SPILLOVER EFFECTS OF THE UNINSURED

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DEDICATION

For my friends and my family, especially my parents, for their unwavering support.

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ABSTRACT

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This study seeks to determine the effects of the local uninsurance rate on the quality of care delivered to Medicare beneficiaries. While a great deal of research exists on the negative consequences of uninsurance for the uninsured, few studies have attempted to address the spillover effects of this population to the health care system in a local market. Theory suggests that a high local uninsurance rate in a market has the potential to cause a decrease in the shared quality of care provided to Medicare beneficiaries. It also suggests however that a higher uninsurance rate may result in increases in access to care by Medicare beneficiaries as well as improvements in the unique quality provided to these individuals. The implications of a high uninsurance rate on outcomes are therefore ambiguous. These concepts are tested using data on hospitals and Medicare beneficiaries in 100 large MSAs. The effects on outcomes of care are examined by exploring the relationship between local uninsurance rates and mortality from a variety of specific conditions. The results are mixed. In smaller markets, the spillover effects of the uninsured are more likely to be negative. In larger markets however, the effects are more likely to be positive. The mechanisms behind these results are examined by looking at the effects on shared and unique quality. The effects on shared quality are tested by examining the availability of specialized hospital services in markets with varying levels

of uninsurance. The results show that hospitals in markets with high levels of uninsurance provide fewer unprofitable services. The effects on unique quality and access are tested by examining the relationship between local uninsurance rates and utilization by Medicare beneficiaries. The results exhibit weak evidence that Medicare beneficiaries in areas with higher uninsurance rates use more care. The study concludes that while local uninsurance rates do not appear to have strong negative consequences for Medicare beneficiaries, spillover effects at the market level do exist and warrant further exploration. In controlling for Medicaid rates in the models, stronger relationships are evident between Medicaid and Medicare which may be an important avenue for future research.

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Chapter 1: Introduction and Literature Review

Introduction

Among the many concerns regarding the state of the US healthcare system, most can be classified as relating broadly to issues of cost, quality or access. The three are inextricably linked and make up what has often been referred to as the iron triangle of healthcare. For at least 15 years, the issue of access, and more specifically the lack of access attributed to a growing number of uninsured individuals, has been at the forefront of health services research. With the number of uninsured individuals currently at 47 million and growing, this population continues to garner a lot of attention from academics and politicians alike. Research on the uninsured has generally focused on the correlates and likely causes of uninsurance as well as on the effect of being uninsured on health, health care access, utilization and expenditures of the uninsured. It has been well established that low-income, non-white, less educated, and younger people are more likely to be uninsured. Uninsured individuals use less preventive care and, after frequently later diagnosis, use less treatment than their insured counterparts. Evidence of higher mortality rates for the uninsured also exists. The health effects of uninsurance often result in economic effects as well. Lower labor force participation and lower earnings are both correlated with a lack of coverage. A good review of this literature can be found in Hadley (2003).

At the individual-level therefore, the conclusions are relatively clear. Uninsurance results in a lack of access to care which can result in poor outcomes as well

as costly financial consequences for the affected individuals. At the market-level, however the impact of a large uninsured population is less obvious. While the uninsured themselves will likely face the negative repercussions detailed above, the insured population may also experience some spillover effects of a high uninsurance rate. Low demand by uninsured individuals may change the incentives for providers to offer a particular service or alter the distribution of services across patients with various types of coverage. High uncompensated care costs for the uninsured may also put financial pressure on providers and ultimately result in cost or quality spillovers in the market as a whole. In a multi-payer system such as that in the US, the entire distribution of insurance coverage will be important in determining the equilibrium levels of access, cost and quality available to all individuals. A variety of potential spillover effects to insured members of the community are therefore possible and have thus far been largely neglected in previous studies on the consequences of uninsurance.

The purpose of this work is to explore the potential spillover effects of the uninsured. It will focus specifically on the spillover effects to Medicare beneficiaries and will examine the effect of the local uninsurance rate on measures of access to hospital services, inpatient utilization and health outcomes. The analysis will also attempt to determine the market-level conditions that may reduce or enhance the likelihood of spillover effects. The policy implications of this work are among its most important contributions. In considering any number of proposals to cover the uninsured, it is often accepted that any intervention will come at a large financial cost and possibly at a cost to the quality of care delivered to insured individuals. This is the iron triangle logic; access

cannot be enhanced without sacrificing quality or affordability. These arguments however do not typically account for the impact that the uninsured are already having on the market as a whole in terms of access, quality and cost spillovers to the insured. This study seeks to bring some of these spillovers to light in order to allow for a better weighing of the costs and benefits of reform.

The results of this work will be especially relevant to recent reform proposals that include mandating coverage for all individuals. Mandates can be politically unpopular, but their supporters have responded by pointing to insurance mandates in other sectors that are widely accepted. Commonly mandated insurance, such as automobile liability coverage, however, is generally not mandated to protect the insured, but to protect potential 'victims' of the insured. Collision insurance, on the other hand, which reimburses an individual for losses to their own property when they are at fault, is not mandated. This indicates that the case for mandating health insurance would be made stronger by providing evidence that the uninsured not only face the negative consequences of their own lack of coverage, but impose negative externalities on their insured neighbors. This study seeks to determine whether such externalities exist.

Literature Review

Effect of insurance on access, utilization and outcomes

As already noted, the effect of insurance on individual access, utilization and outcomes has been clearly demonstrated in many previous studies. Studies range from the RAND health insurance experiment to evaluations of changes in Medicare policy and the impact of managed care (Manning, et al. 1987, Sloan, et al. 1988, Miller and Luft,

1997). The overwhelming conclusion from all of this work however, is that the incentives created by insurance have a pronounced impact on the behavior of both consumers and providers.

Effect of market-level characteristics holding insurance status constant

In addition to studies that investigate the effects of insurance on access, utilization and outcomes, there is an equally important volume of work on how the delivery of healthcare varies across market areas. Such studies often focus on the Medicare population in order to hold insurance constant across areas and investigate how market-level characteristics impact the access, utilization or costs in the market. Market-level factors may change the incentives of providers to choose certain types of care and will thus have a tendency to affect all individuals in the market, regardless of their insurance status. Socioeconomic factors, for instance, including the racial composition of an area or its income level, can have independent effects above and beyond the sum of the effects of the race and income of individuals in the area (Subramanian and Kawachi 2004). Additional health care market characteristics have also been shown to affect the delivery of care including the competitive structure of the hospital market (Dranove, et al. 1992, Kessler and Geppert, 2005).

A similar category of work has focused on the regional variations in spending and utilization that remain after controlling for the individual characteristics of the patients in the market and other market-level characteristics. This work was initiated by researchers at Dartmouth but has inspired a large component of literature in its wake. The initial results found wide variation in spending across areas that could not be adequately explained by individual characteristics of patients or prices (Fisher, et al. 2003). Further

research in this area has attributed much of the variation to the presence of health care capacity in the form of medical specialists and hospital beds including ICU beds and other high intensity services (Baicker and Chandra 2004).

Insurance variation across areas and over time

Independently of the work on regional variations in spending, additional studies have explored the extent of variation in health insurance coverage across areas and over time. The insurance distribution varies widely across areas, specifically the proportions uninsured, with Medicaid and with managed care coverage (Cunningham and Ginsburg 2001, Dranove, et al. 1998). This variation has not been incorporated into the Dartmouth work or other studies on market-level effects in any attempt to explain the regional variations in care.

Insurance spillover effects

A substantial amount of work has focused directly on the types of market-level insurance spillover effects being suggested here. These studies legitimize the concept of insurance spillover effects and provide some initial modeling ideas. Finkelstein (2007) estimates the aggregate impact of the introduction of the Medicare program on hospital expenditures. She finds that expenditures are six times greater than what aggregating the individual effects of the program would have predicted. This study suggests that there are market-level effects of insurance changes which may occur through an improved ability to finance fixed cost investments or through more general changes in practice patterns.

A more commonly examined spillover effect of insurance has been that of managed care on other insured populations. Several studies have explored the effect of

managed care penetration on expenditures, outcomes and utilization of Medicare beneficiaries. Shen (2003) studies the impact of HMO penetration on the quality of care delivered to Medicare beneficiaries with acute myocardial infarction (AMI). She finds that increases in HMO penetration at the market level adversely affect outcomes, as measured by mortality rates and other medical complications. Bundorf and others (2004) also examine the effects of market level HMO penetration on treatments for AMI. They find that utilization of certain treatments declines with increased managed care activity. Baker measures the impact of HMO penetration on Medicare fee-for-service health expenditures (Baker 1997, 1999). His work shows that increased HMO penetration in a market does have spillover effects in reducing the expenditures of Medicare beneficiaries. All of these studies indicate further that the influence of insurance in the health care market can go beyond its immediate impact on those it covers.

A small body of work has recently developed on the spillover effects of the uninsured more specifically. In *A Shared Destiny*, the Institute of Medicine (IOM) begins to address the issue of the community effects of uninsurance. The findings suggest a number of ways that communities with higher rates of uninsurance may face access, cost or quality concerns. The main conceptual argument made by the IOM is that the uninsured affect local health care markets through the financial burden of uncompensated care. The burden of uncompensated care is expected to curb access by forcing providers to reduce hours, cut back on services provided, or even relocate. Such effects may be felt by the insured, as well as the uninsured, when both groups share the same providers. Cost spillovers are also suggested. The cost of providing

uncompensated care may be shifted to those with insurance through higher charges and higher insurance premiums or through tax increases. Strikingly, the IOM report has little to say about the potential impact of the uninsured on quality or outcomes for insured individuals. The only such references are to possible cutbacks in nursing staff due to financial pressures or effects on emergency departments due to overcrowding (IOM p.118).

Several additional studies address the effects of community uninsurance on access to care, but generally summarize the effects as community averages. This necessarily reflects the impact on the uninsured and does not specifically address the issue of spillovers to the insured. These studies also tend to use subjective measures of unmet need and focus on how higher uninsurance rates can enhance access problems for the uninsured (Cunningham and Kemper 1998, Andersen et al. 2002, Brown et al. 2000). More recent work by Pagan and Pauly (2006, 2007) extends this approach. They examine the effect of local uninsurance rates on a measure of unmet need for insured and uninsured individuals, separately. They find that insured, but not uninsured, individuals in communities with higher levels of uninsurance have more trouble accessing care than those in communities with lower levels. They also find that, in areas with higher levels of uninsurance, perceived quality of care by both doctors and consumers is lower. The disaggregated approach of examining separate effects on the insured is an important extension and will be pursued further in this study.

Contribution

With the aforementioned literature in mind, this study investigates the effects of the local insurance distribution on the quality of care delivered in the health care market.

