanstad, 2001).

Concerns regarding increases in consumer cost-sharing for health care include the potential for adverse impacts to poor and sick populations. It is noted that co-payments and deductibles that are not adjusted for enrollee income or health status may impose a greater burden on the poor and sick than on the rich and healthy populations (Robinson, 2002). There are concerns that new health insurance models with more consumer responsibility through high deductibles will not provide incentives to be cost conscious for high-cost consumers with chronic illnesses because their health expenses will quickly exceed their deductibles (Enthoven, 2003).

Robinson (2005) thinks that the fundamental differences between managed competition and consumerism are views on consumer ability to make appropriate choices at the time of seeking care and the utility of organizations that inform, subsidize and guide individual choices. He suggests that a combination of the best elements of the demand-side approach (consumerism) and the supply-side approach (managed competition) be considered in developing managed consumerism models.

Key-points in current changes to health care economic models encompass movement from managed care strategies that includes expansion of provider networks care networks, provider reimbursement changes from capitation to FFS, a decline in utilization management and increased consumer cost sharing. Comparisons of supply side managed competition and demand side consumerism highlight differing views on amounts of consumer cost sharing.

Health plans have increasingly shifted health care costs to consumers through higher premiums, deductibles and co-payments. Rationales for this shift include setting reasonable consumer cost sharing to guard against unreasonable expectations and to highlight consumer responsibility. Concerns regarding increased consumer cost sharing include the potential for adverse effects to poor and sick populations.

Current gaps in the literature include projected effects of increased consumer cost sharing as the health care industry shifts from managed care to consumerism models. Documentation is limited regarding effects on sicker consumers and consumers with lower financial income.

Consumer Driven Health Plans (CDHPs)

New consumer driven health plan models are predicated on the potential ability to contain health care costs and to enhance quality of care by making consumers more accountable for the care they receive through increased cost-sharing, expanding decisions regarding health care providers and providing increased health care information via the Internet. Strategies for consumer driven health care products are based on the belief that some health care services are over-utilized and that giving financial incentives to consumers will induce them to seek lower cost providers and will reduce the use of services of marginal value (Davis, 2004). It is thought that by exposing consumers to the actual price of medical services, different options of care, appropriate information that will support decision making and appropriate financial incentives, they will become more involved and more prudent users of care to support a more efficient health care system (American College of Physicians, 2004).

The definition of a consumer driven health plan (CDHP) is fluid, but the basic concept is based on a defined contribution, in which employers provide a pre-defined amount of money or contribution for eligible employee health benefit coverage, thus giving employees a larger stake in financial decision-making regarding the health care that they purchase (Chapman & Barchet, 2002). CDHPs can be described along a continuum of health plans with varying degrees of employer/sponsor and employee/participant responsibility, with most common models including high deductible catastrophic insurance with health spending accounts (American Academy of Actuaries, 2004; Davis, 2004). Various forms of health spending accounts include health reimbursement accounts (HRAs), medical savings accounts (MSAs) and health savings accounts (HSAs).

A HRA, which is provided by the employer, is a specified benefit amount that is used to pay for eligible medical expenses as defined by the employer (American Academy of Actuaries, 2004). An example of a consumer driven product using an HRA is as follows (Booz Allen Hamilton, 2003):

> In addition to sharing the health insurance premium with employees, the employer places a certain amount of money each year (e.g., a defined contribution of $2,000) into an employee account that can be used to pay medical expenses. The contribution is funded directly by the employer on a pretax basis and employees are reimbursed up to the limit when expenses are incurred. These plans also include a catastrophic insurance policy with a high annual deductible (e.g., $3,500 for a family and $1,500 for individuals). If the employee uses all of the $2,000 for medical expenses, they would then be responsible for the additional $1,500 in expenses to meet the $3,500 deductible. Afterwards, the catastrophic insurance takes effect. Any of the $2,000 that may remain in the account at the end of the year would be carried over to the following year and added to the new employer contribution of $2,000. In some plans, remaining funds could be invested into portable Financial Savings Accounts.

MSAs are held by the employer and can be rolled over from year to year while building tax-free interest over time, and HSAs are held exclusively by the employee (American College of Physicians, 2004). Key differences between HRAs and HSAs include HRAs being employer funded and not typically portable and HSAs being funded by individuals that can be invested if not used (Cigna, 2006; Society of Actuaries, 2004). Preventive services may be paid by the health plan and not from the employee account and high deductible plans (Chapman & Barchet, 2002).

The Treasury Department and the Internal Revenue Service (IRS) have provided guidance for health spending accounts to include definitions of medical services and preventative services, and interactions between various health spending accounts (Fronstin, 2004). These entities direct standards on minimal and maximum amounts for health savings accounts, as well as penalties for early withdrawals from these accounts (Fronstin, 2004; Fuchs & James, 2005).

Identified potential benefits of consumer driven products include better consumer information regarding personal health, greater consumer responsibility for health choices, a possibility of decreased utilization of marginal health care services, more efficient administrative systems and a more knowledgeable patient base (Harris, 2003). Supporters of CDHPs suggest that the approaches are realistic for health care cost containment as, while managed care relied on decisions regarding limitations in care utilization by second parties, CDHPs will assign utilization decisions with higher cost-sharing to the users of care (Lagoe, Aspling & Westert, 2005). Plans for President Bush's second term health policies include expanding the use of high-deductible insurance products by allowing individuals who set up health spending accounts to

deduct the premiums they pay for major medical policies from their taxes. There will be a continued push for health spending accounts, as the administration believes that they will help curb healthcare spending and provide more affordable health insurance products to stem the rising tide of uninsured populations (Price Waterhouse Cooper, 2004).

Potential problems associated with consumer driven products include adverse selection in other products, as a study of early experiences of firms offering consumer-driven health care plans showed favorable selection trends when these plans are introduced alongside traditional PPO and HMO plan offerings (Harris, 2003; Buntin, Damberg, Haviland, Kapur, Lurie, McDevitt & Marquis, 2006). Initial surveys of consumers who purchase consumer driven products show that they are higher income employees, are less likely to have chronic health problems and are more likely to have had no recent physician visits (Davis 2004). An early evaluation of medical care costs and utilization in a consumer driven health plan as compared to other health plans showed that enrollees in the consumer driven plans had total expenditures that were less that other plans after an initially favorable selection (Parente, Feldman & Chris, 2004). It is noted that consumers with a chronic health care condition are more likely to choose health plans with lower out-of-pocket responsibilities (Davis, 2004). The potential for healthy consumers to purchase consumer driven products and consumers with chronic conditions to purchase plans with lower out-of-pocket costs presents a potential selection bias for consumers in CDHPs and HMOs. It is noted that employers generally direct what types of health plans employees will be able to choose which may limit selection bias at the member level, however selection bias may occur at the employer level.

There are concerns that there are wide variations in consumer ability and preparedness to use information to navigate the health care system (Robinson, 2001). There may also be limitations in health care consumer information for decision support (Rosenthal & Milstein, 2004). Fear of adverse risk selection and disproportionately greater out of pocket costs for those who are sicker or poorer has also drawn opposition to consumer driven health plans (Gauthier & Clancy, 2004). Additionally, little is known about the extent to which quality of care is affected by these plans and if web-based information and tools actually make patients become better consumers (LoSasso, Rice, Gabel & Whitmore, 2004). Opponents of consumer driven health plans argue that the approach is inferior to managed care, and that financial incentives and Internet based information is not a substitute for the relationship between a patient and health care provider (Lagoe, Aspling & Westert, 2005).

There are additional concerns regarding increased consumer cost sharing having detrimental impacts on access to needed care, especially for those with chronic health conditions (Mays, Hurley & Grossman, 2003). The high out-of-pocket cost burden that is associated with health spending accounts may cause lower income people with chronic conditions to forgo needed care and/or force decisions regarding cost-choice tradeoffs when they are too sick to make an informed choice (American College of Physicians, 2004). One study states that only a minority of health plans report that they monitor claims to protect against under-use of health services (Rosenthal & Milstein, 2004).

It is noted that five percent of the population use a majority of all dollars that are generated on health care, and that a high deductible may not have an impact on health care spending for this population (Halvorson, 2004). Robinson (2004) notes that

consumers with chronic medical conditions such as asthma, diabetes and congestive heart failure are usually in frequent need of clinical services and will have to pay considerable amounts of money before reaching their insurance product out-of-pocket maximum. This may stimulate a consumer backlash against consumer driven health plans when consumers refuse needed health care services when faced with high deductibles and network tiers (Robinson, 2004). Thorpe (2005) states that a reliance solely on a consumer-driven model will not address key factors in health care spending, and this model does not address public health and prevention interventions at the population level.

A study of initial experience with consumer driven health plans in Switzerland suggests that to attain universal access, it is necessary to require individual purchase of health insurance of all people and to provide financial subsidies for people who cannot afford premiums (Herzlinger & Parsa-Parsi, 2004). Other suggestions if consumer driven plans are implemented in the United States include permitting experimentation in coverage to allow risk-adjustment to reflect risk status, to reward efficient and effective providers and to disseminate risk-adjusted provider results to consumers (Herzlinger & Parsa-Parsi, 2004).

The first Employee Benefit Research Institute (EBRI)/Commonwealth Fund Consumerism in Health Care Survey (2005) for high deductible plans ($1,000 or more for individual plans and $2,000 or more for family plans) found lower consumer satisfaction with consumer driven plans. Individuals with more comprehensive health insurance were more satisfied with their health plan and, despite similar rates of health care use, individuals in consumer driven plans were more likely to spend a large share of their income on out-of-pocket health care expenses than those in comprehensive health plans.

Individuals in consumer driven plans were more likely to avoid, skip or delay health care than those with more comprehensive health insurance, with problems being more pronounced with individuals with health problems or annual incomes under $50,000. For individuals who did receive care, there was evidence that they are more cost-conscious than those in comprehensive health plans.

The National Council on Disability (2004) has stated that literature in the field of consumer directed health care is limited and many of the programs that test the models are too small to yield definitive data. However, despite the limitations in research they support the changes in payment of long-term-care of individuals with disabilities and feel that consumer direction indicates positive outcomes in consumer satisfaction, quality of life and perceived empowerment with no evidence of patient safety being compromised.

A study by the United States Government Accountability Office (2006) estimated that health spending account eligible plan enrollees would incur higher annual costs than Preferred Provider Organization (PPO) plan enrollees for extensive use of health care, but would incur lower annual costs than PPO plan enrollees for low to moderate use of health care. Most health spending account eligible plan enrollees were satisfied with their plan and would recommend them to healthy consumers, but not those who use maintenance medication, have a chronic condition, have children, or may not have the funds to meet high deductibles.

Initial health services research speculates that there are benefits in greater consumer involvement in health care, but does not indicate that consumer-driven health plans are a panacea for reducing health care cost (Nichols, Ginsburg, Berenson, Christianson & Hurley, 2004). More research is needed on a broad range of benefit

designs to test for effects among vulnerable populations and measures of changes in patterns of health care utilization (Buntin, Damberg, Haviland, Kapur, Lurie, Mcdevitt & Marquis, 2006). It is noted that consumerism in health care and associated insurance products are new, and as with most new ideas the initial models and products will need to be revised and improved as prototype designs are almost never without flaws (Scandlen, 2004).

Key-points around CDHPs include that these products are based on the consumer health care economic model. Strategies for CDHPs are based on the belief that health care services are over-utilized and that giving financial incentives to consumers will induce them to seek lower cost providers and reduce the use of services with marginal value. Included in the concept of CDHPs is the provision of increased consumer information regarding health care services and health care providers. Identified potential benefits of CDHPs include the potential for better consumer information regarding personal health, greater consumer responsibility for health choices, a possibility of decreased utilization of marginal health care services and a more knowledgeable patient base. Potential problems that are associated with CDHPs include differing abilities of individuals to gather and evaluate information, adverse selection in other products and increased cost sharing having detrimental effects on access to needed care, especially for those with chronic health conditions and/or those with limited financial income. Limitations in literature and research regarding CDHPs include impacts to consumers with chronic health conditions and actual use of information by consumers.

CDHPs and Health Care Consumer Attitudes

Strategies around CDHPs are based on the concepts of moral hazard and asymmetric information. Moral hazard refers to the increased use of services when pooling of risks leads to decreased marginal price, which creates differing tendencies of people with health insurance to maximize the use of health services (Folland, Goodman & Stano, 2004, p. 159-161; Stewart, 1994). By not knowing the full cost that is associated with health care, consumers can demand more and overuse health care services (Thorpe, 2005). Asymmetric information refers to a lack of information for health care consumers, in that they are often poorly informed compared to the provider about their condition, available treatments, expected outcomes and prices charged by other providers (Folland, Goodman & Stano, 2004, P. 189).

Dowd (2005) states that CDHPs attempt to reduce inefficient moral hazard through a large deductible that requires enrollees to spend a substantial amount of their own money before the insurance company begins to pay for health services. The Rand Health Insurance Experiment in the 1970s tested the effects of health insurance cost sharing on consumer use of medical services and health. Participants in the study were randomly assigned to either free health care or to one of four cost sharing plans for three to five years. Key findings of the RAND study include: (Keeler, 1992)

1. Health care cost sharing reduces health care spending. It was estimated that people without health insurance will utilize half as much health care than people with free health care. There was no evidence that cost sharing would become less effective over time due to unmet health care needs.

2. Cost sharing lowered dollars spent and quantity of use at equal rates. Cost sharing works to reduce the amount of services used, not in finding lower prices.
3. People with cost sharing do not just cut out nonessentials. Despite the higher utilization rates with free care, the proportion of hospitalizations that were inappropriate was almost identical for both cost sharing and free plans, as was the inappropriate use of antibiotics.
4. Rich and poor people had similar reductions with cost sharing. However, poor people were less likely to seek care in a year, but were also more likely to be hospitalized.
5. People given free care had better health results at the end of the study on blood pressure control, corrected vision, and oral health, especially for the poor and initially sick. Better blood pressure control with free care was due to better case finding, as it was detected in the extra visits induced by free care. An examination of other conditions showed no significant health differences between those with free care and those with cost sharing.

While the RAND Health Insurance Experiment demonstrated that if patients pay more health care bills directly out of pocket they will consume less health care, the experiment excluded people over 62 years of age and those who were totally disabled (Davis, 2004). The experiment showed negative impact on health for those who are at high medical risk, particularly if they are also of lower income (Gruber, 2006). The experiment found that the use of physician services was more sensitive to cost sharing than the use of hospital services, but what is less well known are effects on health status and use of clinically appropriate or inappropriate services which suggests the importance

of examining whether a reduction in utilization is inappropriate and whether there are adverse health consequences (Davis, 2004).

Concerns regarding higher member cost-sharing and associated under-use of medical care are represented by an AARP Nebraska survey that showed that one of three people over the age of 50 were cutting back on medications to cope with drug costs (Ganguli, 2003). A study of the impact of patient cost sharing on the use of services and resulting health status impacts for a population aged 65 and older showed that having some form of supplemental insurance is associated with more appropriate health care use, particularly when this insurance provides coverage for prescription medication (Rice & Matsuoka, 2004).

Regina Herzlinger (2004), an early proponent of consumer driven health-care, believes that the concept of CDHPs is dependent on consumers and providers creating health care services that best meet their needs through differentiated health plans. She believes that consumer choice increases satisfaction, enhances motivation and improves performance. Important assumptions regarding choice in consumer driven health plans include that providers will increase consumer choice because of identified positive aspects and insurers will increase choice among attributes that consumers consider to be important to them (Herzlinger, 2004, p. 97-98).

Herzlinger states that enabling consumers to evaluate health insurance as if they were using their own money will help to curb health care costs (Herzlinger, 2003, p. 75). However, questions are raised regarding effects of member access to care and medications in a study to evaluate the impact of managed care on the use of chronic disease medications. Stafford, Davidson, Davidson, Miracle-McMahill, Crawford &

Blumenthal (2003) showed that chronic disease patients in managed care plans are more likely to receive expensive medications as compared to less use of expensive medications in indemnity plans. Noted differences may be explained by members in indemnity plans facing higher out-of-pocket costs.