The analysis focuses on the impact of local uninsurance rates on the availability of hospital services and on the utilization and outcomes of care for Medicare beneficiaries. The Medicare population is chosen because data access is obtainable and because it will minimize the need to control for individual insurance coverage across markets. It is also consistent with much of the previous work on spillover effects of managed care as well as the work on geographic variations in care. Furthermore, with access to multiple years of data, this study supplements the cross-sectional results with additional analyses to further explore the questions of interest.

Chapter 2: Conceptual Framework

One of the weaknesses of the earlier work on spillover effects is a lack of a coherent theoretical framework as to how these effects might arise. This results in difficulty in generating clear testable hypotheses regarding the impact of uninsurance rates on Medicare quality. Initial intuition suggests that facing a large proportion of less generously insured patients may result in poorer quality and spillover effects to insured patients. Further reflection however reveals several complex ways in which a high uninsurance rate may affect the delivery of care to insured individuals, not all of them negative. The mechanism(s) by which these potential spillover effects arise and what causes them to be more or less prominent has not been made clear. This chapter summarizes the concepts that have been suggested in the previous literature and presents a more complete conceptual framework to guide future work on spillovers. The framework also focuses specifically on how the uninsured generate spillover effects to Medicare beneficiaries.

This chapter describes several ways in which the uninsured might influence quality for Medicare beneficiaries. It relies on a variety of literature on provider choice of price and quality as well as some work on product differentiation to provide a theoretical background. Each applicable theory paints a slightly more complex picture of the relationship between the insurance distribution and the level and distribution of quality available in the market. A formal model would be exceedingly complex and unlikely to generate a clear and consistent set of hypotheses. A descriptive story will be

generated based on the applicable theory and used to further illustrate the potential impact of the uninsured on Medicare beneficiaries specifically. A set of hypotheses based on the applicable theory and the descriptive story rounds out the chapter. The question however is ultimately an empirical one as to how the uninsured affect the quality of care delivered to Medicare beneficiaries.

Theoretical Background

Several previous studies consider the issue of how providers choose price and quality in response to consumer demand. Some explicitly consider the role of insurance in the provider's decision process while others are less explicit, but allow for similar interpretations. Each study presented here includes an important element in predicting the existence of spillover effects.

Single price and quality

In one of the simpler cases, Dranove and Satterthwaite (1992) consider a producer in monopolistic competition choosing price and quality when both are imperfectly observable to consumers. The producer chooses one price and one quality. In their model, which is not specifically a model of healthcare provider behavior, the observability of an attribute is related to its elasticity of demand. For instance, when price is hard to observe, demand becomes more inelastic with respect to price. In a healthcare context, health insurance changes an individual's exposure to the true price of health services and therefore makes the price harder to observe. This observation is used to consider the implications of this model for a healthcare provider.

The model shows that a provider facing more elastic demand will choose a lower price and produce at a lower quality. This occurs because as demand becomes more

sensitive to price, prices will fall which causes a reduction in the price-cost margin and creates the incentive to reduce quality. The model also explores the role of elasticity of demand with respect to quality and finds that it has a positive impact on quality. As quality becomes more observable, incentives to produce higher quality products are enhanced. The authors use the example of managed care as a case in which price becomes easier to observe and can result in the above chain of causation to lower quality. This is consistent with some of the findings on the spillover effects of managed care, but none of these studies were motivated in precisely this way. In summary, the model suggests that a high level of uninsurance (and thus price elastic demand) bolstered by the fact that healthcare quality is difficult to observe (and thus demand is quality inelastic) can result in a lower optimal quality choice.

A similar prediction concerning price elasticity and quality choice is attributed to Spence (1975) who suggests that when price-cost margins are high, the profit-maximizing response is to increase quality despite its cost, as it will attract more customers at a high margin. As price-cost margins are a function of the elasticity of demand, this again suggests that in markets with more elastic demand, lower quality will be chosen, all else equal. Both models then suggest that high uninsurance and elastic demand can lead to lower optimal quality choices under profit maximization. The profit maximizing assumption is not required to get such a prediction however. Newhouse (1970) models the behavior of a non-profit hospital seeking to maximize quantity and quality. A shift in the generosity of insurance coverage resulting in a more elastic market demand results in a lower optimal quality in this instance as well. Thus, based on the

above models, all else equal, an individual provider facing more elastic demand as a result of a less generously insured population will choose a lower quality.

The above results are important in thinking about the effect of insurance on the provision of quality however the models discussed assume that only one price and one level of quality are chosen by a provider. In reality, providers serve patients from multiple payers and charge them different prices. Different levels of quality may also be provided based on the individual payer. Furthermore, providers produce multiple products, each with its own price and quality, which may be factored into an overall maximization problem. Finally, competition with other providers in a market can affect the chosen prices and quality for all payers and products. These are just a few of the complexities that arise in theoretically predicting the impact of a large uninsured population on the care delivered to insured individuals. The remainder of this section reviews a series of studies that address one or more of these issues in their modeling of quality choice.

Multiple prices, single quality

Perhaps the most important of the issues noted above is the notion that providers produce a unique quality for each payer. If this were true, the opportunity for spillover effects would be minimal. Each payer would receive a quality determined only by the incentives created by their own coverage. Most discussions of spillover effects therefore acknowledge that there must be some common element to the provision of care in order for spillovers to occur. Depending on the context, suggested commonalities have included fixed cost technologies, ethical obligations and physician practice patterns. The

underlying idea is the same however in that a spillover will exist if the incentives created by one payer have an effect on some element of care that is shared by all payers. If a provider must balance the incentives of several payers in choosing the quality of a common element of care, spillovers become relevant.

If we assume that there are at least some elements of care that are provided in common and are influenced by multiple payers, then we would like to know how the distribution of coverage affects this common quality. The Dranove-Satterthwaite model addresses the issue by assuming that there is one representative consumer and that one price is chosen. This generates a prediction regarding the effect of the overall elasticity of demand on the quality chosen, but is quite unrealistic in representing a healthcare market. Glazer and McGuire (2002), on the other hand, explicitly examine the effect of a mix of private-pay and Medicare patients on the common quality of care. The model assumes that providers take the Medicare price as given and set a price for private patients. The authors prove that a mix of payers will lead to a compromise by the provider on the common quality that is delivered. Each set of patients receives a different level of quality than that which they would have received were they the only payer. In this example, Medicare patients receive a higher quality and private-pay patients receive a lower quality than they would have as a single payer.

A few notable findings from the model include some interesting ramifications of the compromise that occurs. In some cases, the compromise actually brings one or both payers closer to an efficient level of quality than they would have been as a single payer. Compromise also has the effect of diluting the impact of any changes by either payer

intended to influence quality. In this particular example, because Medicare sets its price and hospitals take it as given, Medicare can take advantage of the compromise that occurs on quality and free-ride on the more generous private payer. Finally, the model also examines the effect of the number of private pay patients on the Medicare price required to induce a provider to serve Medicare patients. Fewer private-pay patients lower this price, effectively improving Medicare's access to the provider. All of the above findings have implications in discussing spillover effects of the uninsured. Most importantly however, the compromise on quality indicates the presence of spillover effects in this context and thus supports the existence of spillover effects from the uninsured as well.

As opposed to Dranove-Satterthwaite, Glazer-McGuire comes a bit closer to a realistic picture of how providers choose a common quality. It captures the fact that there are multiple payers and that each pays a separate price. It also incorporates the unique fact in healthcare markets that Medicare's price is set in advance and taken by the provider. These are great improvements, but there are still a number of concerns. In generating the hospital profit function for the model, the profit derived from Medicare is a function of the probability that a Medicare beneficiary will choose the provider. This probability is a function of the quality of the provider and is included under the assumption that Medicare beneficiaries are not restricted in their choice of provider. No such dependence is included for the private payer under the assumption that choice is often restricted for these patients. This may have important implications for extending this model to consider the spillover effects of the uninsured.

The Glazer-McGuire model also assumes that there is only one private payer, but does provide some insight as to how the model could be altered to include additional payers. It does the same regarding the role of competition from other providers. It does not explicitly model other providers, but suggests ways to interpret the effect of market structure on the model. Finally, the model simplifies the choice of quality to one element of shared quality and seeks to determine how multiple payers affect this quality. Of course, the quality of care delivered to a patient is likely to have both shared and unique components. Furthermore, a provider also produces multiple products each of which may have shared and unique elements of quality. The take-home message from the Dranove-Satterthwaite and Glazer-McGuire results is that when at least some quality is shared across payers, the incentives of all payers will be balanced in choosing this shared quality which can result in spillover effects. The role of non-shared, or unique, quality, multiple providers and multiple products will be discussed below.

Multiple prices, multiple qualities

While the common quality delivered to all payers is influenced by the insurance distribution as discussed above, it is also probable that there are unique elements of quality provided based solely on the incentives of the individual payer. Dor and Farley (1996) examine this issue by considering a multiproduct cost function. Their theoretical results are interesting in that they emphasize the fact that the marginal cost of quality has two components; the cost of treating intra-marginal discharges more intensively and the cost of the additional discharges demanded as a result of a quality increase. Empirically, they find that providers do vary the marginal costs, or intensity of care, to reflect the generosity of a specific payer after accounting for case-mix. The authors conclude that

this is evidence that providers respond to financial incentives from multiple payers and allocate resources accordingly. This complements the work by Glazer and McGuire which finds that providers respond to multiple payers in setting shared elements of quality by requiring some compromise. Dor and Farley's results indicate that this compromise on shared quality may also be accompanied by adjustments to marginal costs for individual payers. The first argues for a role for spillovers while the second seems to argue against it.

Glied and Zivin (2002) do not present a formal model, but do explore similar issues and empirically try to determine of HMO penetration on shared and unique quality. They address the effects of managed care on physicians caring for both managed care and fee-for-service (FFS) patients. They find that an increase in managed care patients can result in a reduction in the shared quality as measured by the length of an office visit. All patients in the practice are impacted by this adjustment. They also suggest however that in response to a given investment in fixed costs, or shared quality, the provider will alter the investment in variable costs to each payer. For example, if the practice is dominated by FFS payers and thus makes a large investment in fixed costs, managed care patients are expected to see a reduced variable cost investment because they are getting an 'excessive' fixed cost investment in proportion to their own payment. If the practice is dominated by managed care patients on the other hand and a smaller fixed investment is made, both managed care and FFS patients may get more variable cost investment than in the previous scenario. FFS patients however may get a larger increase. This type of response on variable costs, or unique quality, would diminish any negative spillover

effects. In response to a reduction in fixed costs, the work thus suggests an increase in variable costs for both payer types. Whether these costs converge to the same level or diverge will depend on which group sees a higher rate of increase.