Key-points around CDHPs and health care consumer attitudes include that CDHPs attempt to affect consumer attitudes regarding health care spending through higher cost sharing and increased exposure to health care information. It is thought that increased cost sharing will lower unnecessary health care utilization. The RAND study indicates that increased consumer cost sharing decreases consumer health care spending. However, there are concerns regarding higher consumer cost sharing and associated under-use of needed medical care.

Health Care Consumer Use of Medical Information

A review of studies for patient activation to make more prudent health care choices when they are given financial incentives with access to comparative cost and quality information by Hibbard, Stockard, Mahoney and Tusler (2004) showed patient engagement and active participation in care being linked to better health outcomes. They summarize that patients who are able to self manage symptoms and problems, engage in activities that maintain functioning, be involved in treatment and diagnostic choices, collaborate with providers, select providers based on performance or quality and navigate the health care system are likely to have better health outcomes.

Harris (2003) showed that despite predictions of the increasing importance of consumer choice in shaping the health care delivery system, the image of patients as passive health care consumers of physician services tends to be true with poor health

status, higher levels of service use in the past year, and stronger ties to individual physicians being associated with less consumer activism. Higher levels of consumer activism were found among racial and ethic minorities, among those who report using information to choose their physicians and among those who switched physicians as a result of dissatisfaction some time in the past five years (Harris, 2003). While Schulz, Call, Feldman and Christianson (2001) showed that consumers who changed to a new provider group were more likely to use report card information and find it useful, Longo (2004) showed that there is little empirical evidence on how consumer reports are used by employers to make health care purchasing decisions. Hurley (1997) notes the feature of the changing interface between employers and providers involving the consumer role in the decision process seems to be struggling with developing and adopting a consumer orientation rather than communicating to consumers the criteria, expectations and biases of professional perspectives.

A study (Murray, Lo, Pollack & Donelan, 2003) to determine physician views of effects of direct to consumer (DTC) advertising on health service utilization, quality of care and the doctor-patient relationship showed that more than half (56%) of patients who discussed information from direct-advertising in a visit did so because they wanted a specific intervention. The physician deemed 49% of these requests to be clinically inappropriate. This effect on the doctor-patient relationship eventually led the physician to do what the patient wanted. Conclusions were that DTC advertising can have both positive and negative effects on quality of care, the doctor-patient relationship and health service utilization. The benefits may be maximized by increasing the accuracy of information in advertisements, enhancing physician communication and negotiation skills

and encouraging patients to respect physician clinical expertise (Murray, Lo, Pollack & Donelan, 2003).

Vale and Yamamoto (2004) found that the attitudes of oncology nurse practitioners were similar to those in previous studies of physicians regarding the number of visits when patients requested DTC advertised medications. However, major differences were seen in the positive attitudes of the practitioners toward potentially longer patient visits to explain and educate patients regarding medication requests based on DTC advertising, and smaller percentages of practitioners felt pressured to prescribe requested medications. The practitioners considered patient encounters for educational purposes as appropriate and included information about requested DTC-advertised medications in their approach to patient care (Vale & Yamamoto, 2004).

Vogel, Ramachandran and Zachry (2003) showed that mass media DTC advertising of prescription drugs has emerged as a successful advertising strategy. Opponents argue that DTC advertising provides misleading messages rather than well balanced and evidence-based information. Their conclusions were that direct consumer advertising indirectly affects the price and quantity of production of pharmaceuticals via its effect on changes in consumer demand (Vogel, Ramachandran & Zachry, 2003).

Key-points around CDHPs and increased use of medical information include potential positive health outcomes through consumer activation with consumer involvement and collaboration with providers regarding treatment choices. However, there are questions regarding the impact and appropriateness of increased use of medical information that is available to consumers.

Consumer Use of Health and Wellness Information

Strategies for consumer driven healthcare include providing consumers with information regarding health and wellness information. It is thought that by exposing consumers to the actual price of medical services, different options of care, appropriate information that will support decision making and appropriate financial incentives, they will become more involved and more prudent users of care to support a more efficient health care system (American College of Physicians, 2004). Kyrouz, Holt, Mittman & Everett (1998) suggest that consumers are beginning to take on more health responsibilities such as gathering more information about health, disease, treatments, prevention and health impacts of products. This is expected to initiate a shift in the self-perception of patients from passive recipients of medical care to active consumers of health services, including a cultural shift that changes the dynamics of the physician and patient relationship.

Herzlinger (2004) notes that the primary care system does not do enough in the area of disease prevention, especially in addressing the needs of the whole person-body, mind, heart and spirit. She thinks that the health care system must do more to encourage people to modify their lifestyles and behaviors to prevent disease (Herzlinger, 2004, p. 206). Hibbard (2004) identifies that provider quality of care measurements have not kept pace with policy approaches that rely on patients to contain costs and improve quality, and that quality measures that focus on patient self-management abilities that are integrated into the measurement of processes of care have not been developed.

Kane, Johnson, Town and Butler (2004) evaluated evidence of the impact of economic incentives on consumer adoption of preventive health behaviors and

determined that economic incentives for prevention appear to work, but their mechanisms are not well understood. Economic incentives appear to be effective in the short run for simple preventive care and distinct, well-defined behavioral goals. However, there is less evidence that economic incentives can sustain the long-term lifestyle changes required for health promotion. Small incentives can produce finite changes, but it is not clear what size of incentive is needed to yield a major sustained effect.

Earlier studies predicted that health care consumer access to the Internet would be an important issue for the health care industry because health care organizations that would be able to provide information through the Internet would have a competitive advantage. However, it was also identified that, while many people would use the Internet to become more sophisticated health care consumers, a large segment of the population would not benefit from Internet self-education opportunities because they do not have the access to do so. One study noted that many people not only lack a Internet device, they also may not know how to find public access to the Internet, are afraid of computers and technology, or have a physical, geographic or financial limitation preventing them from tapping into the Internet (Wilkins, 1999). However, recent RAND and Blue Cross and Blue Shield Association surveys show that consumer main sources of health information come from the Internet and their personal physician (Blue Cross and Blue Shield Association, 2006).

A major concern about the widespread use of interactive Web-based technologies is the volume of unendorsed, non-validated, misleading, fraudulent and potentially harmful health information available over the Internet (Rodrigues, 2000). A study to systematically review the effect of consumer use of online health information on

decision-making, attitudes, knowledge, satisfaction, health outcomes and utilization concluded that despite widespread Internet use to obtain health care information, there is almost a complete lack of evidence of any effects this may have on health outcomes (Bessell, McDonald, Silagy, Anderson, Hiller & Sansom, 2002).

Herzlinger (2004) notes the prevailing opinion that the cost effectiveness of an informed consumer strategy cannot be demonstrated as there are concerns that uncontrolled consumers will drive up health care costs through unconstrained demand without corresponding cost consciousness. This creates the need for the development of mechanisms to create an economic balance between unrestricted and unaffordable demand (Herzlinger, 2004, p. 424).

The Agency for Healthcare Research and Quality (AHRQ) has defined health literacy as a constellation of skills that constitute the ability to perform basic reading and numerical tasks for functioning in the health care environment and acting on health care information (Agency for Healthcare Research and Quality, 2004). Other definitions consider health literacy issues that go beyond basic skills to include health information communication, literacy and health as cultural and social practices, the relationship with health information literacy and behavior, and the impact of the Internet on the use of health information (Kerka, 2003).

The AHRQ reports that low literacy may impair functioning in the health care environment, affect patient-physician communication dynamics and inadvertently lead to substandard medical care. It is associated with poor understanding of written or spoken medical advice, adverse health outcomes and negative effects on the health of the population (Agency for Healthcare Research and Quality, 2004). Hibbard, Greene and

Tusler (2005) report that low health literacy has been linked with higher rates of hospitalization, lower use of preventive care, less effective self management of chronic conditions and poor health habits with estimated costs to the health care system between $30 billion and $73 billion annually.

A report was developed by the US Department of Education to illuminate the relationship between literacy and health using information from large-scale surveys of adult literacy (National Adult Literacy Survey and International Adult Literacy Survey, 2003). Included in the assessments were a variety of health related materials on topics such as drugs and alcohol, disease prevention and treatment, safety and accident prevention, first aid, emergencies and staying healthy. The assessments showed the following results (Rudd, Kirsch & Yamamoto, 2004):

1. Results for the total population showed that 12% of the US adult population is estimated to have skills in the lowest level of adult health literacy, while an additional 7% can be expected to have great difficulty performing simple tasks with a high degree of proficiency.
2. Results for selected vulnerable or at-risk groups showed that health literacy is strongly related to educational attainment. The average score of adults who had not completed high school or earned a GED at the time of the survey was far lower than that of individuals who had graduated from high school or earned a GED and for those who had continued their education beyond high school.
3. Results for U.S. health literacy proficiency and multiple characteristics showed that, on average, working adults who reported having additional assets such as income

from savings or dividends had the highest literacy scores, and retired adults living below the poverty level had the lowest scores.

The AHRQ (2004) states that the concept of health literacy and its role in health care use and health outcomes will need further evaluation. The current literature focuses only on reading ability and health, but taking a patient-centered approach that addresses challenges in navigating the health care system and providing self-care may enrich understanding of health literacy and ultimately how to measure and improve it (Agency for Healthcare Research and Quality, 2004).

Key-points regarding CDHPs and consumer use of health and wellness information include the need for the healthcare system to encourage lifestyle modification. There are questions regarding the consumer use of health/wellness economic incentives and use of information. While use of the Internet for healthcare information is increasing, there are questions regarding consumer access and quality of information that is provided.

There are overall questions regarding if consumers can understand health information, where they will receive it from, and if they will actively use the information. Low health literacy has been linked with higher rates of hospitalization, lower use of preventive care, less effective self-management of chronic conditions and poor health habits. There is a high interest in the measurement of health literacy, with recent efforts attempting to develop shorter tests than what currently exist to be used in the clinical setting.

Managed Care and Non-Managed Care Effects on Chronic Conditions

While the question of higher member responsibility and use of information for the majority of health care consumers with lower health acuity levels is pertinent, the impact of these components on consumers with higher health acuity levels is more important as this may determine the overall effectiveness of consumer driven health care. Research on the outcomes of patients with chronic conditions in managed care and non-managed care models shows mixed results. While Wholey, Burns and Lavizzo-Mourey (1998) found that access to primary care in managed care organizations is better but access to specialists and hospitals is more difficult, Wang & Pauly (2003) concluded that enrollees in HMOs used more preventive services than enrollees in fee-for-service (FFS) plans. A four-year observational study of 2,235 patients (age 18 to 97) with hypertension, non-insulin dependent diabetes, recent acute myocardial infarction, congestive heart failure and depressive disorder indicated that physical and mental health did not differ for average patients in an HMO versus a FFS plan, but concluded that elderly and poor chronically ill patients had worse physical health outcomes in the HMO than in FFS systems (Ware, Bayliss, Rogers, Kosinski & Tarlov, 1996). Yelin, Criswell and Feigenbaum (1996) could find no evidence that persons with rheumatoid arthritis in FFS and prepaid group practice settings received different quantities of health care or experienced different outcomes on either an annual or long-term basis. Greenfield, Rogers, Mangotich, Carney and Tarlov (1995) found no meaningful differences for health outcomes of patients with hypertension and non-insulin dependent diabetes over a seven-year period for patients treated by managed care systems or by different specialists.

Luft (2003) states the need to move beyond simple comparisons of FFS versus HMOs to deeper analyses of the reasons for performance differences, in that there is substantial variation in practice pattern differences in FFS plans and that variation across HMOs is not due only to financial arrangements. He believes that specific practice guidelines, quality review and other features should also be examined, in that differential practice patterns and better outcomes in some plans may also be due to different physicians and hospitals.

Chronic diseases claim the lives of more than 1.7 million Americans annually, with ten percent of Americans being limited in their daily activities by these diseases (Blue Cross and Blue Shield Association, 2006). Important chronic conditions to be considered in the analysis of CDHPs include congestive heart failure, diabetes mellitus and coronary artery disease.

Congestive heart failure (CHF) is recognized as a major chronic condition through both high prevalence and costs. Approximately 2% of the population in the age range of 40-59, 5% in the age range of 60-69 and 10% of Americans over the age of 70 have CHF. There are over 400,000 new cases of CHF annually. It has been estimated that health care costs for CHF are over $23 billion per year. Half of the number of patients diagnosed with CHF will die within five years (Statistics About Congestive Heart Failure, 2003).

Diabetes mellitus (DM) is a chronic medical condition that is the third leading cause of death behind heart disease and cancer (Mathur, 2005). Approximately 18 million people in the United States have diabetes, with direct and indirect costs totaling $132 billion (Blue Cross and Blue Shield Association, 2006). DM is a risk factor for

CHF. Aronow and Ahn (1999) showed that patients with DM have a 1.3 times higher chance of developing CHF than those without DM. Guazzi, Brambilla, De Vita & Guazzi (2002) showed that patients with DM have a four-to-fivefold increased risk of CHF, and in the case of co-morbidity, aggravates the lung dysfunction that frequently accompanies CHF which produces a synergistic rather than a simple additive effect.

Coronary artery disease (CAD) is a chronic process that begins during adolescence and slowly progresses throughout life. It is responsible for one million deaths per year in the United States. The estimated prevalence of CAD in men is 6.9% and 6.0% in women (Rimmerman, 2005). In 1992 the American Heart Association estimated the total direct and indirect costs of CAD to be $94.5 billion (Deckelbaum, 1992).

Key-points regarding the comparison of people with chronic health conditions in managed care and non-managed care models is that mixed outcomes results are shown. Study results range from HMOs showing better and poorer results than fee-for-service plans, to having similar results between plan types. It is noted that measurement of outcomes is difficult due to multiple factors, other than just plan financial arrangements, that can influence changes in health status. Major chronic conditions include heart failure, diabetes mellitus and coronary artery disease.

Literature Summary and Direction of Study

The literature review indicates that there is a health care industry transition from managed care to consumer driven health care that intends to increase consumer cost sharing, expand decisions regarding health care providers and increase exposure to health care information. Strategies for CDHPs are based on the belief that health care services

are over-utilized, and that giving financial incentives to consumers will induce them to reduce the use of services with marginal value. The concept of CDHPs is based on defined contribution, in which employers provide a defined amount of money or contribution for eligible employee benefit coverage that will give the employee a larger stake in financial decision making regarding the health care that they receive. Original concepts underlying the development of CDHPs included increased consumerism and use of information to help consumers make health care choices.

Identified potential benefits of CDHPs include better consumer information regarding personal health, greater consumer responsibility for health choices, a possibility of decreased utilization of marginal health care services, and a more knowledgeable patient base. Potential problems that are associated with CDHPs include the differing abilities of individuals to gather and evaluate information and adverse selection in other products. Additionally, increased cost sharing may have detrimental effects on access to needed care, especially for those with chronic health conditions.

Noted knowledge gaps include CDHP impacts on consumers with chronic health conditions and impacts on consumers that have lower financial incomes. While the Rand Study provides information regarding effects on differences in cost sharing and potential effects on poorer populations, the literature is lacking in regard to increased consumer cost sharing in populations with chronic health conditions.

The literature review indicates that consumer driven health care is a very recent phenomenon that is predicated on increased consumer involvement in the delivery of health care. Research gaps include the impact of increased cost sharing on consumers with chronic health conditions and/or consumers with lower financial income. There are

questions regarding what overall quality and cost impacts will occur for consumers with complex and/or chronic health conditions as a result of higher cost-sharing responsibility.

The emphasis of this study will be on consumer driven health plans and their impact on consumers with chronic health conditions of CHF, DM and/or CAD. This population may be affected by multiple components of CDHPs, to include increased cost-sharing through no first-dollar coverage as experienced in HMOs, more choice of network providers, increased information regarding health care conditions and increased information regarding health care providers. While many factors can influence health outcomes, the focus of the study will be on the effects of increased cost sharing on health outcomes for people with chronic health conditions when they transition from an HMO to a CDHP.

Impacts to these consumers will affect the long-term viability of consumer driven health plans and additional study in this area will be helpful in determining potential changes to the consumerism health care economic model. This study will contribute to research gaps regarding CDHP consumer cost sharing and impacts to people with chronic health conditions that can provide information that can be used in future studies. This information will be especially useful if these insurance models are introduced to the elderly population where chronic diseases are more prevalent.

The review of theory and conceptual research in chapter three will provide an overall framework of the identified components of consumer driven health care. A comparison of managed competition/HMOs and consumerism/CDHPs focusing on differences in cost sharing will provide direction for the study of consumers with heart failure, diabetes mellitus and/or coronary artery disease.

CHAPTER THREE: THEORY AND CONCEPTUAL RESEARCH REVIEW

The application of theory and conceptual research to the health care industry transition from managed care to consumer driven health care with specific application to consumers with chronic conditions will need to include not only the study of health plan member behavior changes due to more responsibility in the use of health plan benefits, but also the introduction of environmental factors that are beyond the scope of behavioral theory alone. Social ecology theory is considered as an overarching structure for analysis of components that influence healthcare outcomes. The Andersen behavioral model of health services use is used as a framework to develop an analytical model. A comparison of managed competition and consumerism health care models that influence consumer utilization of health care services provides detail to develop the analytical basis of the study. The comparison of consumer cost sharing based on prior research of health coverage benefits is used to develop hypotheses for samples of consumers enrolled in HMOs and CDHPs with heart failure (HF), diabetes mellitus (DM) and/or coronary artery disease (CAD).

Social Ecology Theory

Social ecology theory can be helpful in framing multiple variables of consumer driven health plans, the interaction between the variables and their ultimate impact on

members with chronic health conditions. Assumptions of Social Ecology Theory include: (Whiteley, 1999)

1. Health promotion is based on an understanding of the dynamic interplay among diverse environmental and personal factors.
2. The incorporation of multiple levels of analysis and diverse methodologies.
3. The application of systems theory to take into account both the interdependencies that exist among intermediate and more distant environments, and the dynamic interrelations between people and their environments.

Stokols (1996) notes that social ecology theory provides a framework to understand the dynamic interaction of intra-personal and environmental factors in health and illness, and emphasizes the importance of conducting longitudinal evaluations of intervention outcomes and effectiveness. He states that in view of the interdisciplinary foundations and multi-sectoral design of ecological interventions, the evaluation of program outcomes will require different behavioral, environmental and health indices (Stokols, 1996).

Grzywacz and Fuqua (2000) state that the ecological perspective is characterized by different dimensions of well-being, with certain individual or environmental conditions that exert a disproportionate amount of influence on health and well-being which then become leverage points. Stokols (2000) states that the increased use of an ecological orientation stems from a growing recognition that most public health challenges are too complex to be understood adequately from single levels of analysis, and instead require more comprehensive approaches. He states that researchers and

practitioners should identify and give top priority to high-leverage variables, or those that exert the greatest influence on well-being across multiple levels of analysis, which includes the use of diverse research methods such as qualitative and quantitative measures, formative and summative evaluation strategies, interrupted time-series designs and hierarchical linear modeling.

Andersen Model

The framework for the proposed study will be based on the Andersen behavioral model of health services use. The model is an ecological application that illustrates the dynamic interaction of individual use of health services, and is a reflection of the conceptualization of the premises of social ecology theory. The Andersen model was initially developed in the 1960s to assist in the understanding of use of health services, to define and measure equitable access to health care, to assist in developing policies and to promote equitable access (Andersen, 1995). The initial model included predisposing characteristics (demographics, social and health belief variables), enabling resources (personal/family and community variables) and need (perceived and evaluated) components that result in the use of health services (Andersen, 1995). The model evolved in the 1980s and 1990s to include primary determinants of health behavior, actual health behavior and health outcomes.

Andersen has developed the behavioral model of health services use to stress contextual and individual characteristics (Andersen, 2006). Both contextual and individual characteristics include predisposing, enabling and need components that result in health behaviors that ultimately result in health outcomes. The model is represented in

Figure 1 which demonstrates the interdependencies of contextual and individual characteristics, health behaviors and outcomes. This is consistent with the social ecology theory premise that health promotion is based on understanding of dynamic interplay among diverse environmental and personal factors (Whitley, 1999).

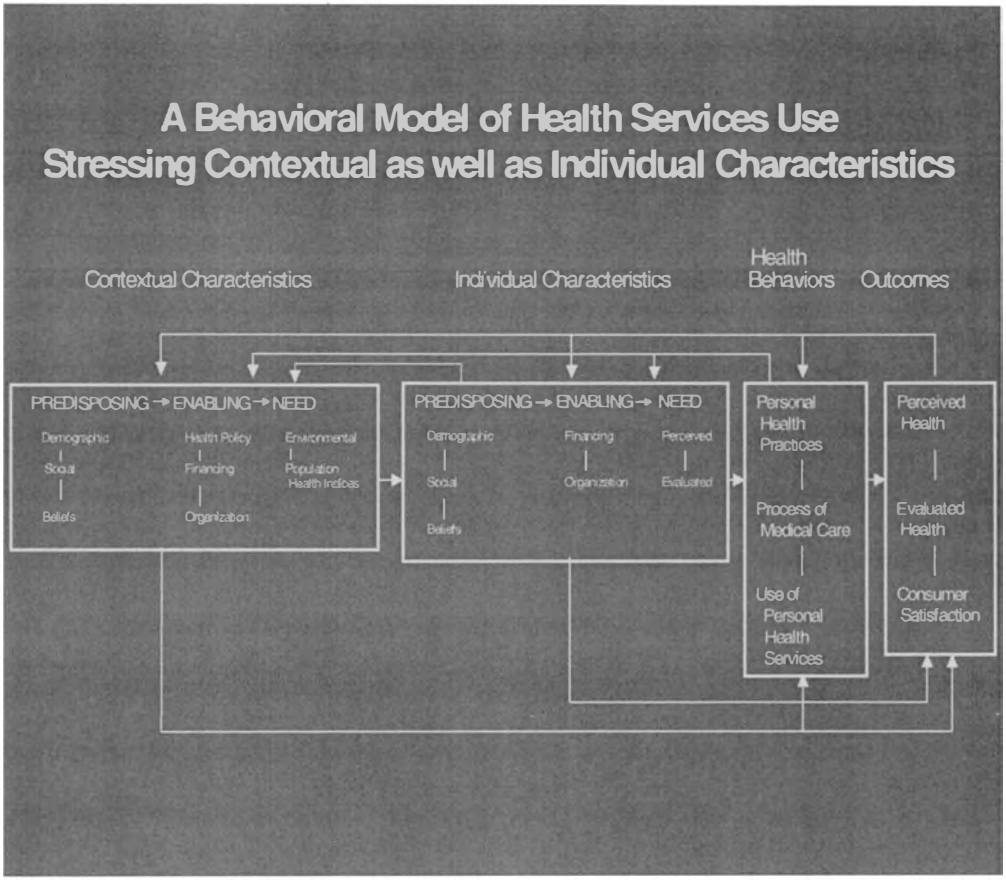


Figure 1: Andersen Behavioral Model of Health Services Use (Andersen, 2006). Used with permission from author.

Andersen Model Application to Consumer Driven Health Care

Member transition from managed care products to consumer directed products encompasses multiple interrelated variables that can influence health outcomes. These variables include health status and co-morbid conditions, financial ability to access needed services, demographics of consumers, changes in provider networks, use of health information, behavioral attitudes toward healthcare and health care behaviors. The study of interrelationships between these variables and their influences on health outcomes is needed to understand the potential impacts of CDHPs.

Increased member cost sharing in consumer driven health care is a individual characteristic that may have negative impacts on health outcomes of individual members who have been diagnosed with chronic health conditions. Robinson (2002) notes concerns regarding increases in consumer cost-sharing for health care that can create adverse impacts on poor and sick populations, such as co-payments and deductibles that are not adjusted for member income or health status. The high out-of-pocket cost burden that is associated with consumer driven health plans may cause lower income people with chronic conditions to forgo needed care and/or force decisions regarding cost-choice tradeoffs when they are too sick to make an informed choice (American College of Physicians, 2004).

Strategies for consumer driven healthcare include providing consumers with information regarding health care provider cost and quality indicators (Herzlinger, 2004, p. 76, 168). Consumer attitudes regarding the use of health care providers will be based on trust in the entity that provides the information (Balkrishnan, Hall, Blackwelder &

Bradley, 2004). Harris (2002) states that consumers will trade high quality for restrictions on provider access, but these differences in quality will need to be significant.

LoSasso, Rice, Gabel and Whitmore (2004) and Robinson (2001) indicate that there are wide variations in consumer ability and preparedness to use information to navigate the health care system. Attitudes concerning the use of health information may be variable for individual consumers. It is noted that there is little empirical evidence on how consumers use information in making health care purchasing decisions and how economic incentives can sustain long-term lifestyle changes (Kane, Johnson, Town & Butler, 2004; Longo, 2004).

While behaviors can be influenced by peer experience in increased provider interaction, providers may be considered as important individuals that will influence normative beliefs. Providers have historically driven decisions regarding health care with little questioning by consumers, and the authority of providers appears to be an important element in initiating and sustaining patient behavior change (Center For The Advancement of Health, 2000). Barriers to consumers being able to influence the health care system through increased provider interaction include gaps in information and authority between consumers and providers, the infrequency of health care purchases and consumer vulnerability when health services are needed (Miller, 2001).

While the literature suggests that health care consumers are taking on more health care responsibilities such as gathering information about health, disease, treatments and prevention (Kyrouz, Holt, Mittman & Everett, 1998), another study (Harris, 2003) showed that despite predictions of the increasing importance of consumer choice in

shaping the health care delivery system, the image of patients as passive health care consumers of physician services holds to be true. Poor health status, higher levels of service use in the past year and stronger ties to individual physicians were associated with less consumer activism (Harris, 2003).

The interrelationships and influence of health status and co-morbid conditions, financial ability to access needed services, changes in provider networks, use of health information, behavioral attitudes toward healthcare and health care behaviors on health outcomes (as measured by health services utilization and health status changes) for members with chronic conditions are complex. A multivariate outcomes study to determine impacts on health plan members as they transition from managed care programs to consumer driven programs is needed to understand discussed components of consumer driven health care. Outcomes research for a population with chronic conditions is based on the understanding of the dynamic interplay of contextual and individual characteristics, health behaviors and outcomes.

Kane (2004) provides a conceptual model for the outcomes study with the interaction of multiple variables that can influence health services utilization and health status changes. Using the Kane model, coupled with the application of the Andersen model of health services use, the outcomes study assessing differences in plan coverage between managed care programs and consumer driven health programs can be conceptually depicted as Figure 2. The detailed study of how individual and contextual characteristics will influence the outcomes of utilization of health care services and/or

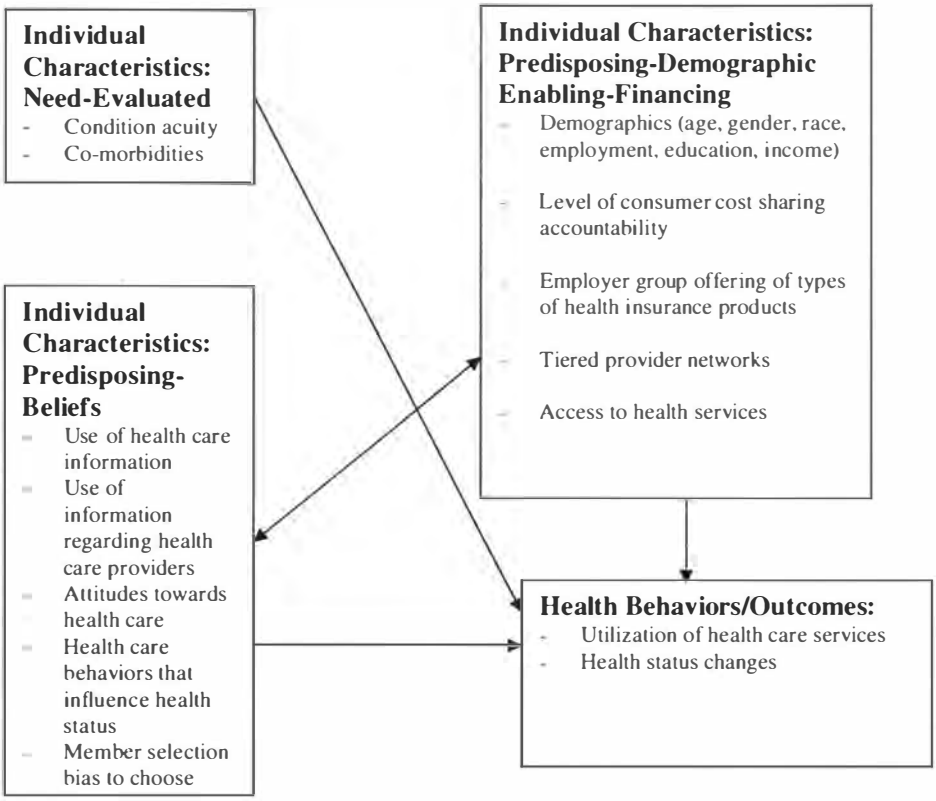


Figure 2: Andersen Behavioral Model Adaptation of Health Service Use/Outcomes Research Model

changes in health status is needed to understand how these components of consumer driven health care will impact populations with HF, DM and/or CAD.

A focus on consumer cost sharing accountability, condition acuity and co-morbidities, on utilization of health care services and health status can be studied through the comparison of consumer experience in managed care and consumer driven health care. Additional components to consider in the study include member demographics, the ability of the member to choose certain plans designated by the employer and member

selection bias to choose certain plans. A key component in this study will be consumer cost sharing accountability for members with the diagnosed conditions of HF, DM and/or CAD and their impacts to health outcomes.

Comparison of Managed Competition and Consumerism

A comparison of managed care and consumer driven health care will provide detail in developing the study model. Differences can be described through previous research comparing the health care models of managed competition which HMOs are based, and consumerism which CDHPs are based. Robinson (2005) provides a detailed comparison of managed competition and consumerism for multiple components of the health care market:

1. Managed competition considers large physician and hospital organizations as being a source of coordination and incentive alignment, with preferred practice settings being multi-specialty medical groups in an integrated delivery system. Consumerism views large physician and hospital organizations as often being bureaucratic and monopolistic, with preferred practice settings being small physician practices with single specialty hospitals.
2. Managed competition considers provider practice variations and quality shortfalls as resulting from weak consumer choices. Consumerism views price-conscious consumer choice as generating appropriate provider behavior.
3. Managed competition considers capitation and salary as the preferred provider payment methodology, with measures of physician organizations and a spectrum of services as preferred performance measures. Consumerism views fee-for-service and

episode-of-illness pricing as the preferred provider payment method, with measures of individual physicians and clinical services as preferred performance measures.

4. Managed competition supports health insurance plans, and considers them as supporting consumer choice and provider coordination, as well as spreading risk. Consumerism is skeptical regarding health insurance plans, and considers insurance as being necessary to spread consumer risk but also fostering consumer price-unconscious demand.

Robinson (2005) also provides a comparison of managed competition and consumerism regarding the key study variables of consumer cost sharing:

1. Managed competition supports limited consumer cost sharing economic incentives at the time of seeking care with a focus on quality rather than cost. Consumerism supports substantial consumer cost sharing incentives at the time of seeking care, with strong incentives to consider cost as well as quality.
2. The preferred benefit design for managed competition is limited consumer cost sharing and comprehensive coverage with modest co-payments. The preferred benefit design for consumerism is extensive consumer cost sharing and high deductibles with health savings accounts.