The empirical results show that there is a reduction in the length of an office visit in practices with more managed care patients. This represents a reduction in a shared element of quality. They also show that both managed care and FFS patients see an increase in the number of prescriptions in response to an increase in managed care. This is thought to reflect an increase in unique quality. Managed care use increased faster indicating a convergence in variable costs. This suggests that FFS beneficiaries are not receiving substantial additional investment in variable costs of quality and thus may experience a net negative spillover effect. This could result from an implicit ethical obligation to treat all patients equally.

Multiple providers

At this point, we have seen evidence from Glazer and McGuire that multiple payers will affect a common level of quality and can thus create spillover effects between payers. Their work also suggests that access for Medicare beneficiaries will increase with a decline in private payers. Dor and Farley, along with Glied and Zivin, provide evidence that these effects may be mitigated by payer-specific changes in the unique elements of quality. Glied and Zivin do suggest however that the compensation might not be complete and spillover effects may still occur. It is important to note that all of these models generally discuss how the payer distribution at the *provider-level* affects the choices of the provider. As has been the case in most of the previous work on spillover

effects however, the insurance distribution is most easily observed at the market-level. This market-level insurance distribution does not necessarily mirror the payer distribution at any individual provider in the market. The distribution of coverage in the market may lead to differentiation by providers in response to the varied incentives and this differentiation may change the potential for spillover effects. If all providers choose the same quality and compete for all of the different payers in the market, the potential for spillovers will remain strong within each provider. If however, each provider caters to a specific portion of the preference distribution, the need to balance the incentives of the different payers is diminished. This consideration of provider specialization by payer has been missing from previous work on spillover effects.

Theories of product differentiation in the industrial organization literature lend some insight to the question of how the strategic interaction between providers affects the potential for spillovers. While the models themselves require many assumptions and simplifications that make them inappropriate for predicting hospital behavior, the dominant message from the formal models of product differentiation is important. When markets are large enough to support multiple providers, the extent of quality differentiation will be the result of a tradeoff between increasing market share (less differentiation) and limiting price competition (more differentiation). The following discusses some of the factors that contribute to the likelihood of differentiation and how these might apply to markets for hospital services.

The most dramatic case for specialization and thus against spillovers is made by Rosen (1974). He shows that, in a perfectly competitive market with no economies of

scale and a uniform distribution of consumer preferences, all levels of a given attribute will be produced and the market will determine the prices such that supply and demand for each variant are equal. Producers in this scenario have no market power and prices are entirely determined by the market. In such a setting, there would be no spillovers because each desired quality would be produced and priced to equate demand and supply. Incentives would be perfectly aligned and all consumers would receive their preferred quality. The assumptions here are unlikely to apply to a healthcare market however. Healthcare providers are assumed to operate in an environment more appropriately described as monopolistic competition where providers do have market power in setting prices. Also, fixed costs will clearly limit the number of providers in the market, but the general insight is important.

Many models of product differentiation, and those most applicable to the current work, stem from Hotelling's (1929) model of location choice. A major incentive for variety in these models is the ability to limit price competition among close neighbors. This goal is traded off against the incentive to gain market share. Several models predict product selection decisions with locations chosen along a horizontal, vertical, or more general characteristics space. The simplest models of product selection are those of a duopoly choosing a location on a line. A representative approach would be that of d'Aspremont, et al. (1979). When consumers are uniformly distributed on a line and firms choose products first and then prices, the result is that of maximum differentiation. That is, producers will locate as far as possible from one other in order to minimize price competition and maximize profits. Other models use a circular city approach and assume

maximum differentiation in order to focus on the entry decision (Salop 1979). This analysis reveals the intuitive result that as fixed costs fall, entry increases, prices approach marginal costs and the market is approximately competitive. Therefore, as in the Rosen model, when fixed costs are low, most consumers can purchase a product that meets their individual preferences. Very large markets where demand is sufficient to support a large number of providers may approximate the conditions of such a model. In this case, spillover effects would be minimal.

The maximum differentiation result described above is highly dependent on the assumption of a uniform distribution of preferences. In a situation where fixed costs limit the variety of products offered, it is less clear how a non-uniform distribution of consumer preferences affects the equilibrium distribution of product attributes. It is noted that the maximum differentiation result is less likely when consumer demand is more concentrated. Take the example of locating on a line. Locating at the endpoints is no longer sensible if the population is concentrated on one end. The trade-off between the strategic effect of limiting price competition and the demand effect of gaining market share is dominated by the strategic effect in the case of two firms and uniform preferences. With consumer preferences more concentrated however, the demand effect may dominate causing producers to locate closer to one another to compete for customers. Under this scenario, it is more likely that a shift in the distribution of preferences would result in a shift in the distribution of quality. The results noted thus far apply specifically to horizontal differentiation models. These results can vary somewhat

when incorporating the concept of a vertical product space where all individuals agree on the overall ranking of products, but have different incomes or insurance coverage.

Models of vertical differentiation bear many similarities to the location models noted above. Shaked and Sutton (1982) find that, under certain assumptions, a duopoly with a uniform income distribution also displays maximum differentiation in quality space. Costs are assumed to be zero. Under an assumption limiting the width of the income distribution, it is shown that at most two firms will enter. Proceeding under this assumption, it can be shown that exactly two firms will enter and produce distinct products if the income distribution is wide enough. The differentiation is due to the fact that if qualities become close, price competition would reduce profit for both firms. Finally, if more than two firms are present, quality competition will lead all firms to set a high quality and price competition will drive prices and profits to zero. While the results are elegant in demonstrating the differentiation result in quality space, the simplifying assumptions of a uniform income distribution, the width of which allows for only two firms to enter, as well as zero production costs leave much to be desired for a realistic application to a health care market.

Nonetheless, the above models are useful in considering the incentives for product variety for the purpose of examining the effect of multiple payers on healthcare quality. Fixed costs will limit the number of providers in a market and the distribution of preferences will determine where in product space the firms will locate. One common theme of the above models is an assumption of uniformly distributed consumer preferences. While this is analytically convenient, it may be practically implausible in

the case of preferences for health care quality. The more evenly spread healthcare consumers are across the preference distribution, the greater the likelihood that a distribution of products will arise that is similarly distributed. A more concentrated distribution of preferences will result in a more concentrated selection of products. Shifts in the coverage distribution at the market level can thus have a significant impact on the distribution of quality available in the market and could enhance or diminish any spillover effects already occurring at the provider-level.

Multiple products

The review of applicable theory has thus far suggested that incentives of multiple payers can be balanced to determine a commonly provided quality of care. Payer-specific incentives however can influence the provision of unique elements of care and reduce any potential spillovers on the common quality. Furthermore, incentives for providers to differentiate themselves in response to the distribution of coverage can have a variety of effects on available quality and the presence of spillover effects. The discussion thus far however has focused on the quality of some ambiguous health care service which has these shared and unique elements of quality and may be provided to multiple payers by multiple providers in a market. The final complication in considering how the incentives of multiple payers affect the delivery of care is that there is not *one* generic service provided by a hospital for which it must choose a price and quality. Hospitals provide *many* services and these services appeal to different sets of payers and have different potential profitability. Any balancing of incentives is likely to occur not only within a particular service line and across payers, but across service lines and payers and providers in the market. Now, we examine the possibility that multiple payers and

the incentives they create may affect not only the level of shared and unique quality of a given service and its distribution across providers, but also the mix of services available and their quality levels. This element may be particularly important because hospitals are constrained in their ability to set prices to certain payers and are expected to provide care to non-paying patients. Their ability to adjust their service mix and the quality of each service thus may be an important mechanism for seeking profits. If one service becomes relatively more profitable due to a shift in payer mix, it may show an improvement in quality while a relatively less profitable service could see a quality decline.

Horwitz (2005) investigates the mix of services provided by all general hospitals over time by concentrating on the profitability of these services. She finds that the hospitals do vary in the set of services that they provide and that the variation is correlated with ownership type in predictable ways. For-profit hospitals are most likely to offer the most profitable set of services while government hospitals are most likely to offer the least profitable set of services. Non-profit hospitals typically fall somewhere in between. This is evidence of product differentiation and the insurance distribution in the market no doubt contributes to both the mix of provider types as well as the mix of services at each provider. Horwitz and Nichols (2009) follow up on this study by examining the competitive effects on the service mix provided by non-profits. They find that non-profits in markets with high for-profit penetration are more likely to produce relatively profitable services and less likely to produce relatively unprofitable services. In regards to the product differentiation discussed previously, this may present some evidence of a tendency towards clustering rather than specialization as non-profits choose

to compete with for-profits on these services rather than specialize in their own product mix.

Summary

At this point, the complexity of the task of predicting the impact of the insurance distribution on the level and distribution of quality should be quite clear. A fairly simple model with two payers shows that under certain conditions, the common quality provided will reflect a compromise between the two payers. Additional work has shown that each payer also affects the individual intensity of care that is provided to its patients. Others have suggested that the common quality and the unique quality are related. To date, no previous work in health economics has tried to incorporate the effect of the insurance distribution on the distribution of quality *across* hospitals, but the work on product differentiation indicates that this could have very important implications for the equilibrium results. Finally, quality is most often defined as some level of intensity of care that is provided by the hospital. This does not account for the fact that this intensity may vary widely across the different types of services that are provided by a hospital. Any attempt to incorporate all of the potential avenues through which the insurance distribution might influence quality of care would likely fall short of the simplicity necessary in a formal model and the ability to provide any clear and consistent hypotheses. The various mechanisms through which the distribution of coverage may impact the level and distribution of quality provided in a market are outlined above however and ultimately the question is an empirical one and will be pursued as such.

Spillover Effects of the Uninsured to Medicare Beneficiaries

As this study focuses on the impact of local uninsurance rates on quality for Medicare beneficiaries, the following discussion concentrates more specifically on the uninsured and Medicare populations. Hospitals can influence the quality of care received by their patients through some common level of quality for each service, through a unique quality provided to each payer for each service, and through the mix of services that they provide. They can also influence the quality provided to those in the market by choosing to accept or reject individual payers or patients. Each of these elements may be influenced by the distribution of payers and the competitive nature of the healthcare market. Unique characteristics of the uninsured as well as Medicare beneficiaries also contribute to the potential for spillover effects in this context.

Uninsured individuals differ from their insured counterparts in two important ways when it comes to their utilization of health care services. When seeking non-emergency care, uninsured individuals are generally required to bear the full price of the services they receive. Not only do they not have the benefit of insurance itself in order to minimize the risk of high expenditures, but the prices they face for each and every service are higher than the discounted prices charged to insurance companies. The effect of such high out-of-pocket (OOP) costs is to substantially lower demand for services by uninsured individuals. This lower demand by the uninsured is one mechanism through which this population may create spillovers to Medicare patients.