A comparison of managed competition and consumerism identifies key differences regarding consumer cost sharing. While the RAND Health Insurance Experiment demonstrated that if patients pay more health care bills directly out of pocket they will consume less health care, it did not measure effects on health status and use of clinically appropriate or inappropriate services (Davis, 2004). There are concerns

regarding increased consumer cost sharing having detrimental impacts on access to needed care, especially for those with chronic health conditions (Mays, Hurley & Grossman, 2003). These concerns are in contrast to potential benefits of consumer cost sharing that include increased consumer responsibility resulting in efficient health services utilization (Harris, 2003; Hertzlinger, 2004).

Key research questions include:

1. What factors are associated with a change in health insurance coverage from HMOs to CDHPs for members with the chronic health conditions of HF, CAD and/or DM?
2. If health services utilization is affected, is it increased or decreased?
3. If health services utilization is affected, what are factors regarding consumer cost sharing and income level that are correlated with health services utilization?
4. If health status changes occur, are they increased or decreased?
5. If health status changes occur, what are factors regarding consumer cost sharing and income level that are correlated with changes in health status?

Proposed Study Model

The study model to answer the identified research questions incorporates the Andersen behavioral model of health services use that is applied to the outcomes research model to provide a framework in identifying interrelationships for consumer driven health care. These include individual characteristics of consumer cost sharing responsibility and income level, individual characteristics of consumer condition acuity and co-morbidities and health behaviors/outcomes of consumer utilization of health services and changes in consumer health status.

The study model is broken down into more detail by comparing the health care models of managed competition and consumerism and the associated impacts of member cost sharing. The managed competition model includes limited consumer cost sharing while the consumerism model includes extensive cost sharing. In this analysis, cost sharing is compared using the managed competition health insurance products of HMOs and the consumerism health insurance product of CDHPs. HMOs tend to have first-dollar coverage without deductibles with modest co-payments and CDHPs tend to have high deductibles with high co-payments.

The study model focuses on consumers in HMOs and CDHPs that have been diagnosed with the chronic health care conditions of HF, DM and/or CAD. As opposed to consumers who are healthy or have episodic health care conditions, consumers with these chronic conditions may be affected by higher deductibles and co-payments as experienced in CHDPs as compared to HMOs. Higher consumer cost sharing for consumers with chronic health conditions in CDHPs could result in lower health services utilization and adverse changes in condition acuity than for consumers with chronic health conditions in HMOs.

Figure 3 depicts a conceptual model of an analysis based on the comparison of managed competition and consumerism. Differences between HMOs and CDHPs in consumer cost sharing are applied to consumers who have been diagnosed with HF, DM and/or CAD. This influences health care outcomes for health services utilization and changes in health status for these members. It is noted that additional variables of

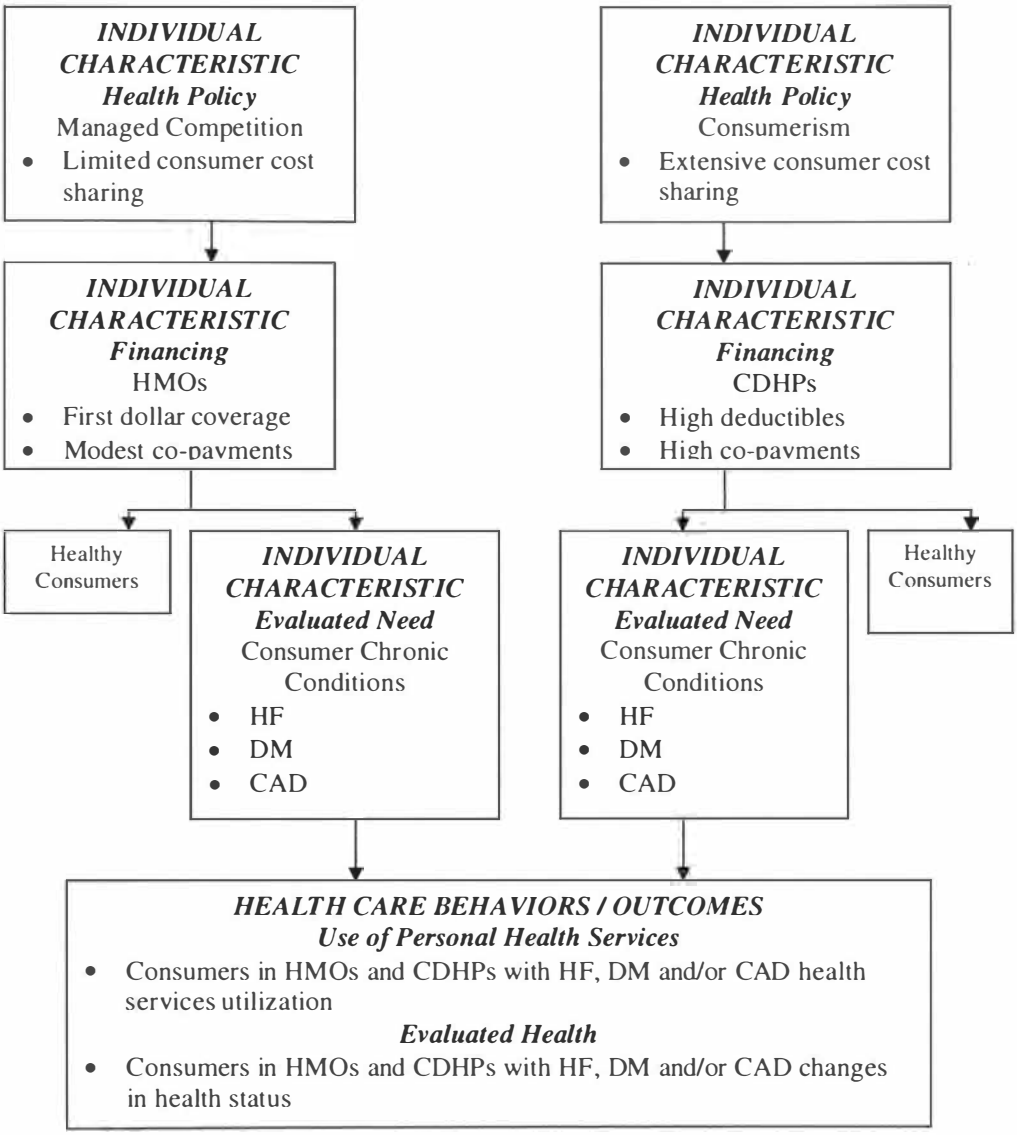


Figure 3: Conceptual Study Model of Outcomes for Heart Failure, Diabetes and Coronary Artery Disease

member demographics, employer group offerings of health insurance offerings and

member selection bias will need to be considered throughout the study.

Study Hypotheses

The difference between HMOs and CDHPs in member cost sharing for consumers with chronic health conditions presents a key study for the transition from the health care model of managed competition/HMOs to consumerism/CDHPs. The RAND study showed that health care consumers are sensitive to cost sharing and will consume less health care when faced with higher cost sharing (Keeler, 1992). The literature review indicates that increases in member cost sharing will result in decreases in health services utilization, and there are concerns that this will have adverse health effects for consumers with chronic health conditions and/or consumers with lower financial incomes (Robinson, 2002; Enthoven, 2003; Mays, Hurley & Grossman, 2003; American College of Physicians, 2004; Davis, 2004).

The overall hypothesis for consumers who change to CDHPs and have diagnoses that are consistent with the conditions of HF, DM and/or CAD is they will have lower health services utilization when compared to consumers with these conditions who remain in HMOs, in the initial year after transitioning from the HMO to the CDHP. While the RAND experiment showed that the use of physician services was more sensitive than the use of hospital services (Davis, 2004), the detailed hypotheses for the study will consider all of the following measures of utilization to be directional:

1. Primary care physician utilization (PCP visits) for members with diagnoses of heart failure, diabetes and/or coronary artery disease in a CDHP will be lower than members with diagnoses of heart failure, diabetes and/or coronary artery disease who remain in an HMO.

2. Specialty care physician utilization (specialist visits) for members with diagnoses of heart failure, diabetes and/or coronary artery disease in a CDHP will be lower than members with diagnoses of heart failure, diabetes and/or coronary artery disease who remain in an HMO.
3. Inpatient utilization (inpatient admissions) for members with diagnoses of heart failure, diabetes and/or coronary artery disease in a CDHP will be lower than members with diagnoses of heart failure, diabetes and/or coronary artery disease who remain in an HMO. It is noted that decreased utilization of primary care physicians and specialists could cause exacerbation of clinical conditions and result in increased inpatient utilization. It is assumed that exacerbation of clinical conditions due to decreased utilization of physicians will be limited in the initial year after changing health insurance products.
4. Outpatient utilization (outpatient procedures) for members with diagnoses of heart failure, diabetes and/or coronary artery disease in a CDHP will be lower than members with diagnoses of heart failure, diabetes and/or coronary artery disease who remain in an HMO.
5. Emergency room utilization (ER visits) for members with diagnoses of heart failure, diabetes and/or coronary artery disease in a CDHP will be lower than members with diagnoses of heart failure, diabetes and/or coronary artery disease who remain in an HMO. It is noted that decreased utilization of PCPs and specialists could cause exacerbation of clinical conditions and result in increased emergency room utilization. It is assumed that exacerbation of clinical conditions due to decreased

utilization of physicians will be limited in the initial year after changing health insurance products.

Hypotheses for actual and projected changes in health status are as follows:

1. Members with diagnoses of heart failure, diabetes and/or coronary artery disease in a CDHP will have higher actual adverse health status changes than members with diagnoses of heart failure, diabetes and/or coronary artery disease in an HMO.
2. Members with diagnoses of heart failure, diabetes and/or coronary artery disease in a CDHP will have higher projected adverse acuity status changes than members with diagnoses of heart failure, diabetes and/or coronary artery disease in an HMO.

The methods chapter will explain the analytic approach to measure and test the study model and hypotheses. The study provides descriptive detail regarding consumer experience in HMOs and CDHPs with a focus on the impact of cost sharing on consumers with diagnoses that are consistent with the chronic health conditions of HF, DM and/or CAD. Understanding the impact on members with chronic diseases and the implications for population health status provides valuable information for future planning for health care delivery models.

CHAPTER FOUR: METHODOLOGY

This research examines differences in product benefits regarding cost sharing between health maintenance organizations and consumer driven health plans, member demographics, member estimated income levels and member health acuity on the outcomes of utilization of health services and health status of members that have diagnoses that are consistent with chronic health conditions of heart failure (HF), diabetes mellitus (DM) and/or coronary artery disease (CAD). The study methodology includes discussion of data sources, study samples, the analytic approach and human subjects protection review.

Data Sources

The study was completed by analysis of member claims data for a major health insurance company that administers health insurance products for four million members. The health insurance products included in the study are a Health Maintenance Organization (HMO), and a Consumer Driven Health Plan (CDHP). The study utilizes health plan claims data on a retrospective basis. Claims data are developed through HCFA-1500 and/or UB-92 submission (hard-copy or electronically) by providers for reimbursement by the health plan.

The study population is comprised of health plan members in commercial products between 18-64 years of age who have claims that are consistent with conditions

of HF, CAD and/or DM in the HMO and the CDHP health insurance products. The control group consists of the study population in the HMO with diagnoses that are consistent with HF, CAD and/or DM. The study group consists of the study population in the CDHP product with diagnoses that are consistent with HF, CAD and/or DM that have transitioned from the HMO.

Measurement

The study will utilize health plan claims data for the year 2006. Analytical units on the claims data will include member age, gender, diagnoses and procedures. There is normally a three-month run-out period for claims data to be completed. Therefore, analysis for actual utilization and health status changes in 2006 for the control and study groups were measured in second quarter 2007. Projected health status changes (acuity) for 2007 were also calculated in second quarter 2007.

Study and control group acuity/risk measurement will be obtained using proprietary software that is utilized by the health plan. Member risk scores (health status) are based on member episodes of care, prior use related to those episodes of care and prescription drugs. The logic for calculation of member risk scores include grouping of member claims into episodes of care that measure disease prevalence, co-morbidities and complications to create homogeneous risk marker categories. Weights measuring the contribution of each of these risk marker categories are applied to create member risk scores.

The risk scores reflect an individual measure of risk relative to that of the overall population. A score of 1.0 indicates risk comparable to that of the non-elderly population

used in developing the model. A score of 1.20 indicates a 20 % greater risk, and a score of 0.80 indicates a 20% lower risk. It is noted that a member without any claims or episodes of care will receive a retrospective risk score of zero and a prospective risk score equal to the weight on their age-gender category.

Member risk scores can be applied either prospectively or retrospectively. Retrospective risk assessment uses risk markers for an individual for a base year to produce a measure of risk for that same year. A prospective application uses markers for a base year to measure risk for a future year.

Study Design

The study is designed to ascertain and compare initial differences in actual health services utilization and health status, and projected health status, for health plan members with HF, CAD and/or DM who remain in the HMO and health plan members with HF, CAD and/or DM who transition to the CDHP over a one year time period of 2006. The study will analyze retrospective member claims for 2006 using an untreated or non-equivalent control group pretest and posttest design (Cook & Campbell, 1979).

The study will examine benefit differences between the health plan HMO and CDHP products. Product benefit differences vary by the type of plans that are purchased, with product differences between large and small group and/or individual contracts. Members may be offered one product at enrollment, or they may be able to choose from two or more products (dual enrollment options). Normally, member benefits are determined by the type of product(s) that their employer chooses.

A review of the member liability between the health plan products shows the highest potential for differences in member cost sharing is for deductibles and co-payments. There are no in-network deductibles for the HMO versus a range between $0 - $500 to $10,000 for individual coverage, or between $0 - $1,500 to $30,000 for family coverage for the CDHP. The minimal deductibles of $500 for individual and $1,500 for family coverage are the most common. There are no co-payment percentages for the HMO versus a range between 0% and 50% for the CDHP, with in-network co-payments of 20% individual being the most common.

The study group will be members who transition from the HMO to the CDHP at the beginning of 2006, and the control group will be members who remain in the HMO over the one-year time period. Multivariate analysis will be performed to determine whether independent variables of benefit differences between the two products (deductibles and co-insurance), member financial income, member demographics and member health status affect actual health services utilization and health status, and projected health status, for members in both groups.

The study and control groups are developed from health plan claims data that identified members with HF, DM and/or CAD who remained in the HMO or transitioned into the CDHP in December 2005 or January 2006. The study will focus only on members that did not have a selection choice between insurance products to help to control for selection bias. Selection bias may exist if members choose a product based on their perceived and actual acuity (e.g., sicker members choosing a HMO and healthier members choosing a CDHP) versus no product choice for the member (e.g., the employer

designates only an HMO or CDHP), or other unobserved variables that can lead to a selection preference. It is noted that the potential for selection bias at the employer administrative level, based on demographics and acuity level of the employees, may exist. As there are no members in the control and study groups with health savings accounts, this variable will not be used in the analysis.

Analytic Approach

The analytic approach is based on the literature review, conceptual model and hypotheses that there will be differences in HMOs and CDHPs for actual and predicted use of health services and changes in health status, and projected health status, due to differences in member financial responsibility. Table 1 indicates an overview of the study regarding health plan differences, how members are influenced by illness burden, the independent variables regarding type of insurance plan and financial income status, member demographics, member health status and dependent variables of health services utilization and changes in health status.

Table 1: Study Overview of Health Plan Differences and Measures

Health Plan Differences Between HMOs and CDHPs	**Member Illness Burden**	**Independent Variables**	**Dependent Variables**
• Increased first dollar coverage responsibility (deductible) → • Increased co-insurance responsibility →	• HF, CAD and/or DM → • Severity of illness →	• Type of insurance plan in 2006 → • Amount of cost sharing in 2006 → • Financial income status → • Member demographics → • Member health status →	• Actual use of health services • Actual changes in health status • Projected changes in health status

Identified independent study variables are as follows:

1. The health insurance products for the control and experimental groups. These include the HMO, the CDHP with HMO similar health insurance benefits and the CDHP with CDHP similar benefits. This variable will be used to ascertain if overall product design will affect the dependent variables.
2. Actual member age.
3. Member gender: 1=Male, 2=Female.
4. Estimated household income levels are based on member demographic information and are obtained through proprietary software that is utilized by the health plan. These variables may impact member ability to utilize health care services, and may be correlated with member deductibles/co-payments as well as utilization of health services/health status. Variable measures are $0 - $29,999 = 1, $30,000-$49,999 = 2, $50,000-$74,999 = 3, $75,000-$124,999 = 4, ≥$125,000 = 5.
5. Estimated individual member financial net worth levels are based on member demographic information and are obtained through proprietary software that is utilized by the health plan. Variable measures are: <$25,000 = 1, $25,000-$49,999 = 2, $50,000-$74,999 = 3, $75,000-$99,999 = 4, $100,000-$149,999 = 5, $150,000-$249,999 = 6, $250,000-$499,999 = 7, $500,000-$749,999 = 8, ≥$750K= 9.
6. In-network per-person deductible levels in the health plan: Individual: $0=1, $1 - $500=2, $501-$1,000=3, $1,001-$1,500=4, $1,501-$2,000=5, >$2,000=6.
7. In-network family deductible levels in the health plan ($0=1, $1-$500=2, $501-$1,000=3, $1,001-$1,500=4, $1,501-$2,000=5, $2,001-$2,500=6, $2,501-$3,000=7,

$3,001-$3,500=8, $3,501-$4,000=9, $4,001-$4,500=10, $4,501-$5,000=11, $5,001-$5,500=12, $5,001-$6,000=13, $6,001-$6,500=14, $6,501-$7,000=15, >$7,000=16.

8. The member in-network physician (primary care physician and specialist) co-insurance in the health plan level: 0% = 1, 1% - 10% = 2, 11% - 20% = 3, 21% - 30% = 4, 31% - 40% = 5. Control and study group member co-payments for inpatient and outpatient facilities are not included in the study.

The study will include the following dependent variables:

1. Actual number of member professional (primary and specialty) care visits in 2006. This will be measured by claims data.
2. Actual inpatient, outpatient and emergency room utilization. This will be measured by claims data. It is noted that some utilization measures may vary from the hypotheses of the study group having lower utilization than the control group, as lower professional care visits may result in higher emergency room and/or inpatient utilization due to exacerbation of clinical conditions caused by not receiving primary or specialist care.
3. Actual member retrospective acuity score changes in 2006. This will be measured through proprietary software that is utilized by the health plan.
4. Projected member acuity score changes in 2007. This will be measured through proprietary software that is utilized by the health plan.

Table 2 shows the design for independent and dependent variables to be used in the study.

Table 2: Independent and Dependent Variables

Study Independent Variables	Study Dependent Variables
Health Insurance Products (Grouping Variable) • Member in HMO • Member in CDHP with HMO similar benefits • Member in CDHP with CDHP similar benefits **Age** • Individual Member Age **Gender** • 1 = Male, 2 = Female **Estimated Household Income:** • $0-$29,999 = 1, $30,000-$49,999 = 2, $50,000-$74,999 = 3, $75,000-$124,999 = 4, ≥$125,000 = 5 **Estimated Individual Financial Net-Worth:** • <$25,000 = 1, $25,000-$49,999 = 2 $50,000-$74,999 = 3, $75,000-$99,999 = 4, $100,000-$149,999 = 5, $150,000-$249,999 = 6, $250,000-$499,999 = 7, $500,000-$749,999 = 8, ≥$750,000 = 9 **In-Network Per-Person Deductible** • $0 = 1, $1-$500 = 2, $501-$1,000 = 3, $1,001-$1,500 = 4, $1,501-$2,000 = 5, >$2,000 = 6 **In-Network Family Deductible** • $0 = 1, $1-$500 = 2, $501-$1,000 = 3, $1,001-$1,500 = 4, $1,501-$2,000 = 5, $2001-$2,500 = 6, $2,501-$3,000 = 7, $3,001-$3,500 = 8, $3,501-$4,000 = 9, $4,001-$4,500 = 10, $4,501-$5,000 = 11, $5,001-$5,500 = 12, $5,501-$6,000 = 13, $6,001-$6,500 = 14, $6,501-$7,000 = 15, >$7,000 = 16 **In-Network Physician Co-Insurance Levels** • 0% = 1, 1%-10% = 2, 11%-20% = 3, 21%-30% = 4, 31%-40% = 5 **Member 2006 Retroactive Acuity Scores** • Individual member acuity score	**Health Services Utilization:** • Actual number of professional (primary and specialty) care visits in 2006. • Actual inpatient, outpatient and emergency room utilization in 2006. **Health Status Changes:** • Actual member retrospective acuity score changes in 2006. • Projected member acuity scores in 2007.

An analysis of employer group size and differences in member demographics and acuity levels between the control and study groups will be made to determine if selection bias may exist at the employer group decision making level. The emphasis of the study will be on the control group and the study group with CDHP similar benefits, as this will provide a comparison of significant differences between HMO and CDHP member cost sharing responsibilities. Statistical power for the study will be performed using SPSS SamplePower® software.

SPSS® software will be used to perform statistical analyses. Analyses will include descriptive statistics of dependent and independent variables. Testing for differences in the group means of the independent and dependent variables for the control and study groups will include the use of t-tests and chi-square tests (Polit & Beck, 2004). Additionally, probability analysis of utilization will be performed to ascertain differences between the control and study groups.

Statistical significance between the independent and dependent variables will be determined by Multivariate Analysis of Variance (MANOVA). MANOVA is used to test the significance of differences in group means for two or more dependent variables that are being considered simultaneously by taking inter-correlations of dependent variables into account (Polit & Beck, 2004). Separate Analysis of Variance (ANOVA) tests or t-tests may not control for overall experiment-wide error rate and may ignore correlations between dependent variables, while MANOVA may detect combined differences not found in univariate tests (Hair, Anderson, Tatham & Black, 1998). The comparison of products (HMO, CDHP with HMO similar benefits, and CDHP with CDHP similar

benefits) will be the primary analysis and the other independent variables will be considered as covariates. A RAND 2-Part Model will be used to compare probabilities of health plan member utilization. Multivariate Analysis of Co-Variance (MANCOVA) will be used to simultaneously test for differences in the group means for utilization and health status dependent variables.

Overall multivariate formulas for utilization are:

1. Primary Care Physician Visits = *f* (Grouping Variable, Age, Gender, Estimated Household Income, Estimated Individual Financial Net-Worth, In-Network Per-Person Deductible, In-Network Family Deductible, In-Network Physician Co-Insurance Level, Member 2006 Retroactive Acuity Scores)
2. Specialty Physician Visits = *f* (Grouping Variable, Age, Gender, Estimated Household Income, Estimated Individual Financial Net-Worth, In-Network Per-Person Deductible, In-Network Family Deductible, In-Network Physician Co-Insurance Level, Member 2006 Retroactive Acuity Scores)
3. Inpatient Admission = *f* (Grouping Variable, Age, Gender, Estimated Household Income, Estimated Individual Financial Net-Worth, In-Network Per-Person Deductible, In-Network Family Deductible, In-Network Physician Co-Insurance Level, Member 2006 Retroactive Acuity Scores)
4. Outpatient Procedures = *f* (Grouping Variable, Age, Gender, Estimated Household Income, Estimated Individual Financial Net-Worth, In-Network Per-Person Deductible, In-Network Family Deductible, In-Network Physician Co-Insurance Level, Member 2006 Retroactive Acuity Scores)

5. Emergency Room Visits = *f* (Grouping Variable, Age, Gender, Estimated Household Income, Estimated Individual Financial Net-Worth, In-Network Per-Person Deductible, In-Network Family Deductible, In-Network Physician Co-Insurance Level, Member 2006 Retroactive Acuity Scores)

Overall multivariate formulas for health status changes are:

1. Actual retrospective risk score = *f* (Grouping Variable, Age, Gender, Estimated Household Income, Estimated Individual Financial Net-Worth, In-Network Per-Person Deductible, In-Network Family Deductible, In-Network Physician Co-Insurance Level, Member 2006 Retroactive Acuity Scores)
2. Projected prospective risk score = *f* (Grouping Variable, Age, Gender, Estimated Household Income, Estimated Individual Financial Net-Worth, In-Network Per-Person Deductible, In-Network Family Deductible, In-Network Physician Co-Insurance Level, Member 2006 Retroactive Acuity Scores)

Institutional Review Board Review/Health Plan Oversight

Institutional Review Board (IRB) human subject review and Exempt Status was obtained through the Virginia Commonwealth University review process. The study is a retrospective analysis using existing claims data that was previously collected for another purpose (calculation of provider reimbursement), and will not influence member choice in health plans or utilization of health services. The study is also performed under the auspices of the health plan Quality Improvement Committee as a potential quality improvement initiative.

The results chapter will finalize the control and study groups and will provide a detailed analysis of member utilization and acuity changes. Study results for member health services utilization will be obtained utilizing a logistic and MANOVA statistical approach. Study results for member health status changes will be obtained by utilizing a MANOVA statistical approach. A MANCOVA model to ascertain independent variable effects and utilization and health status change interactions will also be developed.

CHAPTER FIVE: ANALYSIS AND RESULTS

The study is a detailed analysis of utilization and acuity change differences between members in a health plan Health Maintenance Organization (HMO) and members in a health plan Consumer Driven Health Plan (CDHP) with significant benefit differences when compared to the HMO. Control and study groups are finalized and independent variables, dependent variables and hypotheses are tested. Statistical analyses are developed and performed, and results are documented.

Finalization of Control and Study Groups

Employer group sizes from which the control and study groups were derived are grouped into multiple categories by the health plan. There are 10,074 employer groups that have a health plan HMO product and there are 14,070 employer groups that have a health plan CDHP product. The health plan HMO group sizes range from 2 to 56,468 members with an average group size of 70 members. The health plan CDHP group sizes range from 2 to 30,540 members with an average group size of 65 members.

Member attrition due to death or leaving the health plan throughout 2006 resulted in moderate decreases of group sizes. The control group size decreased 17 % from 7,187 members to 5,922 members. The study group size decreased 20% from 2,036 members to 1,629 members.

The health plan Quality Improvement Committee review of clinical diagnoses relating to the three targeted clinical conditions revealed diagnoses that were not

considered to be chronic conditions. These diagnoses were removed resulting in the final diagnosis list that is shown in Appendix 1. Removal of these diagnoses resulted in limited decreases of group size. The control group size decreased 11% from 5,922 members to 5,288 members. The study group size decreased 13% from 1,629 members to 1,422 members.

Group descriptions for the study are comprised as follows:

1. Health plan members with CHF, DM and/or CAD who remained in the health plan HMO throughout 2006 are designated as the Control Group (CG). There are 5,288 members in the CG.
2. Health plan members with CHF, DM and/or CAD who transitioned to and remained in the health plan CDHP throughout 2006, and had health plan benefits that were similar to the HMO (no deductibles and limited physician coinsurance), are designated as Study Group 1 (SG1). There are 734 members in SG1.
3. Health plan members with CHF, DM and/or CAD who transitioned to and remained in the health plan CDHP throughout 2006, and had health plan benefits with higher member cost sharing than the HMO (deductibles and higher physician coinsurance), are designated as Study Group 2 (SG2). The focus of the study and interpretation of results are for the comparison of CG and SG2, as differences in member cost sharing responsibilities are the research interest between these groups. There are 688 members in SG2.

Statistical power calculations for the groups show high power. A standard power analysis result of at least 0.80 is a normal goal and indicates a 20% chance of committing a Type II error (Hair, Anderson, Tatham & Black, 1998; Polit & Beck, 2004). The power

calculation result for SG1 using eight covariates and seven dependent variables is 0.91. The power calculation result for SG2 using up-to eight covariates and seven dependent variables is 0.88.

Independent Variable Descriptive Statistics

Comparison of study group independent variables with the control group for significant differences are shown in Table 3. The table shows similarities and differences across study groups. Predisposing variables of age and gender show differences between the control and study groups. Enabling characteristics include financial variables. The need variable of 2006 retrospective risk score shows differences between the control and study groups.

Product grouping variables of CG, SG1 and SG2 are used with all statistical tests. This variable compares the control group to each of the two study groups.

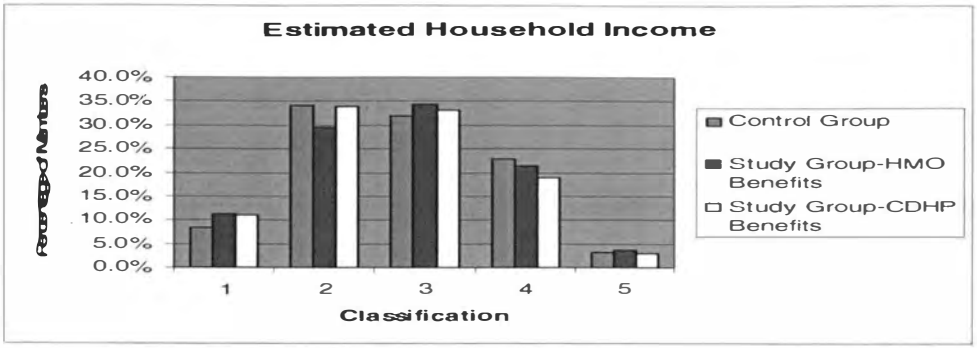
The predisposing demographic age variable is a continuous variable for all members. Both SG1 and SG2 showed statistical significance indicating members in the study groups are younger than in the CG. The predisposing demographic gender variable shows a significantly higher female population in the CG as compared to both SG1 and SG2.

Household income classification shows a symmetrical distribution with variability between groups, as is illustrated in Figure 4. This enabling variable shows a majority of member household incomes are between $30,000 and $74,999.