Despite their typically high OOP costs, however, uninsured individuals can also obtain care at little or no cost in certain circumstances. The law requires hospitals to stabilize any patient without regard to their ability to pay. Furthermore, non-profit

hospitals are obligated to provide community benefits in exchange for their exemption from certain taxes. Among such community benefits is the provision of uncompensated care to those with low ability to pay. Therefore, uninsured individuals generally use less care than their insured counterparts, but in some cases also pay less for the care they do receive through a variety of charity mechanisms. Each of these characteristics of the uninsured and their use of health care services has the potential to affect the quality choices made by hospitals in a multitude of ways. The potential effects of their lower demand for care are addressed first followed by a discussion of the impact of uncompensated care.

Uninsured Demand and Hospital Quality

As discussed, uninsured individuals demand less care than their insured neighbors due to the high OOP prices they must pay for care. A large uninsured population in a health care market has the effect of lowering the total market demand for a variety of services, particularly high-cost services. This may have a variety of effects on the elements of quality discussed above. As was suggested by Glazer and McGuire, the shift in demand could have an effect on some common elements of quality provided to all payers. A more price elastic population of private payers would likely have the effect of bringing the level of shared quality down. This could be reflected in smaller levels of investment in diagnostic technology or nursing staff, for example. It could also manifest itself in a smaller number of service offerings as the demand necessary to support additional services, technologies or staffing might not be present. This lack of demand would then effectively lower the shared quality for all patients including Medicare beneficiaries. To the extent that ethical obligations exist to provide comparable care to

all payers, shared elements of quality would not be limited to those consisting of high fixed costs.

In contrast to the drop in shared quality in response to more uninsured, access to providers may improve as the number of privately insured declines making Medicare beneficiaries relatively more profitable. This increase in access could be seen as a positive spillover effect. As was noted by Dor and Farley, as well as Glied and Zivin, hospitals also provide a unique quality level to each payer although there may be some limitations to this concept in relation to ethical obligations. In response to a smaller privately insured population and thus a drop in shared quality, the incentive to provide additional quality to Medicare beneficiaries might be enhanced. If the drop in demand from private payers results in a decline in shared quality, the provider may raise variable quality to compensate. The ultimate effect on the total quality or outcomes is unclear and subject to investigation. However, the evidence suggests that low demand by the uninsured could have the effect of improving access and boosting the unique quality received by Medicare beneficiaries. Unique quality may consist of any element of care that can be varied based on the individual patient. This could include prescription drugs, diagnostic testing, or room amenities. Shared quality on the other hand cannot be varied based on the individual patient. This may include the existence of a burn or cardiac surgery unit or the nurse staffing levels at the provider.

The mix of services available to Medicare beneficiaries and the quality of these services may also be affected by the presence of more uninsured. Providers may be less able to subsidize less profitable services with the revenues from more profitable services

as demand declines. Thus, a shift away from unprofitable services may occur. Furthermore, providers may choose to invest in the quality of their profitable service lines in order to attract more patients as overall demand declines. The effect of the uninsured on service mix may result in a reduction in provision of less profitable services, but an increase or improvements in the quality of more profitable services.

The effects discussed thus far are also likely to vary based on the extent of competition and differentiation in the market. Large markets are likely to have sufficient demand to provide a wide variety of services and will be less affected by the presence of a large uninsured population. Spillovers on shared quality will thus be less likely in large markets. The above also predicts an increase in unique quality in response to more uninsured. The impact of market size is ambiguous here. Improved access to care resulting from a lack of private pay patients may be stronger in large markets, but increases in quality designed to compensate for drops in shared quality should be lower in these markets.

Uncompensated Care and Hospital Quality

While in many cases, uninsured individuals use less care due to the high OOP costs they must face, there are times when the uninsured are able to obtain care at little or no cost. The uncompensated care that they receive can also impact the level and distribution of quality in the market. The mechanisms may be somewhat different however from the effects of their reduced demand. It is also important to recognize that the amount of uncompensated care provided to the uninsured is chosen by the hospital so the cause and effect in this case are less clear.

Uncompensated care, like reduced demand, can have a negative effect on shared elements of quality. In the short-run, uncompensated care will simply result in a loss to the provider. In the long-run however, the presence of a large population using uncompensated care will reduce the incentive to invest in costly quality improvements because higher costs will mean higher losses. The size of the market and its level of differentiation will minimize such an effect. Where the uninsured are more concentrated among a few safety-net hospitals, uncompensated care effects will be isolated. This should result in fewer spillover effects to Medicare beneficiaries.

The effect of uncompensated care on the distribution of unique quality across payers is somewhat less clear. More uncompensated care may shift some resources away from other payers. Medicare may be a preferred choice because the profit on private-payers is likely to be higher. Thus, uncompensated care may result in less access for Medicare beneficiaries. On the other hand, as in the demand scenario, if uncompensated care ultimately results in a reduction in the shared quality available, Medicare beneficiaries may be compensated with an increase in the variable costs of quality.

The effect of uncompensated care on the mix of services and their quality is also unclear. A case could be made that more uncompensated care would create incentives for a provider to invest in more profitable services and to improve the quality of those services to increase demand, both in the interest of subsidizing their uncompensated care losses. In this case, a hospital with more uncompensated care losses would provide a more profitable mix of services and higher quality profitable services. The argument could also be made however that those hospitals that provide a more profitable service

mix are better equipped to provide uncompensated care. This brings up the question of direction of causation.

In general, market size and provider differentiation are expected to significantly diminish the effects of uncompensated care because the users of such care will be more concentrated at particular providers.

Hypotheses

The above discussion considers many of the possible ways in which the local uninsurance rate might affect the care delivered in the market and to Medicare beneficiaries more specifically. Here, we generate a set of hypotheses to be tested, based on the applicable theory and the above discussion. Ideally, we would like to examine the effects of uncompensated care separately from those of low demand. Unfortunately, the data does not allow for a separate identification of uncompensated care. Thus, all hypotheses will be generalized for testing the impacts of local uninsurance rates on a variety of outcomes.

H1: A high uninsurance rate will be associated with lower levels of shared quality

H2: A high uninsurance rate will be associated with improved access for Medicare beneficiaries

H3: A high uninsurance rate will be associated with higher levels of unique quality for Medicare beneficiaries

H4: Based on the above, a high uninsurance rate will have an ambiguous effect on total quality

The above are the primary hypotheses that are tested in the following chapters. Each one has the potential to be influenced by market size. Larger markets are likely to show less evidence for H1 and H3. Finally, the effects on product mix are also examined though no formal hypothesis emerges. The next chapter discusses the data to be used in the analysis and the following two chapters present the analytical methods and the results.

Chapter 3: Data Sources and Descriptive Statistics

By examining the relationship between local uninsurance rates and the care delivered to Medicare beneficiaries, this work will shed light on the question of how providers respond to financial incentives and what contributes to the variation in access, utilization and outcomes across areas. In the interest of testing the hypothesis on total quality, this study will examine how the local uninsurance rate ultimately relates to outcomes for Medicare beneficiaries by examining the effects of the uninsurance rate on mortality from a variety of conditions. Next, it will test the hypothesis regarding shared quality by considering the impact of local uninsurance rates on the overall availability of hospital services in the market. Finally, it will test the hypotheses on access and unique quality by investigating the effect of the insurance distribution on utilization by Medicare beneficiaries. The study will primarily use cross-sectional analysis and identify the effects of the insurance distribution using the variation in local uninsurance rates across areas. Some supplementary analyses will use time series data and examine the impact of changes in uninsurance over time. The main cross-sectional analyses will pool a variety of data from the years 2000-2002 while the time series analysis will focus on the change between this period and the period 2004-2006.

In order to address the questions of interest, a great deal of data on local insurance distributions and Medicare discharge data, as well as hospital and market characteristics has been compiled. Current Population Survey data is used to determine local uninsurance rates. Data from the Area Resource File (ARF) supplements this data to provide a more detailed picture of the sample markets. The American Hospital

Association (AHA) annual survey is used to identify and describe the hospitals in the sample markets. Finally, MEDPAR data on all Medicare inpatient discharges is used to measure the outcomes for Medicare beneficiaries. This chapter will describe the data in some detail and lay out the descriptive foundations for the analyses that will be discussed in the following chapters.

Local Uninsurance Rates

Identifying insurance coverage at the local level is essential to this analysis, but proved to be somewhat challenging. Most typical household surveys used to estimate insurance coverage are designed for national estimates. A few allow for reliable and representative estimates at the state level, but most do not even identify sub-state divisions much less produce estimates that are representative at this level. Because there is not a perfect measure of insurance at a level that could be considered to represent a local healthcare market, this study uses data from the March supplement of the Current Population Survey (CPS) at the MSA level. The March CPS supplement is a commonly used household survey for estimating the ranks of the uninsured. The survey is conducted each March and the results are a commonly cited source of the current number of uninsured individuals in the US. While the CPS is only designed to be representative at the national and state levels, it identifies roughly 240 Metropolitan Statistical Areas (MSAs) for which estimates of the uninsured can be made. By pooling multiple years of the survey, the sample size in each MSA can be increased leading to more precise estimates. Again, the sample was not chosen to be representative of MSAs and may result in estimates that vary substantially from the true values. Despite these concerns,

the relatively large sample sizes and the generally reliable insurance definition make the MSA-level insurance rates from the CPS the best available local insurance measure for this study.

Aside from sampling error which will be present on any survey-based measure, the major drawback to using the CPS for this analysis is the fact that it does not separately identify any non-metropolitan areas and is limited by sample size constraints to the largest MSAs. This is a limitation specifically because, as noted in the conceptual framework, we expect certain spillover effects to be more prominent in smaller markets. For the purpose of this analysis, two consecutive years of CPS data will be pooled to create estimates of the insurance distribution at the MSA level. The sample is then limited to the 100 largest MSAs by CPS sample size. By limiting the sample of MSAs and pooling two years of the CPS data, each MSA has at least 400 observations on which to base the local uninsurance rate. Some additional adjustments were made to the MSA definitions in order to make them consistent over time. The MSA definition underwent a major change in 2003 which is reflected on the 2005 CPS. All of the previous years are re-coded to roughly match this definition. Additional information on these adjustments is available upon request.

Table 3.1 displays the trends in insurance coverage at the national level over the time period of interest from 2000 to 2005. These are the CPS survey years, but the CPS is intended to represent the full-year insurance coverage for the prior calendar year. In other words, those listed as uninsured on the CPS were, in theory, uninsured for the entire calendar year prior to the March survey based on the wording of the insurance questions.

In comparisons with a number of other surveys, however, the CPS insurance rates have actually been shown to be more in line with estimates of the number of uninsured at a point in time (Swartz 1986). After a small decrease in 2001, the uninsurance rate steadily climbs until 2004 with another small dip in 2005. These estimates have already been adjusted to eliminate the impact of the verification question that was added in 2001 so that the estimates are consistent over the entire time period.

As has been noted, the analysis will place some emphasis on how market size affects the potential for and realization of spillover effects. Tables 3.2 and 3.3 display the sample markets, by size, and the trends in the uninsurance rate over time in these markets. Note that there is a great deal of variability in the insurance rates across areas and over time in both small and large markets. Both sources of variation will be used to identify the spillover effects of uninsurance in a variety of analyses. The standard errors of the CPS proportions are also included in the tables. The average standard error of the proportion uninsured for an MSA in 2001 is 1 percent while the standard deviation of the estimates is over 5 percent. This indicates that there is substantial meaningful variation in the estimates of the uninsurance rate. The changes in the uninsurance rate over time are statistically significant in roughly half of the MSAs and are more likely to be significant in the larger markets. The implications of the measurement error in the insurance rates will be discussed further and some additional analytical approaches will be used to add credence to the results.

Market characteristics

Now that we have explored the uninsurance rates in small and large markets over time, we will examine the other characteristics of the sample markets over the study period. Some of these characteristics will ultimately be used as outcomes in later models examining access and utilization at the market-level. Others will be used as controls. Data from the Area Resource File (ARF) will be used to examine the characteristics of the sample markets. The data years used to match the pooled insurance distributions will be 2000 and 2004. This reflects a compromise between the calendar year and data year interpretations of the CPS years that have been used for insurance purposes. CPS survey years 2000 and 2001, for instance, have been pooled to obtain the relevant insurance distribution for the primary analysis and the ARF data from 2000 will be used with this data. Using the 2000 data for the cross-sectional analyses also allows access to the most accurate data based on the 2000 census. Data on population size, poverty status, and the racial distribution of the market are measured without error in this year only. This will prove useful in controlling for market characteristics other than insurance that may affect the delivery of care to Medicare beneficiaries. Table 3.4 displays the characteristics of the sample markets, by size and over time.

In 2000, small markets have a lower average uninsurance rate than larger markets. The small and large markets' distribution across the 5 quintiles of insurance coverage (created using the entire sample where quintile 1 represents the 20 MSAs with the lowest uninsurance rates and quintile 5 represents the 20 MSAs with the highest uninsurance rates) is also shown. MSAs with the highest uninsurance rates, those in quintile 5, are more dominant in the larger markets which is consistent with their higher average

uninsurance rate. Smaller markets also have higher average Medicaid rates and lower rates of private coverage than larger markets in 2000. Additional calculations show that from 2001 to 2005, 67 percent of small markets and 73 percent of large markets lost coverage. Thus, small markets have slightly lower uninsurance rates in the initial period and lose somewhat less coverage over time. Their lower uninsurance rates are driven at least in part by higher rates of Medicaid coverage however.

The racial distribution also varies across small and large markets, largely due to the presence of larger black and smaller white populations in large markets. The proportion Hispanic is only slightly higher in small markets than large in 2000. Income and poverty measures are also considered. Percent in poverty is lower and per capita income is higher in large markets. The unemployment rate is also lower in large markets. These observations are consistent with the higher rates of private coverage in large markets and lower rates of Medicaid coverage. Also interesting is how these measures change over the time period 2000 to 2004. In the time period of interest, the poverty rate is rising, unemployment is rising and the rise in uninsurance appears to be driven by a reduction in private coverage that is only partially offset by an increase in Medicaid.

In addition to demographics and economic conditions in the market, the characteristics of the health care market vary as well. Small markets have fewer hospitals than their larger counterparts though both have seen a decline over the study period. Small markets also have a slightly higher admission rate per capita which may be consistent with the higher levels of insurance coverage in these markets. Length of stay varies little by market size, but does decline over the study period. ER visits per capita

are also higher in smaller markets, but unlike admissions, are rising in both small and large markets over time. The staffing ratios for nurses in the market are almost equal for small and large markets in 2000. Both the nurse to bed ratio and percentage RNs rises over this time period with the increase being just slightly larger in smaller markets.

Some of the characteristics discussed above, including the racial and income distribution of the market, are those that one would expect to have an impact on the delivery of care in the market. Several of these however are also likely to be highly correlated with the local uninsurance rate. In order to create a clearer picture of how uninsurance relates to these other market characteristics, Table 3.5 displays the correlations between the local uninsurance rate as estimated by the CPS and several market-level characteristics for the year 2000. Very strong positive correlations are seen between the proportion Hispanic in the market and the proportion uninsured. This is consistent across market sizes although the correlations are slightly higher in smaller markets. The same pattern exists between the market-level poverty rate and the uninsurance rate. High correlations exist in both small and large markets with the correlation in large markets slightly smaller. Including these two market-level characteristics as explanatory variables in simple OLS regressions on the uninsurance rate results in R-squared values of 0.78 and 0.69 for small and large markets, respectively. This will present some challenges in modeling the effects of all of these market-level characteristics together.

In the interest of establishing a set of market level variables that can be used together to model the delivery of care in the market, some collinearity diagnostics are

displayed in Table 3.6. The results of these diagnostics indicate that including measures of the insurance distribution, the poverty rate and the racial distribution together in a model would be unwise. Substituting per capita income for the poverty measure, but keeping the racial distribution diminishes the collinearity concerns. In weaker models however, such as the logistic regressions that will be used in some of the analysis, the collinearity between the proportion Hispanic and the uninsurance rate even in the absence of a poverty measure may also cause problems. Concerns will be especially strong in smaller markets. A common rule of thumb for diagnosing collinearity uses a threshold of ten for the variance inflation factor (VIF) as indicative of a problem. For weaker models, however, some sources suggest that a VIF of as low as 2.5 may be of concern (Allison 1999). This information will be used in model specification in the following chapters.

Hospital characteristics

After identifying the 100 MSAs with sufficient sample to analyze the changes in the insurance distribution and describing those markets more thoroughly using the ARF data, the hospitals in these markets were identified on the AHA annual surveys. The community hospitals(non-federal, short-term, general and specialty hospitals) present in the markets of interest in either of two years were identified. The years 2001-02 were used to match the CPS insurance years 2000-01, for instance.

Table 3.7 displays the characteristics of all of the community hospitals in the sample markets, by market size. These may not correspond directly with the hospitals that are analyzed when using the MEDPAR outcomes and utilization data because some

AHA hospitals were missing the necessary Medicare identifier to merge them with the patients from the MEDPAR file. Also, some of the hospitals did not have any matching Medicare discharges on the corresponding MEDPAR files. These were typically children's or various other specialty hospitals or LTC hospitals. They will be left in the sample however for some general analysis on the availability of hospital services in the area.

Comparing the hospital characteristics in small and large markets elicits some interesting observations. For-profits are slightly more common in small markets in both years. The large shift in for-profit presence from 2001 to 2005 coincides with a large drop in the proportion classified as general hospitals. This would seem to indicate a rapid expansion of for-profit specialty hospitals.

Hospitals in small markets unsurprisingly have fewer beds than those in large markets. Furthermore, hospitals in both market sizes are getting smaller over the study period. In both small and large markets, length of stay goes up in the study period. Hospitals in small markets also have a smaller percentage of Medicaid discharges and a larger proportion of Medicare discharges, but in combination, a larger portion of public discharges than the hospitals in larger markets. There is also an increasing reliance on public payers as a proportion of hospital discharges over time in both types of markets. Staffing also varies by market size and over time. Hospitals in small markets have a lower proportion of RNs on their nursing staff. The proportion RNs does increase in all markets however over time. The nurse to bed ratio is also increasing over the study

period in both small and large markets as is the RN to bed ratio. The nurse to bed ratio in small markets is lower than that in large markets as was the RN to bed ratio.

The above information indicates that hospitals in small markets may be under some additional financial pressure due to the larger presence of public payers and evidenced by the use of lower cost staff. The increase in for-profits and specialty hospitals seems to be evidence of a differentiation effect which is interestingly occurring in small markets to a greater extent than in large markets. This is also consistent with the more prominent drop in presence of public hospitals in small markets. This is somewhat out of line with expectations that differentiation would be stronger in larger markets, but will be important to consider in interpreting later results.

Table 3.8 explores the availability of particular services in the sample hospitals. The departments and specialty services are broken into groups of profitable and unprofitable services based on work by Jill Horwitz and colleagues (2005). With a few exceptions, a larger proportion of hospitals in large markets offer profitable services than those in small markets. Substantial growth occurs over time in both small and large markets in the proportion of hospitals providing MRI and PET scanners as well as more modest growth in the provision of cardiac surgery and catheterization. There are less consistent results over time in the provision of NICU and PICU services and a decline in the proportion of hospitals providing CT scanners and ultrasounds.

The results for the set of unprofitable services are quite different. Hospitals in small markets are also less likely than those in large markets to provide unprofitable services, but the discrepancies are not as pronounced as those for profitable services.

Over time, however, the provision of unprofitable services declines in both small and large markets. The declines are more pronounced in small markets and also seem to coincide with the changes in economic and insurance conditions. This may be consistent with the observation that over the same time period small markets experience a larger proportional growth in for-profit hospitals.

Discharge data

Following the creation of the hospital sample in the 100 MSAs, the Medicare discharges from the sample hospitals are identified on the MEDPAR data. Two years of discharges are pooled to match the sample from the AHA. The study years again are 2001-02, and 2005-06. The MEDPAR data contains 100% of the Medicare discharges from the sample hospitals. The use of the 100% MEDPAR files is particularly important for this study because we are working at the MSA level and it is unlikely that the smaller files would be representative at this level. Outcomes have been measured for the Medicare population by applying the AHRQ Quality Indicators to the Medicare discharges. The quality indicators identify mortality from a set of conditions that has been determined to be influenced by hospital quality. These measures are an admittedly crude measure of quality because it is difficult to control for all of the additional elements that contribute to an individual's probability of death. Table 3.9 displays the outcomes and utilization measures from hospitals in our sample markets, by market size. Differences in outcomes by market size vary by condition. Those in small markets consistently have lower mortality on CABG and AMI and consistently higher mortality on CHF, Stroke, GI hemorrhage and hip fracture. Mortality rates on virtually all the conditions of interest however are improving over the study time period.

Table 3.9 also displays the utilization measures that will be used to test the hypotheses on unique quality provided to Medicare beneficiaries. There are some fairly consistent trends in the utilization measures. Lap chlolys are growing over time in both small and large markets. Similarly bilateral catheterization is falling consistently over time, but in this case is lower in small markets. Incidental appendectomies are also falling in both market sizes over time, but here, the rate is higher in small markets. There is a trend over time in both small and large markets showing higher use of ICUs. The use of CT scans is also growing rapidly over time in both small and large markets with large markets showing higher use in both periods. Other imaging follows the same pattern. Unfortunately, discharge data provides only a limited set of utilization measures for analyzing the role of local uninsurance on unique quality delivered to Medicare beneficiaries. Additional measures of the individual processes of care experienced by Medicare beneficiaries might provide better evidence of such quality.