Estimated individual net worth classification ranges show a non-symmetrical distribution with variability between groups, as illustrated in Figure 5. This enabling

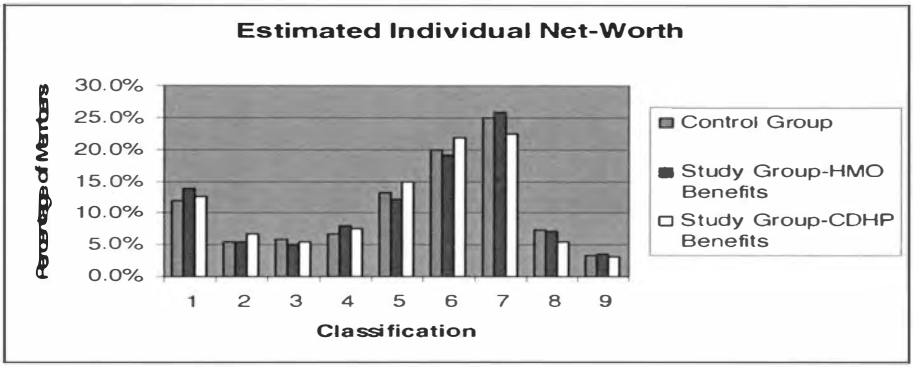
Table 3: Independent Variable Comparison for Significant Differences Between Control and Study Groups

Independent Variable (Characteristic)	**Control Group (CG)**	**Study Group One (SG1)**	**Study Group Two (SG2)**
Product Grouping	Control N=5,228	SG1 N=734	SG2 N=688
Age (Predisposing)	Mean: 49.74	Mean: 47.47 T-Test: **-5.66** Sig: **..000**	Mean: 48.00 T-Test: **-4.20** Sig: **.000**
Gender (Predisposing)	Male: 2,390 – 45.7% Female: 2,840 – 54.3%	Male: 374 – 51.0% Female: 360 –49.0% Chi-Square Asymp. Sig: .605	Male: 330 – 48.0% Female: 358 –52.0% Chi-Square Asymp. Sig: .286
Estimated Household Income: Classifications (Enabling)	1: 439 – 8.4% 2: 1,775 – 34.0% 3: 1,660 – 31.8% 4: 1,191 – 22.8% 5: 163 – 3.1%	1: 82 – 11.2% 2: 216 – 29.4% 3: 252 – 34.3% 4: 157 – 21.4% 5: 27 – 3.7% Chi-Square Asymp. Sig: **.000**	1: 76 – 11.0% 2: 233 – 33.9% 3: 228 – 33.1% 4: 131 – 19.0% 5: 20 – 2.9% Chi-Square Asymp. Sig: **.000**
Estimated Individual Net-Worth Classifications (Enabling)	1: 621 – 11.9% 2: 289 – 5.5% 3: 303 – 5.8% 4: 355 – 6.8% 5: 693 – 13.3% 6: 1,099 – 20.0% 7: 1,307 – 25.0% 8: 385 – 7.4% 9: 176 – 3.4%	1: 102 – 13.9% 2: 40 – 5.4% 3: 37 – 5.0% 4: 58 – 7.9% 5: 89 – 12.1% 6: 140 – 19.1% 7: 190 – 25.9% 8: 52 – 7.1% 9: 26– 3.5% Chi-Square Asymp. Sig: **.000**	1: 87 – 12.6% 2: 46 – 6.7% 3: 38 – 5.5% 4: 52 – 7.6% 5: 102 – 14.8% 6: 150 – 21.8% 7: 154 – 22.4% 8: 37 – 5.4% 9: 22 – 3.2% Chi-Square Asymp. Sig: **.000**
Individual Deductible Classification Ranges (Enabling)	$0: 5,228 – 100%	$0: 734 – 100%	$1-$500: 625 – 90.8% $501-$1,000: 36 – 5.2% $1,001-$1,500: 24 – 3.5% $1,501-$2,000: 1 – 0.7% >$2,000: 2 – 0.3%
Household Deductible Classifications (Enabling)	$0: 5,228 – 100%	$0: 734 – 100%	$501-$1,000: 100 – 14.5% $1,001-$1,500: 525 – 76.3% $2,001-$2,500: 34 – 4.9% $2,501-$3,000: 26 – 3.8% >$7,000: 3 – 0.4%
Physician Coinsurance Classification Ranges (Enabling)	0%: 5,228 – 100%	0%: 665 – 90.6% 1%-10%: 40 – 5.4% 11%-20%: 29 – 4.0%	0%: 1 – 0.1% 1%-10%: 61 – 8.9% 11%-20%: 624 – 90.7% 21%-30%: 2 – 0.6%
2006 Retrospective Risk Score (Need)	Range: 0-42.74 Mean: 2.76 Median: 2.22 Mode: 0 (246, 4.7%)	Range: 0-35.9 Mean: 2.22 Median: 1.31 Mode: 0 (66, 9.0%) T-Test: **-4.41** Sig: **.000**	Range: 0-38.21 Mean: 2.11 Median: 1.29 Mode: 0 (81, 11.8%) T-Test: **-5.66** Sig: **.000**



Classification: 1: $0-$29,999; 2: $30,000-$49,999; 3: $50,000-$74,999; 4: $75,000-$124,999; 5: ≥$125,000

Figure 4: Estimated Household Income Distribution



Classification: 1: < $25,000; 2: $25,000 - $49,999; 3: $50,000 - $74,999; 4: $75,000 - $99,999; 5: $100,000 - $149,999; 6: $150,000 - $249,999; 7: $250,000 - $499,999; 8: $500,000 - $749,000; 9: ≥$750,000

Figure 5: Estimated Individual Net-Worth Distribution

variable shows a majority of estimated individual net worth are between $150,000 and $499,999.

The enabling individual deductible classification ranges show deductibles being present only in SG2. The majority (98.2%) of SG2 individual deductibles range from $1-$500, with $500 deductibles being most common in the health plan.

The enabling household deductible classification ranges showed deductibles also being present only in SG2. The majority of SG2 deductibles (76.3%) ranged from $1,001-$1,500.

The enabling variable of physician (PCP and specialist) coinsurance classification ranges are only present in the study groups with most coinsurance occurring in SG2. The majority (90.7%) of SG2 physician coinsurance is for 11%-20%, with 20% coinsurance being most common in the health plan. It is noted that members in both the control and study groups are accountable for inpatient and outpatient facility co-payments that are not included in the study. These facility co-payments vary by provider network tiers in the study groups.

The need variable is represented by the 2006 retrospective risk score. It is a continuous variable and is used as a proxy for member health status/acuity. The risk scores were derived through the health plan proprietary software. These scores were obtained in the first quarter of 2006, and are based on member utilization in 2005 when all groups (CG, SG1 and SG2) were in the HMO plan. Mean risk scores for SG1 and SG2 show significantly lower than results than mean risk scores for the CG, suggesting that better health status in each group relative to the comparison group.

Correlation Results

Correlation analysis of the independent variables using a Pearson Correlation measurement reveals moderate to high correlation between some of the variables. Correlation analyses for independent variables are included in Appendix 2. Variables showing correlation significance at the 0.01 level are shown in Table 4.

Table 4: Independent Variable Correlation Analysis

Individual Variable Correlation 0.01 Level (2-Tailed Test)	Pearson Correlation
Individual Deductible – Family Deductible	.953
Household Deductible – Physician Coinsurance	.907
Individual Deductible – Physician Coinsurance	.823
Household Income – Individual Net Worth	.559
Coinsurance – Retrospective Risk	-.069
Individual Deductible – 2006 Retrospective Risk	-.065
Age – Physician Coinsurance	-.045
Age – 2006 Retrospective Risk	-.044
Age – Individual Deductible	-.033
Age – Household Deductible	-.032

The individual deductible and household deductible variables show high correlation. The health plan usually adjusts membership for having more than one member per contract, therefore the individual deductible was eliminated from the multivariate analysis.

The household deductible and physician coinsurance variables are highly correlated. As there is some physician coinsurance in SG1 (9.4%) as opposed to no household deductibles in both CG and SG1, the household deductible variable was also eliminated from the multivariate analysis.

The household income and individual net worth variables show high correlation. As was previously noted the health plan contracts usually adjust membership for having more than one member per contract and the household income was considered to be a more descriptive variable for the population, therefore the individual deductible was dropped from the multivariate analysis. The remaining independent variables of product grouping, gender, household income, physician coinsurance, age and 2006 retrospective risk score were used in the study.

Dependent Variables and Hypotheses Testing

Based on the study hypotheses, the following dependent variables were used to evaluate probability and actual use rates:

1. Primary Care Physician (PCP) Visits. This was measured through health plan claims data as the number of PCP visits for individual members in CG, SG1 and SG2 in 2006.
2. Specialist Visits. This was measured through health plan claims data as the number of specialist visits for individual members in CG, SG1 and SG2 in 2006.
3. Inpatient Admissions. This was measured through health plan claims data as the number of inpatient admissions for individual members in CG, SG1 and SG2 in 2006.
4. Outpatient Procedures. This was measured through health plan claims data as the number of outpatient procedures for individual members in CG, SG1 and SG2 in 2006.
5. Emergency Room (ER) Visits. This was measured through health plan claims data as the number of ER visits for individual members in CG, SG1 and SG2 in 2006.

Hypotheses for member utilization between the groups of interest, CG and SG2, are directional. Primary care physician utilization (PCP visits), specialty care physician utilization (specialist visits), inpatient utilization (inpatient admissions), outpatient utilization (outpatient procedures) and emergency room utilization (ER visits) for members with diagnoses of heart failure, diabetes and/or coronary artery disease in the health plan CDHP (SG2) will be lower than members with diagnoses of heart failure, diabetes and/or coronary artery disease in the health plan HMO (CG).

Table 5 shows a correlation analysis of the dependent variables using a Pearson Correlation measurement reveals moderate correlation between all variables. All variables are significant at the 0.01 level with Pearson Correlation scores ranging from .097 to .271. Higher correlations were seen between PCP visits and specialist visits (.271), specialist visits and outpatient procedures (.250) and ER visits and specialist visits (.204).

Table 5: Correlation Analysis for Dependent Variables

Independent Variable	Pearson Correlation Coefficient	Significance (2-Tailed Test)
PCP Visits	• Specialist Visits .271** • Inpatient Admissions .146** • Outpatient Procedures .133** • ER Visits .155**	• .000 • .000 • .000 • .000
Specialist Visits	• PCP Visits .271** • Inpatient Admissions .230** • Outpatient Procedures .250** • ER Visits .204**	• .000 • .000 • .000 • .000
Inpatient Admissions	• PCP Visits .146** • Specialist Visits .230** • Outpatient Procedures .164** • ER Visits .154**	• .000 • .000 • .000 • .000
Outpatient Procedures	• PCP Visits .133** • Specialist Visits .250** • Inpatient Admissions .164** • ER Visits .097**	• .000 • .000 • .000 • .000
ER Visits	• PCP Visits .155** • Specialist Visits .204** • Inpatient Admissions .154** • Outpatient Procedures .097**	• .000 • .000 • .000 • .000

** Correlation is significant at the 0.01 level (2-tailed)

Utilization Analysis Results

Table 6 shows a comparison for years 2005 and 2006 mean utilization for all members in the study who were enrolled in the health plan throughout 2005. Members in

Table 6: 2005 – 2006 Utilization Comparison

2005 – 2006 Utilization Comparison: Control Group (N=4,997)			
Dependent Variable	**2005 Mean**	**2006 Mean**	**Repeated Measures T-Test Significance**
PCP Visit	**6.12**	**5.68**	**.000**
Specialist Visit	6.54	6.46	.366
Total PCP and Specialist Visit	**12.66**	**12.13**	**.000**
Inpatient Admission	**.60**	**.48**	**.000**
Outpatient Procedure	**2.69**	**2.44**	**.042**
ER Visit	.64	.61	.206
2005 – 2006 Utilization Comparison: Study Group 1 (N=644)			
Dependent Variable	**2005 Mean**	**2006 Mean**	**Repeated Measures T-Test Significance**
PCP Visit	5.55	5.57	.909
Specialist Visit	**5.87**	**6.29**	**.014**
Total PCP and Specialist Visit	11.11	11.86	.062
Inpatient Admission	.60	.60	.991
Outpatient Procedure	2.65	2.30	.428
ER Visit	**.70**	**.57**	**.025**
2005 – 2006 Utilization Comparison: Study Group 2 (N=600)			
Dependent Variable	**2005 Mean**	**2006 Mean**	**Repeated Measures T-Test Significance**
PCP Visit	4.76	4.42	.191
Specialist Visit	**4.61**	**5.52**	**.026**
Total PCP and Specialist Visit	9.52	9.93	.439
Inpatient Admission	**.54**	**.25**	**.000**
Outpatient Procedure	1.68	1.69	.972
ER Visit	.53	.49	.446

SG1 and SG2 were enrolled in the health plan HMO in 2005 and the CDHP in 2006. The CG shows significant decreases in PCP visits, inpatient admissions and outpatient procedures in 2006 when compared to 2005. Both SG1 and SG2 show significant increases in specialist visits in 2006 when compared to 2005. This pattern may have been influenced by the CDHP design of members not having to obtain primary care physician authorization to utilize specialists which remained in place in the HMO. There is no

evidence of member substitution of specialist visits for PCP visits. SG2 shows a significant decrease in inpatient admissions in 2006 when compared to 2005.

Table 7 shows the 2005 mean utilization comparison between SG1 and SG2 to CG. Members in SG1 and SG2 were enrolled in the health plan HMO in 2005. SG2 shows significantly less PCP Visits, Specialist Visits, Outpatient Procedures, and ER Visits in 2005 when compared to the CG.

Table 7: 2005 Study Group Average Utilization Comparison

Independent Variables	Control Group (CG, N=4,997)	Study Group One (SG1, N=644)	Study Group Two (SG2, N=600)
Mean PCP Visits	6.12	5.55 T-Test: **-.2.82 /** Sig: **.005**	4.76 T-Test: **-7.09** / Sig: **.000**
Mean Specialist Visits	6.54	5.87 T-Test: **-.2.14 /** Sig: **.033**	4.61 / $282 T-Test: **-8.10** / Sig: **.000**
Mean Inpatient Admissions	0.60	0.60 T-Test: -.041 / Sig: .997	0.54 T-Test: **-.**783 / Sig: .434
Mean Outpatient Procedures	2.69	2.65 T-Test: -.095 / Sig: .924	1.68 T-Test: **-6.36 /** Sig: **.000**
Mean ER Visits	0.64	0.70 T-Test: 1.11 / Sig: .267	0.53 T-Test: **-2.16 /** Sig: **.031**

Table 8 shows the 2006 mean utilization comparison between SG1 and SG2 to the CG. Health plan allowed payment amounts to providers that are included in the table were adjusted to provide comparison between all groups across all services. SG2 shows significantly less utilization in all measures (PCP Visits, Specialist Visits, Inpatient Admissions, Outpatient Procedures and ER Visits) in 2006 when compared to the CG. Allowed payment amounts in SG2 were significantly lower than allowed payment amounts in the CG for PCP visits, inpatient admissions and ER visits in 2006.

Table 8: 2006 Utilization and Payment Control Group Comparison to Study Groups

Independent Variables	Control Group (CG)	Study Group One (SG1)	Study Group Two (SG2)
Mean PCP Visits and Mean Allowed Amount per Member	5.66 / $267	5.53 / $286 T-Test: -.729 Sig: .466 / T- Test: **2.00** Sig: **.046**	4.45 / $214 T-Test: **-7.31** Sig: **.000** / T- Test: **-7.09** Sig: **.000**
Mean Specialist Visits and Mean Allowed Amount per Member	6.49 / $305	6.27 / $360 T-Test: -.001 Sig: .999 / T- Test: **3.64** Sig: **.000**	5.52 / $282 T-Test: **-3.74** Sig: **.000** / T- Test: -1.69 Sig: .091
Mean Inpatient Admissions and Mean Allowed Amount per Member	0.47 / $2,599	0.57 / $1,872 T-Test: -.005 Sig: .996 / T- Test: **-2.09** Sig: **.037**	0.26 / $1,205 T-Test: **-5.62** Sig: **.000** / T- Test: **-5.13** Sig: **.000**
Mean Outpatient Procedures and Mean Allowed Amount per Member	2.39 / $1,055	2.22 / $1,384 T-Test: -.528 Sig: .598 / T- Test: 1.58 Sig: .155	1.71 / $993 T-Test: **-2.90** Sig: **.004** / T- Test: -.232 Sig: .816
Mean ER Visits and Mean Allowed Amount Per Member	0.61 / $377	0.61 / $336 T-Test: .033 Sig: .973 / T- Test: -1.07 Sig: .285	0.51 / $281 T-Test: **-2.04** Sig: **.042** / T- Test**: -2.73** Sig: **.006**

Probability of Use

To ascertain Product Grouping differences for members who had utilization in 2006, probability analysis was performed through a RAND Two-Part Test. Individual member probabilities for each utilization variable were created. Probability scores for members that had utilization in 2006 were then placed into an Analysis of Covariance

(ANCOVA) with Product Grouping used as a fixed variable and all other independent variables used as covariates to obtain predicted probability differences for at least one unit of utilization in 2007.

Table 9 shows differences between groups in percentages of members that had at least one unit of utilization for the dependent variables in 2006. SG2 shows lower percentages of at least one unit of utilization for all dependent variable measures.