Finally, additional individual characteristics are shown in Table 3.10. These will be used for risk-adjustment and individual level controls. Age and sex are relatively constant across market size and over time. The race distribution however varies considerably by market size as well as over time. As was true in the markets as a whole, blacks represent a larger portion of discharges in large markets. Hispanics are more prevalent in large market discharges however, which is not the case for the population more generally. While the percentage black grows over the study period in large markets, it falls over the same period in small markets. Hispanics on the other hand are growing as a proportion of discharges in both small and large markets. There is also

substantial growth over time in the proportion of those discharged that are disabled or have ESRD. ESRD is more prevalent in larger markets while disability status does not have a clear pattern.

The discharges used for this analysis were chosen by identifying all of the discharges in the hospitals in the sample markets. This does not necessarily mean that the individuals receiving care in these MSAs also live in the area. The proportion that actually lives in the MSA in which they receive care is lower for small markets. This is likely due to the fact that the hospitals in these markets will serve individuals from the surrounding non-metro areas.

Small markets have a smaller proportion of admissions classified as emergent than those in large markets. Regardless of size, however, this proportion is growing over time. It is unclear whether this is actually a meaningful trend in terms of the severity of the conditions upon admission or some type of administrative change. If it represents a failure of ambulatory care over the time period of interest, this would be an important observation.

Over time, those who ever had Medicaid or who had Medicaid in all twelve months of the calendar year increased steadily in small and large markets. Those in small markets were generally less likely to have Medicaid however. From 2001 to 2005, there was new growth in HMO coverage in Medicare as well. This may be related to the passage of the Medicare Modernization Act in 2003 which changed some of the details of the Medicare Advantage program. Again, however, it was more common for those in large markets to be in an HMO regardless of the timing.

Aside from the racial distribution of those in small and large markets, which are quite different, the differences are less than striking. With very clearly different market and hospital characteristics in small and large markets, the beneficiaries being treated seem to show the least contrast. There may of course be unobserved differences which will need to be addressed later. The most glaring omission is the inability to identify the income of the Medicare beneficiaries who are using the hospital. We know the income parameters at the market level and knowing Medicaid status identifies the poorest beneficiaries. We do not know however which beneficiaries have supplemental insurance coverage and this will be important in later discussions. This gives us a fairly good descriptive picture however of the individuals in all markets over time.

The data described above will be used to further examine the relationship between MSA-level uninsurance and outcomes of care received by Medicare beneficiaries. The differences between small and large markets described above as well as the trends over time will all be important in interpreting the results of the analyses in the following chapters.

Chapter 3 Tables

Table 3.1
National Insurance Trends
CPS Survey Years

Insurance Distribution	2000	2001	2002	2003	2004	2005
Medicare and ESI	4.17	4.24	4.29	4.13	4.36	4.46
Medicare and NG	3.33	3.38	3.32	3.25	3.19	3.1
Medicare only	5.66	5.75	5.84	6.01	6.08	6.06
Employer coverage	57.83	58.19	56.72	55.7	54.52	54.5
Non-group coverage	5.67	5.45	5.47	5.59	5.58	5.7
Medicaid	6.8	6.75	7.46	7.8	8.41	8.74
Other public	1.02	0.98	1.05	1.05	1.04	1.1
Uninsured	**15.53**	**15.28**	**15.85**	**16.47**	**16.82**	**16.34**

Table 3.2
Uninsurance Rates in Small Markets
2001 to 2005

MSA Name	00-01	SE	04-05	SE	Difference 2001 to 2005	
Akron, OH PMSA	9.7%	1.1%	9.6%	1.0%	0.0%	
Albany-Schenectady-Troy, NY	5.8%	0.9%	10.4%	1.0%	4.6%	*
Albuquerque, NM MSA	20.5%	0.9%	18.5%	0.9%	-1.9%	
Allentown-Bethlehem-Easton, PA	5.9%	0.9%	8.8%	1.0%	2.9%	*
Anchorage, AK MSA	15.5%	1.0%	18.4%	0.9%	3.0%	*
Ann Arbor, MI PMSA	7.5%	1.0%	8.0%	1.0%	0.5%	
Bakersfield, CA MSA	18.5%	1.8%	13.9%	1.3%	-4.6%	*
Birmingham, AL MSA	14.6%	1.3%	11.7%	0.9%	-3.0%	*
Boise City, ID MSA	15.1%	1.0%	17.1%	0.9%	2.0%	
Burlington, VT MSA	10.8%	1.2%	10.5%	0.7%	-0.2%	
Charleston-North Charleston,	16.3%	1.7%	15.9%	1.2%	-0.3%	
Colorado Springs, CO MSA	9.9%	1.3%	15.0%	1.0%	5.0%	*
Dayton-Springfield, OH MSA	7.8%	0.9%	11.6%	1.0%	3.8%	*
Des Moines, IA MSA	9.7%	1.2%	12.3%	0.9%	2.6%	*
Dover, DE MSA	15.5%	1.7%	12.8%	1.1%	-2.6%	
Dutchess County, NY PMSA	13.1%	1.4%	13.0%	1.3%	-0.1%	
El Paso, TX MSA	34.6%	1.7%	33.8%	1.6%	-0.8%	
Fargo-Moorhead, ND-MN MSA	11.6%	1.4%	9.5%	0.9%	-2.1%	
Fayetteville-Springdale-	15.1%	1.7%	15.2%	1.3%	0.1%	
Fresno, CA MSA	18.7%	1.5%	19.4%	1.3%	0.7%	
Greenville-Spartanburg-	13.5%	1.3%	17.8%	1.3%	4.3%	*
Harrisburg-Lebanon-Carlisle,	8.7%	1.2%	10.3%	1.1%	1.6%	
Honolulu, HI MSA	10.2%	0.7%	10.4%	0.4%	0.2%	
Jackson, MS MSA	16.8%	1.7%	19.1%	1.4%	2.3%	
Knoxville, TN MSA	10.9%	1.6%	13.9%	1.4%	2.9%	
Lancaster, PA MSA	13.0%	1.7%	17.1%	1.7%	4.1%	*
Lansing-East Lansing, MI MSA	11.0%	1.5%	14.8%	1.5%	3.8%	*
Las Cruces, NM MSA	23.7%	1.7%	28.4%	1.8%	4.7%	*
Lincoln, NE MSA	10.3%	1.4%	13.9%	1.3%	3.6%	*
Little Rock-North Little Rock,	11.6%	1.2%	12.7%	1.1%	1.1%	
McAllen-Edinburg-Mission, TX	33.1%	2.2%	32.1%	1.8%	-1.0%	
Omaha, NE-IA MSA	9.6%	0.8%	10.8%	0.6%	1.2%	
Portland, ME MSA	7.0%	1.2%	9.6%	0.8%	2.6%	*
Provo-Orem, UT MSA	12.3%	1.2%	13.2%	1.0%	0.9%	
Reno, NV MSA	15.3%	1.4%	16.0%	1.0%	0.7%	
Richmond-Petersburg, VA MSA	13.2%	1.4%	13.8%	1.0%	0.6%	
Saginaw-Bay City-Midland, MI	9.9%	1.5%	12.3%	1.6%	2.3%	
Sarasota-Bradenton, FL MSA	13.2%	1.7%	15.2%	1.5%	2.0%	
Scranton-Wilkes	10.9%	1.3%	9.9%	1.1%	-1.0%	
Sioux Falls, SD MSA	10.9%	1.3%	11.7%	0.9%	0.8%	
Springfield, MA MSA	9.7%	1.2%	11.6%	1.2%	1.9%	
Syracuse, NY MSA	9.9%	1.3%	8.4%	1.2%	-1.5%	
Toledo, OH MSA	13.8%	1.5%	7.9%	1.0%	-5.9%	*
Tucson, AZ MSA	16.6%	1.3%	14.1%	1.1%	-2.5%	
Tulsa, OK MSA	14.7%	1.3%	17.6%	1.1%	3.0%	*
Ventura, CA PMSA	13.0%	1.6%	18.0%	1.5%	5.0%	*
Wichita, KS MSA	13.1%	1.3%	12.3%	0.9%	-0.8%	
Youngstown-Warren, OH MSA	10.0%	1.2%	15.3%	1.3%	5.3%	*

* Indicates that the difference in uninsurance from 2001 to 2005 is statistically significant at the .05 level.

Table 3.3
Uninsurance Rates in Large Markets
2001 to 2005

MSA Name	00-01	SE	04-05	SE	Difference 2001 to 2005	
Atlanta, GA MSA	15.2%	0.8%	18.1%	0.6%	2.9%	*
Austin-San Marcos, TX MSA	13.2%	1.2%	24.2%	1.2%	11.0%	*
Baltimore, MD PMSA	11.6%	0.9%	13.5%	0.6%	1.9%	*
Boston, MA-NH PMSA	10.5%	0.4%	12.9%	0.4%	2.4%	*
Buffalo-Niagara Falls, NY MSA	10.3%	1.0%	9.6%	0.9%	-0.7%	
Charlotte-Gastonia-Rock Hill,	13.5%	1.0%	19.0%	0.9%	5.5%	*
Chicago, IL PMSA	16.3%	0.4%	15.9%	0.3%	-0.4%	
Cincinnati, OH-KY-IN PMSA	12.9%	0.8%	12.6%	0.7%	-0.3%	
Cleveland-Lorain-Elyria, OH	13.3%	0.7%	11.8%	0.6%	-1.5%	
Columbus, OH MSA	11.3%	0.9%	15.4%	0.8%	4.1%	*
Dallas, TX PMSA	21.1%	0.7%	24.1%	0.6%	3.0%	*
Denver, CO PMSA	17.2%	0.9%	18.5%	0.6%	1.4%	
Detroit, MI PMSA	11.6%	0.5%	12.3%	0.4%	0.7%	
Grand Rapids-Muskegon-Holland,	10.9%	0.9%	8.9%	0.8%	-2.0%	*
Greenboro-Winston Salem-High	13.4%	1.0%	16.5%	1.0%	3.1%	*
Hartford, CT MSA	8.9%	0.9%	12.0%	0.6%	3.1%	*
Houston, TX PMSA	24.9%	0.7%	28.4%	0.7%	3.5%	*
Indianapolis, IN MSA	11.3%	1.1%	14.9%	0.8%	3.7%	*
Jacksonville, FL MSA	16.0%	1.2%	16.5%	1.0%	0.5%	
Kansas City, MO-KS MSA	9.3%	0.7%	11.9%	0.5%	2.6%	*
Las Vegas, NV-AZ MSA	21.3%	0.8%	22.0%	0.6%	0.7%	
Los Angeles-Long Beach, CA	25.6%	0.4%	24.2%	0.3%	-1.4%	*
Louisville, KY-IN MSA	10.0%	1.0%	14.4%	0.9%	4.4%	*
Memphis, TN-AR-MS MSA	16.2%	1.5%	20.0%	1.3%	3.8%	*
Miami, FL PMSA	22.6%	0.6%	24.3%	0.6%	1.6%	*
Milwaukee-Waukesha, WI PMSA	9.4%	0.9%	12.8%	0.7%	3.4%	*
Minneapolis-St., Paul, MN-WI	7.3%	0.6%	9.4%	0.4%	2.1%	*
Nashville, TN MSA	8.0%	1.0%	14.4%	1.0%	6.5%	*
New Haven-Meriden, CT PMSA	10.7%	0.8%	13.0%	0.5%	2.2%	*
New Orleans, LA MSA	22.4%	1.3%	19.1%	1.1%	-3.3%	*
New York, NY PMSA	18.1%	0.3%	17.8%	0.3%	-0.2%	
Norfolk-Virginia Beach-Newport	18.0%	1.3%	14.9%	0.9%	-3.1%	*
Oklahoma City, OK MSA	18.6%	1.1%	19.9%	1.0%	1.3%	
Orlando, FL MSA	15.4%	0.9%	22.3%	0.9%	6.9%	*
Philadelphia, PA-NJ PMSA	10.7%	0.4%	13.7%	0.3%	3.0%	*
Phoenix-Mesa, AZ MSA	19.6%	0.7%	18.5%	0.6%	-1.1%	
Pittsburgh, PA MSA	7.4%	0.6%	10.1%	0.6%	2.7%	*
Portland-Vancouver, OR-WA PMSA	14.7%	0.9%	17.1%	0.6%	2.5%	*
Providence-Fall River-Warwick,	7.4%	0.5%	11.9%	0.4%	4.4%	*
Raleigh-Durham-Chapel Hill, NC	10.7%	1.0%	13.4%	0.8%	2.7%	*
Riverside-San Bernardino, CA	20.9%	0.9%	22.4%	0.8%	1.6%	
Rochester, NY MSA	9.4%	1.0%	11.7%	0.9%	2.4%	*
Sacramento, CA PMSA	13.8%	1.1%	13.4%	0.9%	-0.3%	
St. Louis, MO-IL MSA	9.2%	0.7%	13.1%	0.6%	3.9%	*
Salt Lake City-Ogden, UT MSA	11.6%	0.6%	13.1%	0.5%	1.5%	*
San Antonio, TX MSA	25.8%	1.2%	26.2%	1.1%	0.4%	
San Diego, CA MSA	18.1%	0.9%	16.3%	0.8%	-1.8%	
San Francisco, CA PMSA	17.6%	0.8%	15.6%	0.6%	-1.9%	*
San Jose, CA PMSA	10.8%	0.9%	14.0%	0.9%	3.2%	*
Seattle-Bellevue-Everett, WA	14.0%	0.8%	14.3%	0.6%	0.3%	
Tampa-St.	17.6%	0.8%	14.3%	0.7%	-3.3%	*
Washington, DC-MD-VA-WV PMSA	13.5%	0.5%	14.8%	0.3%	1.3%	*

* Indicates that the difference in uninsurance from 2001 to 2005 is statistically significant at the .05 level.

Table 3.4
Characteristics of Sample Markets
By Market Size

	2000		2004	
	Small	Large	Small	Large
Insurance Distribution				
Uninsured	0.1337	0.1441	0.1445	0.1615
Medicaid	0.0722	0.0551	0.0862	0.0738
Medicare	0.1319	0.1204	0.1310	0.1252
Private	0.6491	0.6714	0.6229	0.6304
pseudo-hhi	0.4816	0.4982	0.4517	0.4527
Uninsurance quintile				
Lowest uninsurance	22.92	17.31		
2	20.83	19.23		
3	20.83	19.23		
4	22.92	17.31		
Highest uninsurance	12.5	26.92		
Race and Age				
White, not hispanic	0.7439	0.6851	0.7272	0.6608
Black	0.0807	0.1442	0.0828	0.1460
Hispanic	0.1257	0.1197	0.1350	0.1328
Other	0.0607	0.0640	0.0639	0.0703
Over 65	0.1217	0.1151	0.1214	0.1141
Income and Unemployment				
Percent in poverty	0.1086	0.0985	0.1229	0.1177
Percent with food stamps	0.0595	0.0532	0.0815	0.0729
Unemployment rate	0.0399	0.0336	0.0532	0.0528
Per capita income	27415	32199	31149	35641

Table 3.5
Correlates of Local Uninsurance Rates, 2000-01
By Market Size

	Correlation with Local Uninsurance Rate			
	Small		Large	
Race				
White	-0.7727	*	-0.7786	*
Black	-0.0422		0.1186	
Hispanic	0.8626	*	0.7338	*
Other	-0.0355		0.2255	
Income				
Percent in poverty	0.8699	*	0.7265	*
Per capita income	-0.7122	*	-0.2402	
Other coverage				
Medicaid	0.5302	*	0.1803	
Medicare	0.0144		-0.1855	
Private	-0.8147	*	-0.8018	*

Table 3.6
Collinearity Diagnostics on Market-level Variables
By Market Size

	All		No poverty		No poverty, no hispanic		No race			
	Small	Large	Small	Large	Small	Large	Small		Large	
	VIF	VIF	VIF	VIF	VIF	VIF	VIF	VIF	VIF	VIF
Market-level independent variables										
Uninsured	5.73	4.91	5.34	4.11	2.17	1.80	2.14	4.63	1.37	3.23
Medicaid	2.43	2.32	1.70	1.33	1.65	1.32	1.62	2.28	1.27	1.95
Medicare	1.16	1.21	1.08	1.10	1.06	1.10	1.04	1.06	1.07	1.15
Percent in poverty	11.35	5.88						6.82		3.84
Per capita income (LOG)			2.60	2.45	2.48	2.39	2.32		1.36	
Hispanic	9.72	4.08	6.27	3.75						
Black	1.88	2.22	1.71	1.89	1.23	1.25				
Other	1.12	1.53	1.15	2.30	1.15	]2.30				
Number of Hospitals	1.36	1.51	1.30	1.64	1.21	1.63	1.02	1.11	1.57	1.37

NOTES:
Values of VIF exceeding 10 are often regarded as indicating multicollinearity, but in weaker models, which is often the case in logistic regression, values above 2.5 may be a cause for concern (see, P.D. Allison, Logistic Regression Using the SAS System, SAS Institute, 1999).

Table 3.7
Characteristics of Hospitals in Sample Markets
By Market Size

	2001-02		2005-06	
	Small	Large	Small	Large
Ownership Type				
Public	0.102	0.093	0.080	0.088
Not-for-Profit	0.663	0.690	0.571	0.617
For-Profit	0.236	0.216	0.346	0.294
General hospital	0.811	0.859	0.708	0.781
Teaching hospital	0.300	0.320	0.238	0.272
Hospital Beds and Utilization				
Less than 150 beds	0.536	0.426	0.593	0.468
150 to 299	0.236	0.311	0.199	0.286
300 to 499	0.146	0.174	0.132	0.166
500 plus	0.082	0.089	0.076	0.080
Length of stay (days/admits)	6.767	6.343	7.525	6.782
Pct Medicaid (mcaid/admits)	0.136	0.149	0.147	0.161
Pct Medicare (mcare/admits)	0.457	0.417	0.488	0.438
Pct Public	0.594	0.566	0.635	0.600
Personnel				
Pct RNs	0.842	0.881	0.854	0.886
Nurse to bed ratio	1.322	1.366	1.500	1.539
RN to bed ratio	1.136	1.216	1.311	1.390

Table 3.8
Hospital Service Provision
By Market Size

	2001-02		2005-06	
	Small	Large	Small	Large
Profitable Services				
NiCU	0.304	0.329	0.205	0.350
PICU	0.163	0.139	0.073	0.153
Cardiac Cath Lab	0.528	0.598	0.531	0.573
Cardiac Surgery	0.393	0.355	0.404	0.381
ESWL (Lithotripsy)	0.252	0.256	0.307	0.279
Fitness Center	0.242	0.274	0.288	0.276
Birthing room	0.656	0.675	0.577	0.627
Sports Medicine	0.383	0.425	0.420	0.410
Womens Center	0.540	0.589	0.520	0.574
CT Scanner	0.828	0.878	0.792	0.847
MRI	0.626	0.677	0.647	0.703
PET	0.147	0.159	0.189	0.224
Spectroscopy	0.436	0.459	0.472	0.492
Ultrasound	0.844	0.890	0.803	0.858
Diagnostic radiology	0.702	0.750	0.642	0.705
SUM	7.043	7.453	7.035	7.453
Unprofitable Services				
OB	0.678	0.696	0.682	0.643
Burn	0.064	0.056	0.073	0.068
Alcohol/drug abuse	0.113	0.135	0.084	0.119
Psychiatric	0.445	0.443	0.253	0.396
Emergency Department	0.865	0.877	0.806	0.840
Trauma Center	0.347	0.322	0.310	0.303
HIV/AIDS Services	0.374	0.435	0.342	0.373
Psych Emergency	0.383	0.441	0.358	0.420
Psych Children	0.255	0.221	0.213	0.204
SUM	3.525	3.627	3.146	3.366

Table 3.9
Discharge-level Mortality and Utilization for Medicare Beneficiaries
By Market Size

	2001-02		2005-06	
	Small	Large	Small	Large
Inpatient Quality Indicators				
CABG Mortality	0.044	0.048	0.040	0.044
Craniotomy Mortality	0.096	0.091	0.074	0.074
AMI Mortality	0.117	0.130	0.092	0.100
CHF Mortality	0.055	0.050	0.041	0.037
Stroke Mortality	0.125	0.117	0.110	0.103
GI Hemorrhage Mortality	0.039	0.038	0.031	0.029
Hip Fracture Mortality	0.038	0.034	0.031	0.030
Pneumonia mortality	0.082	0.083	0.052	0.051
Utilization measures				
Laparoscopic Cholecystectomy	0.670	0.675	0.715	0.720
Incidental Appendectomy	0.024	0.021	0.022	0.019
Bilateral Catheterization	0.093	0.105	0.060	0.079
ICU	0.200	0.236	0.216	0.257
CT Scan	0.283	0.308	0.343	0.379
Diagnostic Radiology	0.802	0.810	0.800	0.820
Other Imaging	0.118	0.123	0.142	0.150

Table 3.10
Discharge-level Characteristics of Medicare Beneficiaries
By Market Size

	2001-02		2005-06	
	Small	Large	Small	Large
Age	73.4	73.6	72.9	73.1
Sex				
Male	0.437	0.431	0.444	0.438
Race				
Black	0.082	0.145	0.085	0.154
White	0.872	0.803	0.858	0.782
Hispanic	0.018	0.020	0.022	0.026
Other	0.024	0.028	0.032	0.034
Medicare Status				
Disabled	0.153	0.155	0.177	0.177
ESRD	0.032	0.037	0.043	0.050
Home MSA = Hosp MSA	0.760	0.876	0.758	0.875
Admission Type				
Emergency	0.508	0.569	0.533	0.606
Urgent	0.232	0.198	0.208	0.174
Elective	0.259	0.230	0.256	0.218
Other coverage				
Ever HMO	0.014	0.026	0.030	0.049
All HMO	0.005	0.008	0.007	0.013
Ever Medicaid	0.229	0.248	0.249	0.272
All Medicaid	0.154	0.171	0.174	0.193

Chapter 4: Local Uninsurance and Medicare Inpatient Outcomes

This chapter will investigate the relationship between the local uninsurance rate and Medicare inpatient outcomes. It will describe the analytical methods used to identify the effect of the uninsurance rate on Medicare mortality from a set of specific condtions and procedures. The results of this analysis will allow for a conclusion as to the ultimate role of spillover effects on outcomes for Medicare beneficiaries.