Table 9: Probability Analysis – Percentage of Members Having Utilization

Dependent Variable Unit of Utilization	Control Group (CG)	Study Group 1 (SG1)	Study Group 2 (SG2)
PCP Visit	91.0%	92.5%	90.0%
Specialist Visit	82.5%	87.6%	80.1%
Inpatient Admission	16.8%	18.7%	12.2%
Outpatient Procedure	49.9%	48.0%	44.9%
ER Visit	29.0%	30.2%	26.2%

Table 10 shows pairwise comparison results of differences between the product groupings. SG2 shows significantly less utilization for outpatient procedure than CG and SG1. It is noted that SG2 shows less utilization for PCP Visit than CG and SG1 at were near significance with p-values of .078 and .053.

Table 10: Probability Analysis - Pairwise Comparison

Dependent Variable and Grouping Variable	Comparison Grouping Variables	Mean Difference	Significance P-Value
PCP Visit / S2	CG	-6.727E-02	.078
	SG1	-7.164E-02	.053
Specialist Visit / S2	CG	3.116E-02	.549
	SG1	2.362E-02	.639
Inpatient Admission / S2	CG	-3.342E-02	.512
	SG1	-6.571E-02	.183
Outpatient Procedure / S2	CG	-.186	.007
	SG1	-.171	.010
ER Visit / S2	CG	2.376E-02	.708
	SG1	7.071E-03	.908

Multivariate Analysis

Statistical significance between the independent and dependent variables were determined through MANOVA to test for differences in the group means for all dependent variables simultaneously. MANOVA is used to test the significance of differences in group means for two or more dependent variables that are being considered simultaneously by taking inter-correlations of dependent variables into account (Polit & Beck, 2004). Separate Analysis of Co-Variance (ANCOVA) tests or t-tests may not control for overall experiment-wide error rate and may ignore correlations between dependent variables, thus increasing the Type I error rate of rejecting the null hypothesis when it is actually true (Hair, Anderson, Tatham & Black, 1998).

MANOVA studies with Product Grouping used as a fixed variable and all other independent variables used as covariates are performed. MANOVA Multivariate Test results for all members (those that had utilization and those that did not have utilization) are shown in Table 11. Pillai's Trace and Wilks' Lambda results indicate independent variable significance on the utilization dependent variables for gender, 2006 retrospective risk score and product grouping. It is noted that coinsurance is at near significance with a p-value of .057.

Table 12 shows MANOVA results for independent variable effects on the utilization dependent variables. It is noted that R-Square calculations for the model are low, ranging from .004 to .062 for the models tested.

Table 11: 2006 Utilization MANOVA Multivariate Tests

Independent Variable and Effect	Effect Value	F-Statistic	Significance P-Value	Observed Power Alpha =.05
Gender (Predisposing)				
Pillai's Trace	.002	2.93	.015	.843
Wilks' Lambda	.998	2.83	.015	.843
Physician Coinsurance (Enabling)				
Pillai's Trace	.002	2.15	.057	.714
Wilks' Lambda	.998	2.15	.057	.714
Age (Predisposing)				
Pillai's Trace	.001	1.79	.110	.621
Wilks' Lambda	.999	1.79	.110	.621
2006 Retrospective Risk Score (Need)				
Pillai's Trace	.087	125.76	.000	1.00
Wilks' Lambda	.913	125.76	.000	1.00
Estimated Household Income (Enabling)				
Pillai's Trace	.001	.837	.523	.305
Wilks' Lambda	.999	.837	.523	.305
Product Grouping				
Pillai's Trace	.003	1.87	.044	.865
Wilks' Lambda	.002	1.87	.044	.865

Table 12: 2006 Utilization MANOVA Results

Independent Variable and Dependent Variable	F-Statistic	Significance P-Value	Observed Power Alpha =.05
PRODUCT GROUPING			
PCP Visit	1.26	.281	.277
Specialist Visit	0.31	.734	.100
Inpatient Admission	3.17	**.042**	.609
OP Procedure	4.91	**.007**	.808
ER Visit	0.11	.888	.068
GENDER			
(Predisposing)	3.68	.055	.483
PCP Visit	0.16	.684	.069
Specialist Visit	4.83	.028	.564
Inpatient Admission	0.32	.567	.088
OP Procedure	3.82	.051	.498
ER Visit			
AGE			
(Predisposing)	2.59	.107	.363
PCP Visit	0.55	.458	.115
Specialist Visit	0.01	.894	.052
Inpatient Admission	0.01	.903	.052
OP Procedure	4.47	.034	.562
ER Visit			
ESTIMATED HOUSEHOLD INCOME			
(Enabling)			
PCP Visit	0.15	.694	.068
Specialist Visit	0.18	.664	.072
Inpatient Admission	0.43	.511	.101
OP Procedure	0.01	.974	.050
ER Visit	3.97	.046	.514
PHYSICIAN COINSURANCE			
(Enabling)	0.02	.964	.050
PCP Visit	0.09	.753	.061
Specialist Visit	0.56	.452	.117
Inpatient Admission	8.19	.004	.817
OP Procedure	0.59	.440	.121
ER Visit			
2006 RETROSPECTIVE RISK SCORE			
(Need)			
PCP Visit	127.47	.000	1.00
Specialist Visit	430.89	.000	1.00
Inpatient Admission	215.33	.000	1.00
OP Procedure	158.69	.000	1.00
ER Visit	20.14	.000	.994
R-Square Calculation			
PCP Visit = .026			
Specialist Visit = .062			
Inpatient Admission = .033			
OP Procedure = .024			
ER Visit = .004			

Table 13 shows MANOVA significant results. Product grouping is significant for inpatient admission and outpatient procedure, which is where differences between the control and study groups occur after controlling for all other variables in the model. Estimated household income is significant for ER Visit. Physician coinsurance is significant for outpatient procedure. Age is significant for ER Visit. Gender is significant for PCP Visit, inpatient admission and ER Visit. 2006 Retrospective Risk Score is significant for all dependent variables.

Table 13: 2006 MANOVA Significant Results

Significant Independent Variable	**Dependent Variable**	**P-Value at Alpha .05**
Grouping Variable	• Inpatient Admission • Outpatient Procedure	• .040 • .007
Estimated Household Income (Enabling)	• ER Visit	• .046
Physician Coinsurance (Enabling)	• Outpatient Procedure	• .004
Age (Predisposing)	• ER Visit	• .034
Gender (Predisposing)	• PCP Visit • Inpatient Admission • ER Visit	• .055 • .028 • .051
2006 Retrospective Risk Score (Need)	• PCP Visit • Specialist Visit • Inpatient Admission • Outpatient Procedure • ER Visit	• .000 • .000 • .000 • .000 • .000

Table 14 shows posthoc test results for parameter estimates for significant effects in the MANOVA using un-standardized regression coefficient scores. Estimated household income is positively correlated with ER utilization meaning members with higher income are likely to have more visits. Higher physician coinsurance levels show positive correlation with higher outpatient utilization. Age is negatively correlated with ER utilization meaning utilization is higher among younger members. Males had higher

Table 14: 2006 MANOVA Posthoc Parameter Estimates

Significant Independent Variable	Dependent Variable	Regression Coefficient
Estimated Household Income (Enabling)	• ER Visit	• 3.472E-02
Physician Coinsurance (Enabling)	• Outpatient Procedure	• 1.509
Age (Predisposing)	• ER Visit	• -3.52E-03
Gender (Predisposing)	• PCP Visit • Inpatient Admission • ER Visit	• -.255 • -9.20E-02 • 6.793E-02
2006 Retrospective Risk Score (Need)	• PCP Visit • Specialist Visit • Inpatient Admission • Outpatient Procedures • ER Visit	• .188 • .525 • 8.752E-02 • .333 • 2.222E-02

PCP and inpatient utilization than females, and females had higher ER utilization than males. 2006 retrospective risk score is positively correlated with utilization for all dependent variables indicating that members with poorer health status used more services in each case.

Table 15 shows posthoc test results for pairwise comparison to ascertain product grouping differences for inpatient admissions and outpatient procedures, which were significant in the MANOVA. Results show that SG2 has significantly lower utilization for outpatient procedures than CG and SG1.

Table 15: 2006 MANOVA Pairwise Comparison for Significant Product Groupings

Dependent Variable	Grouping Variable	Comparison Grouping Variables	Mean Difference	Significance P-Value
Inpatient Admission	SG2	CG SG1	3.479E-02 -.136	.884 .554
Outpatient Procedure	SG2	CG SG1	-3.266 -3.157	.002 .002

Subsequent MANOVA analyses taking into account differences in member utilization did not provide additional information. MANOVA results for members that

had at least one unit of utilization for all dependent variables were limited due to the low number of members in the study groups (C=292; S1=36; S2=20). MANOVA results for members that had at least one unit of utilization for at least one dependent variable showed similar results and R-Square calculations as the MANOVA for all members.

Results of Hypothesis Testing

The one service area in which notable findings were identified related to outpatient procedures. Utilization analysis results show that, with an exception for outpatient procedures, there are no significant differences between SG2 and the CG and that the overall stated hypotheses that SG2 will have lower utilization than the CG should be rejected. While there is lower overall utilization for SG2 in 2006, this was also seen in 2005 when both groups were in the HMO. Logistic analysis results for members that had utilization in 2006 and MANOVA results for all members in the study show no significant differences between the groups.

Overall utilization analysis results for outpatient procedures show that there are significant differences between SG2 and CG and that the stated hypothesis that SG2 will have lower outpatient utilization than the CG should be accepted. Logistic analysis results for members that had utilization in 2006 and MANOVA results for all members in the study show significantly less utilization for SG2 when compared to the CG.

The independent variable showing the most significance in the utilization analysis is the 2006 Retrospective Risk Score, which is not surprising since it represented need in conceptual model and health status in the empirical model. MANOVA results show this variable to be highly significant for all dependent variables with a positive correlation with utilization.

Medical Cost Analysis Results

Table 16 shows pairwise comparison results of average total allowed amount differences between groups with and without the independent variables. The comparison without the independent variables shows S2 to have significantly lower total medical costs than the CG. However, when the independent variables are included the results are not significant and the mean difference between SG1 and CG shows the opposite effect. It is noted that the only significant independent variable in the analysis was the 2006 retrospective risk score. Absent this risk adjustment, SG1 shows lower overall medical costs than the CG.

Table 16: Pairwise Comparison of Average Total Allowed Amounts

Allowed Amount and Grouping Variable	**Comparison Grouping Variables**	**Mean Difference**	**Significance P-Value**
Allowed Amount Without Independent Variables / S2	CG SG1	-1628.310 -1262.019	.030 .197
Allowed Amount With Independent Variables / S2	CG SG1	976.312 614.561	.701 .803

Subsequent analysis of the 2006 retrospective risk scores is shown in Appendix 3. Grouping differences for members with 2006 retrospective risk scores of ≤1.0 (lower acuity) and ≥2.0 (higher acuity) were measured to determine effects of acuity on member utilization and cost. SG2 showed significantly lower utilization of outpatient services than the CG for members with risk scores ≤1.0. There were no significant group differences in utilization for members with risk scores ≥2.0. There were no significant group differences in average allowed amounts for members with risk scores ≤1.0 and ≥2.0.

Acuity Analysis Results

The acuity analysis utilizes risk scores developed by the health plan through proprietary software. These risk scores were to be used as a proxy for health status of individual members in CG, SG1 and SG2. The 2006 retrospective risk scores were obtained in first quarter of 2006 and used as an independent variable in analysis of utilization. These scores were measured against 2007 retrospective risk scores, which were obtained in first quarter of 2007, to obtain an understanding of changes in individual member acuity in 2006. These changes in acuity were to be measured as a dependent variable for health status in a MANOVA model and with utilization results in a MANCOVA model. 2007 prospective risk scores were intended to be used to measure projected risk for the following year.

Risk score measures are shown in Table 17. Comparisons indicate a significant decline in 2007 retrospective risk scores and 2007 prospective risk scores for SG1 and SG2. While the mean 2006-2007 retrospective risk score difference for CG increased almost 5%, the mean differences for SG1 and SG2 decreased 91%.

At face value, the initial results indicate that members in SG1 and SG2 showed significant lower in acuity in 2006. However, further investigation revealed that 93% of members in SG1 and 87% of members in SG2 had risk scores of zero. Only 7.3% of members in CG had risk scores of zero. Potential reasons for members having risk scores of zero, and thus causing the significant decrease in mean risk scores for SG1 and SG2, include that incomplete episodes of care are not counted in the development of risk scores. The high number of members having risk scores of zeros in SG1 and SG2 may be due to incomplete episodes of care for members in these products.

Table 17: 2006-2007 Risk Score Measure Comparisons

Independent Variables	Control Group (CG)	Study Group One SG1	Study Group Two SG2
Retrospective Risk Scores 2006:	Range: 0-42.74 Mean: 2.76 Median: 2.22 Mode: 0 (246, 4.7%)	Range: 0-35.9 Mean: 2.22 Median: 1.31 Mode: 0 (66, 9.0%) T-Test: -4.41 Sig: .000	Range: 0-38.21 Mean: 2.11 Median: 1.29 Mode: 0 (81, 11.8%) T-Test: -5.66 Sig: .000
Prospective Risk Scores 2006:	Range: 0.05-30.85 Mean: 2.76 Median: 2.22 Mode: 0.36	Range: 0.108-24.97 Mean: 2.16 Median: 1.69 Mode: 0.36	Range: 0.102-24.08 Mean: 2.06 Median: 1.60 Mode: 0.48
Retrospective Risk Scores 2007:	Range: 0-52.50 Mean: 2.89 Median: 1.82 Mode: 0 (324, 6.2%)	Range: 0-18.14 Mean: 0.20 Median: 0 Mode: 0 (777, 91.2%)	Range: 0-12.18 Mean: 0.19 Median: 0 Mode: 0 (598, 86.9%)
Prospective Risk Scores 2007:	Range: 0.05-24.53 Mean: 2.70 Median: 2.17 Mode: 0.36	Range: 0.108-10.13 Mean: 0.53 Median: 0.36 Mode: 0.69	Range: 0.11-10.20 Mean: 0.56 Median: 0.36 Mode: 0.69
Retrospective Risk Score Difference 2006-2007	Mean: +0.13 Median: +0.40 Mode: Same	Mean: -2.03 Median: -1.31 Mode: Same	Mean: -1.92 Median: -1.29 Mode: Same

Due to the questionable change in risk score results obtained for SG1 and SG2 the study did not include the analysis of acuity differences between CG, SG1 and SG2. The inability to accurately capture acuity scores in 2007 for members in the health plan CDHP render comparison to members in the health plan HMO impossible to complete.

Important points to consider in the use of acuity measurement based on claims data include that the level of utilization impacts acuity measurement. The health plan calculation of member risk scores is based on member health services utilization on a rolling twelve-month basis. This could be problematic when introducing financial mechanisms during this time period that can decrease utilization, as acuity scores can be

artificially reduced and not be representative of true member health status. Simpler and more straightforward calculation of acuity may be adopted rather than complex algorithms based on utilization.

Conclusion

Utilization analysis shows that members in the health plan CDHP with benefit differences as compared to the HMO had significantly less utilization of outpatient procedures than members in the HMO in terms of probability of procedures and volume of procedures. No significant differences were seen for PCP, specialist, inpatient and ER utilization.

The inability to use member 2007 risk scores for the study groups in determining changes in acuity negates the ability to compare member health status changes between the control and study groups in 2006. Development of the intended MANCOVA model of including both health services utilization and health status changes as dependent variables was not able to be accomplished.

Study results for health services utilization and health status are incorporated into the Health Services Use/Outcomes Research Model in the discussion chapter. The discussion chapter will also address study limitations and consideration for future studies.

CHAPTER SIX: DISCUSSION

The health care industry shift from managed care to consumer driven products brings about both potential positives and negatives for health care consumers. The potential for increased access to health information can contribute to more knowledgeable consumers regarding health care alternatives, which can lead to healthier lifestyles. However, increased consumer cost-sharing could create incentives for consumers to decrease health services utilization when they actually need care.

The contrasting viewpoints between managed competition and consumerism are strongest in preferred health plan benefit designs of limited versus high consumer cost sharing. There are overall questions regarding the impacts of increased cost sharing, especially for populations with chronic health conditions and/or lower financial income status.

Study Results Based on Andersen Model

This study of initial impacts to health services utilization and health status for members with chronic health conditions of congestive heart failure, diabetes mellitus and/or coronary artery disease in health maintenance organizations (HMOs) and consumer driven health plans (CDHPs) is based on the Andersen Behavioral Model of Health Services. Study results for outcomes are based on the contextual characteristics of the model

Study results for the Need contextual characteristic show that members in the CDHP had lower 2006 risk scores, which were the proxy for acuity/health status, than members in the HMO. This is consistent with the literature review that indicates favorable selection for initial enrollment of consumers into CDHPs (Harris, 2003; Davis, 2004; Parente, Feldman & Chris, 2004; Buntin, Damberg, Haviland, Kapur, Lurie, McDevitt & Marquis, 2006). It remains to be seen if lower acuity is maintained with longer enrollment in a plan, or if there is an initial selection bias that might diminish due either to disenrollment or more exposure to these products over time. Study results showed that health acuity status had a significant impact on health services utilization. This is evidenced by the members in the study group having lower acuity scores and less overall utilization in 2005 when both control and study groups were in the HMO, and in 2006 when the members in the study group switched to the CDHP. This may have been a factor in selection between an HMO or CDHP by the employer groups. The only variable to compare the groups was on size and there did not appear to be substantial differences for this measure.

Study results for the Predisposing variables that constituted demographic contextual characteristics show that members in the CDHP were significantly younger than members in the HMO. Age was negatively correlated with ER utilization, and gender impacted utilization in that males had higher PCP and inpatient utilization than females and females had higher ER utilization than males.

Study results for Enabling variables show levels of physician coinsurance influencing outpatient utilization, in that higher physician coinsurance levels showed positive correlation with higher outpatient utilization. This is in contrast to results of the

RAND study, in that members with higher cost sharing exhibited higher utilization for this measurement. Potential causes for this result include the influence of member facility co-payments, which was not included in the study. It is noted that physician coinsurance was not present in the HMO and results of physician coinsurance effects on utilization only pertained to members in the CDHP. When controlling for other factors, outpatient utilization was lower for the CDHP than the HMO. Estimated household income was not significant for health services utilization in the study.

Study results for Behavior variables show that health plan members in the higher cost sharing CDHP plans had significantly lower outpatient utilization than health plan members that remained in the HMO. There were no significant differences in PCP, specialist, inpatient and ER utilization between health plan members in the higher cost sharing CDPH plans and health plan members that remained in the HMO.

Study results for Outcomes variables were not able to be obtained due to the inability to use 2007 risk scores for the study group, and a change in health status could not be calculated. 2006 risk scores that were calculated using experience from when all members were in the HMO were shown to have a high influence on all measured components of utilization.

Study Results Based on Hypotheses

Table 18 shows study results and hypothesis statements for the utilization measures. Overall study results compel one to reject the first hypothesis that members in with chronic health conditions of congestive heart failure, diabetes mellitus and/or coronary artery disease in CDHPs will have lower health services utilization than members with the chronic health conditions of congestive heart failure, diabetes mellitus

Table 18: Study Results for Utilization

Utilization Measure	2005 – 2006 Utilization Comparison	Logistic Analysis Results	MANOVA Results	Hypothesis Statement
PCP Visits	Lower study group utilization than control group in both 2005 and 2006	No significant differences between the control and study group	No significant differences between the control and study group	Reject hypothesis that the study group will have lower utilization than the control group
Specialist Visits	Lower study group utilization than control group in both 2005 and 2006	No significant differences between the control and study group	No significant differences between the control and study group	Reject hypothesis that the study group will have lower utilization than the control group
Inpatient Admissions	No significant differences between the control and study group	No significant differences between the control and study group	No significant differences between the control and study group	Reject hypothesis that the study group will have lower utilization than the control group
Outpatient Procedures	Lower study group utilization than control group in both 2005 and 2006	**Study group shows significant lower utilization than the control group**	**Study group shows significant lower utilization than the control group**	**Accept hypothesis that the study group will have lower utilization than the control group**
ER Visits	No significant differences between the control and study group	No significant differences between the control and study group	No significant differences between the control and study group	Reject hypothesis that the study group will have lower utilization than the control group

and/or coronary artery disease in the HMO. This is with the exception of utilization of outpatient procedures as members in the CDHP showed significantly less utilization, both in terms of probability of use and rate of use, than members in the HMO during the study time period.

It is noted that the study group exhibited lower utilization than the control group in both 2005 and 2006 for PCP visits, specialist visits, outpatient procedures and ER visits. However, these utilization differences were not evident when controlling for the independent variable factors and the hypotheses are still rejected.

The independent variable showing the most significance in the utilization analysis is the 2006 retrospective risk score that was used as a proxy for member acuity or health status. MANOVA results showed this variable to be highly significant for all dependent variables with a positive correlation with health services utilization and an influence on total medical costs.

It is noted that MANOVA results from the study showed very low R-Square values, which indicates the models accounted for low amounts of variation and that there are other influencers of utilization that were not included in the models. Additional characteristics of the Andersen Behavioral Model of Health Services could have been included had these data been available. These characteristics could include environmental considerations, demographic differences in utilization, differing provider networks between the HMO and CDHP, the gatekeeper effect of primary care physicians in the HMO and/or the ability/in-ability of members to utilize health care information.

Study results for the health status hypotheses that members with the chronic health conditions of congestive heart failure, diabetes mellitus and/or coronary artery disease in CDHPs will have higher actual and projected acuity status changes than members with the chronic health conditions of congestive heart failure, diabetes mellitus and/or coronary artery disease in the HMO could not be measured. This was due the inability to use the 2007 risk scores for the study groups. The health plan only utilized

complete episodes of care in deriving member risk scores. Future analyses using both incomplete and complete episodes of care may be helpful in deriving more accurate risk scores.

It is noted that while selection bias was somewhat controlled for in the study by including only members that did not have a choice between the HMO or CDHP plans they were offered, selection bias could exist at the employer group administrator level that determined the type of insurance products that members had access to. While employer group sizes for the control and study groups were similar, the study groups were significantly younger and had significantly lower acuity scores than the control group. No information on industry sector or wage levels of workers was available. This may have impacted study results as acuity scores were significant and positive for all measured components of utilization.

Health Policy and Management Implications

Study results show limited initial effects on utilization for health plan members with chronic health conditions when transitioning from an HMO to a CDHP. This could indicate that the changes in benefit design seemed to have limited influence on the behavior of individuals and there will be limited decreases in utilization for consumers in CDHPs, or it may be too early to fully assess changes in utilization because there are learning effects for consumers associated with participating in these products. It will take time for these effects to be revealed in consumer behavior change. Implications for health policy if utilization is not decreased could include limited effects in attempting to decrease medical costs, especially in populations that utilize higher amounts of health care services.

The need for accurate measurement of consumer acuity and health status is paramount in monitoring CDHPs. If higher consumer cost sharing eventually results in decreased utilization for populations with chronic health conditions, health status could be negatively affected. This may not only have quality of care impacts, but may also have rebound effects through initial decreases in medical costs followed by increased medical costs due to decreased population health status.

Monitoring of multiple aspects of CDHPs will be necessary to understand effects of increased consumer cost sharing and utilization of health information. More detailed monitoring of which services are being affected and impacts on the full dynamics of these products will be needed. Increased health education and case management of appropriate members may appropriately decrease health services utilization. Increased consumer cost sharing may have impacts to the overall economy through increased consumer debt, as well as impacting providers through higher amounts of non-reimbursed care being rendered. Increased access to information will need to be monitored for actual effects on both consumers and providers.

Study Limitations

An inherent limitation of the study is the one year time period to measure differences in study and control group utilization and health status changes, especially when a health insurance product is new and evolving. True differences between members in HMOs and CDHPs may not manifest themselves until after longer time periods. Initial impacts may not be significant in the first year of transition from HMOs to CDHPs.

Internal validity concerns include the potential for selection bias for members choosing either the HMO or the CDHP. As noted previously, this bias was partially controlled for in the study by including only members that did not have choice between the HMO and CDHP. Selection bias could exist at the employer group decision making level regarding what insurance products members will be offered or how the employers may have chosen to introduce the new products, including the extent of employee education regarding the products.

Study external validity concerns include the application of study results to disease conditions other than heart failure, diabetes and coronary artery disease and to older populations. It is noted that the study population was in the age range of 18-64, and applicability of study results to older populations may need to be verified by replicating the study for an older population.

The inability to compare 2006 and 2007 acuity scores in the study groups highlights the complexities and limitations in using claims data to measure health status. Claims measurement of health status in the study was based on member utilization of health services for the prior year. Measurement of health status through claims data that are based on member health services utilization may underestimate actual member acuity if financial incentives to decrease member utilization, such as higher deductibles and coinsurance, are introduced.

Considerations for Future Studies

The problems encountered in measurement of member acuity based on claims data indicates the need for use of better measurements of health status. In addition to the use of claims data, future studies should incorporate health risk assessments and/or

surveys to measure functional health status changes, attitudes and health literacy in relation to consumer knowledge and use of health information. These assessments/surveys could incorporate:

1. A health risk assessment to measure member functional health status such as the Short Form-12 (SF-12). This assessment has been adopted as the standard of measurement by key government agencies, including the Agency for Healthcare Research and Quality.
2. Surveys to measure changes in health care providers as reported by the member.
3. Surveys to measure member use of health care information as reported by the member.
4. Surveys to measure member perception of having or not-having adequate access to health care services and/or prescribed pharmaceuticals.
5. Surveys to measure the presence of member behaviors that negatively impact chronic health conditions as reported by the member. Examples would include smoking, alcohol use and/or obesity.
6. Assessments to measure health literacy, such as a list of questions as a proxy for the Short-Form Test of Functional Health Literacy (S-TOFHLA).

While this study measured initial impacts of members transitioning from HMOs to CDHPs, more longitudinal studies are needed to ascertain potential long-term effects of higher cost sharing in populations with chronic health conditions. These longitudinal studies would monitor utilization of health services and health status over at least a two to three year time period, and would include the application to single chronic health conditions with impacts of co-morbidity.

Closing

This study has attempted to measure initial impacts of the health industry transition from managed competition to consumer driven health plans. Specifically, the study focused on members with chronic health conditions of congestive heart failure, diabetes and coronary artery disease who transitioned from an HMO to CDHPs. The study was limited in not being able to measure what was intended in its original scope, in that portions of the data were not available. The study was also limited to measuring potential impacts over an initial one year time period.

More study is needed to understand impacts to populations with chronic health conditions. Understanding the impacts on people with chronic diseases and the implications for population utilization of health services and health status will provide valuable information for future planning for both commercial insurance carriers and potential adoption of these models in government programs. This research will be especially useful if these insurance models are introduced in the elderly population where chronic disease conditions are more prevalent.

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Appendix I
Diagnoses Comprising Member Health Conditions

Clinical Condition	Diagnostic Categories
Congestive Heart Failure (CHF)	• Hypertensive Heart Disease • Diseases of the Endocardium • Chronic Pulmonary Heart Disease • Cardiomyopathy • Heart Failure
Diabetes Mellitus (DM)	• Diabetes Mellitus • Diabetes with Ketoacidosis • Diabetes with Hyperosmolarity • Diabetes with Other Coma • Diabetes with Renal Manifestations • Diabetes with Opthalmic Manifestations • Diabetes with Neurological Manifestations • Diabetes with Peripheral Circulatory Disorders • Diabetes with Other Specified Manifestations • Diabetes with Unspecified Complications
Coronary Artery Disease (CAD)	• Coronary Atherosclerosis • Acute Myocardial Infarction • Angina Pectoris • Ischemic Heart Disease • Conduction Disorders • Cardiac Dysrythmias

Appendix 2
Correlation Between Independent Variables
Pearson Correlation Coefficient Measurement

Independent Variable	Pearson Correlation Coefficient	Significance (2-Tailed Test)
Age	• Gender -.019 • Estimated Household Income -.008 • Estimated Individual Net Worth -.013 • Individual Deductible -.033** • Household Deductible-.032** • Coinsurance -.045** • 2006 Retrospective Risk Score .044**	• .128 • .491 • .276 • .008 • .009 • .000 • .000
Gender	• Age -.019 • Estimated Household Income -.001 • Estimated Individual Net Worth -.016 • Individual Deductible -.012 • Household Deductible -.013 • Coinsurance -.008 • 2006 Retrospective Risk Score -.022	• .128 • .996 • .184 • .340 • .304 • .526 • .074
Estimated Household Income	• Age -.008 • Gender -.001 • Estimated Individual Net Worth .559* • Individual Deductible -.030* • Household Deductible -.033** • Coinsurance -.029* • 2006 Retrospective Risk Score -.024*	• .491 • .966 • .000 • .013 • .006 • .019 • .049
Estimated Individual Net Worth	• Age -.013 • Gender -.016 • Estimated Individual Household Income .559** • Individual Deductible -.018 • Household Deductible -.024 • Coinsurance -.020 • 2006 Retrospective Risk Score -.016	• .276 • .184 • .000 • .132 • .053 • .107 • .200
Individual Deductible	• Age -.033** • Gender -.012 • Estimated Individual Household Income -.030 • Estimated Individual Net Worth -.018 • Household Deductible .953** • Coinsurance .823** • 2006 Retrospective Risk Score -.065**	• .008 • .340 • .013 • .132 • .000 • .000 • .000
Household Deductible	• Age -.032** • Gender -.013 • Estimated Individual Household Income -.033** • Estimated Individual Net Worth -.024 • Individual Deductible .953** • Coinsurance .907** • 2006 Retrospective Risk Score -.069**	• .009 • .304 • .006 • .053 • .000 • .000 • .000
Coinsurance	• Age -.045** • Gender -.008 • Estimated Individual Household Income -.029* • Estimated Individual Net Worth -.020 • Household Deductible .907** • Individual Deductible .823** • 2006 Retrospective Risk Score -.076**	• .000 • .526 • .019 • .107 • .000 • .000 • .000
2006 Retrospective Risk Score	• Age -.044** • Gender -.022 • Estimated Individual Household Income -.024* • Estimated Individual Net Worth -.016 • Household Deductible -.069** • Individual Deductible -.065** • Coinsurance -.076**	• .000 • .074 • .049 • .200 • .000 • .000 • .000

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Appendix 3
2006 Retrospective Risk Score Analysis

2006 Retrospective Risk Score ≤ 1.0: Pairwise Comparison for Significant Product Groupings for Utilization

Dependent Variable	Grouping Variable	Comparison Grouping Variables	Mean Difference	Significance P-Value
Outpatient Procedure	SG2	CG SG1	-7.113 -6.999	.000 .002

2006 Retrospective Risk Score ≤ 1.0: Pairwise Comparison of Average Total Allowed Amounts

Allowed Amount and Grouping Variable	Comparison Grouping Variables	Mean Difference	Significance P-Value
Allowed Amount Without Independent Variables – Tukey HSD / S2	CG SG1	-104.72453 -498.20533	.991 .879
Allowed Amount With Independent Variables / S2	CG SG1	2431.137 1903.034	.384 .478

2006 Retrospective Risk Score ≥ 2.0: Pairwise Comparison of Average Total Allowed Amounts

Allowed Amount and Grouping Variable	Comparison Grouping Variables	Mean Difference	Significance P-Value
Allowed Amount Without Independent Variables – Tukey HSD / S2	CG SG1	-2430.20849 -1806.2218	.228 .623
Allowed Amount With Independent Variables / S2	CG SG1	-998.982 -754.117	.822 .859

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