Chapter 2 detailed a variety of ways in which the uninsurance rate might create declines or improvements in various types of quality for Medicare beneficiaries. An increase in uninsurance might result in a reduction in shared quality for Medicare beneficiaries, for instance. On the other hand, more uninsured in an area may allow Medicare beneficiaries to obtain better access to care as the number of privately insured falls. Furthermore, decreases in shared quality due to more uninsured could result in increases in unique quality provided to Medicare patients. Finally, a shift in the insurance distribution may shift the mix of quality investment across different service lines. By investigating the effect of local uninsurance rates on Medicare mortality, this chapter aims to determine the net effect of the above mechanisms on outcomes. Additional analyses will be presented in Chapters 5 which will attempt to uncover some of the underlying mechanisms by which the uninsured influence the delivery of care to Medicare beneficiaries.

Most studies that have addressed the spillover effects of the uninsured have done so using cross-sectional data comparing outcomes of various types in areas with differing

levels of uninsurance (Pagan and Pauly, 2006, 2007). The most common criticism of this strategy is that there are unobserved area characteristics that are correlated with both the insurance rate and the access or quality outcomes being investigated. The exogeneity of the insurance measure is thus a key assumption in this analysis. In the cross-sectional models, however, the uninsurance rate may be correlated with some unobserved characteristics of the market that may also influence Medicare mortality. One possibility is that Medicare beneficiaries in areas with higher uninsurance are more likely to have been uninsured prior to obtaining Medicare and thus suffer some of the health consequences of their prior uninsurance. This would bias results on the effects of the uninsured on outcomes towards finding a negative impact.

This study continues to focus on a cross-sectional approach, but will incorporate some additional analysis using changes in insurance rates over time in order to determine the sensitivity of the results to the analysis approach. The additional analyses will avoid potential confounding from any unobservable time-invariant, market-level characteristics. Similarities and inconsistencies in the results from the two different methods will aid in our understanding of the true relationship between uninsurance and quality of care.

While the supplemental longitudinal approach accounts for some endogeneity concerns, a plausible story of reverse causation can also be told. If outcome-enhancing quality improvements, high utilization of high intensity services, or investment in large fixed cost items in an area are driving up costs and resulting in higher rates of uninsurance, a positive relationship between high uninsurance rates and the various

outcome measures may arise. The primary analysis will maintain the assumption of exogeneity of the insurance measure and possible extensions will be discussed. .

Empirical Approach

In order to explore the relationship between local uninsurance rates and Medicare outcomes, I estimate several discharge-level logistic regression models using individual inpatient mortality from a variety of conditions, as the dependent variable. The primary analysis uses the cross-sectional variation in uninsurance rates across the100 sample MSAs in 2001 to identify the effect on Medicare outcomes. Separately for each of eight conditions and procedures, I estimate the model below.

$$Y_{ijm} = Alpha + B_1 U_m + B_2 P_i + B_3 H_j + B_4 M_m + e_{ijm};$$

Y is a binary variable indicating inpatient mortality from the condition of interest. P_i are a set of discharge-level controls including age, sex, race and indicators for 30 co-morbidities designed to control for patient risk (Elixhauser 1998). Indicators for the patient's Medicare coverage through disability, managed care and dual coverage by Medicaid are also included. H_j are a set of hospital controls which include hospital ownership, size, and teaching and specialty status. Also included are measures of the proportion of Medicare and Medicaid discharges at the hospital-level. M_m are market-level controls which include the local rates of Medicare and Medicaid coverage as well as per capita income and the number of hospitals in the area. The market level controls in this model were chosen based on the most conservative approach to dealing with multicollinearity. Several sensitivity analyses will also be discussed. The variable of interest is the MSA-level uninsurance rate, U_m. Separate models are estimated on MSAs

with over and under 1 million residents and standard errors are clustered at the MSA-level.

Baseline Results

Table 4.1 displays the results of the baseline models described above. The table presents the odds ratios for all of the insurance related variables at both the hospital and market level. The results are presented first for all markets combined, followed by separate estimates for small and large markets. P-values are included and a * represents significance at the 5 percent level. Odds ratios greater than one indicate a positive impact on the probability of death and, in the case of the local uninsurance rate, a negative spillover effect from the uninsured to Medicare beneficiaries.

The results for all markets indicate that the uninsurance rate has a negative effect on the probability of death, or a positive spillover effect, in three of the eight models; craniotomy, stroke and hip fracture. This may indicate increased access for, or an increase in unique quality provided to, Medicare beneficiaries in the presence of more uninsured. A far more consistent result emerges however on the effect of the hospital-level Medicaid discharge percentage. Medicare beneficiaries in hospitals with a higher proportion of Medicaid patients have an increased probability of death. This finding is consistent across seven of the eight conditions examined.

The Medicaid rate at the market-level is also associated with an increased probability of death in three of the models. Interestingly, this relationship exists specifically for two of the same conditions where a positive spillover effect of the uninsurance rate was found. In the third case, the effect of the local Medicaid rate is

marginally significant. The effects of hospital- and market-level Medicare rates show fewer and less consistent relationship with the outcomes of interest.

In the case of small markets, the results are quite different. Negative spillover effects of uninsurance, or a positive association between the local uninsurance rate and the probability of death are found to be significant in two of the eight models, CABG and AMI, and are approaching levels of significance in two others, craniotomy and CHF. In these markets, the effects of hospital-level Medicaid proportions on probability of death remain consistently positive, but are significant in only three cases. Market-level Medicaid shows only one negative spillover effect. Local Medicare rates however show significant positive effects on survival in four of the eight models; AMI, CHF, stroke and hip fracture.

The results for large markets are generally consistent with those for all markets. Positive spillover effects of the uninsurance rate are found for the three conditions noted above. Consistent negative spillover effects of hospital-level Medicaid discharge rates are found in seven of eight models.

The models described above intentionally use the most conservative choice of market-level covariates with regard to multicollinearity concerns. Concerns remain however about how much of the effects attributed to the uninsurance rate are capturing the effects of the local population of poor and minority individuals. Controls for the local race distribution are included in an additional set of analyses to see if it is possible to better isolate the effects of the uninsurance rate. The results are shown in Table 4.2.

Several interesting results arise in the analysis incorporating the race distribution. In small markets, the negative spillovers on CABG and AMI mortality rates are reduced in significance although the result on CABG is still moderately significant. More compelling however is that four additional measures, craniotomy, CHF, stroke and hip fracture, now exhibit a negative spillover effect of uninsurance. This seems to be driven by the fact that the proportion Hispanic in the market actually has some positive effects on survival for Medicare beneficiaries and its high correlation with the uninsurance rate was obscuring these negative effects. This relationship between the proportion Hispanic and Medicare mortality is somewhat less evident in larger markets. Despite this fact, including the race distribution in the large market models also changes the effects of the uninsurance rate to be more negative. In this case however, it merely results in fewer positive spillover effects of the uninsured in these models. When controlling for race, there is only one positive spillover effect from the uninsured as opposed to three in the original models.

Sensitivity Analysis

Measurement error and endogeneity

Additional concerns exist regarding the uninsurance measure with regard to measurement error and endogeneity. Because the uninsurance rate is obtained from the CPS and thus includes sampling error as well as because the survey was not designed to produce local area insurance rates, it is possible that the imprecise measurement of the insurance rate could obscure the identification of any spillover effects. In order to address this issue, the poverty rate in the market, which is measured without error from the Census and is highly correlated with the uninsurance rate, is used as a proxy for the

uninsurance rate in the logistic regression models. The results of these proxy models are show in tables 4.3 and 4.4 which exclude and include the racial distribution from the market covariates, respectively.

The results in the models without the race distribution, shown in Table 4.3, reveal that in small markets the significant negative spillovers are reduced to marginal levels of significance when using poverty as a proxy for uninsurance. In large markets, two of three significant positive spillovers from the baseline models are reduced to very marginal levels of significance and one remains significant. In the models with the race variables included, replacing the uninsurance rate with the poverty rate results in no significant spillovers in small or large markets. These results suggest that there is more information in the uninsurance measure than just a proxy for poverty and that the measurement issue is not severely limiting our ability to detect the effects of the uninsurance rate. While the poverty rate might not be a strong candidate for an instrument for the uninsurance rate, as it is likely to have its own effects on Medicare outcomes, these models may help to address the endogeneity concerns because it is far less likely that a reverse causation argument could be made for the impact of the mortality rate on the poverty rate in the market.

Fixed Effects Models

Due to concerns that areas with higher levels of uninsurance may have unobservable characteristics that could be correlated with Medicare outcomes, this study has also taken a longitudinal approach to investigating spillover effects. While such an approach has been common in much of the literature on the spillover effects of managed care, the previous work on spillovers related to the uninsured have been exclusively

cross-sectional. Thus, this analysis adds to the cross-sectional results already established, but also suggests whether a time series analysis of uninsurance spillovers generates consistent results.

The analysis is virtually the same as the cross-sectional model with the addition of MSA and year specific intercepts. These intercepts control for time-invariant characteristics of the market and general trends in outcomes. The analysis will thus identify the effect of local uninsurance rates on Medicare outcomes using the change in the MSA-level uninsurance rate from 2001 to 2005. All controls are as above.

Table 4.5 displays the results of the fixed-effects models for the eight conditions and procedures. The results show some consistencies with the cross-sectional results along with some discrepancies. In small markets, six of the eight conditions have an odds ratio above one for the local uninsurance rate indicating a negative spillover effect. Only the effect for craniotomy is significant however. The cross-sectional results showed two significant negative spillovers for CABG and AMI, but also showed a marginally significant negative effect for craniotomy. The effect of the hospital-level Medicaid discharge rate has a negative impact on survival for six of eight conditions. This differs from the cross-sectional results somewhat where these effects were diminished somewhat in small markets. Because the fixed effects model is using the variations within-markets, this may explain the discrepancy.

In large markets, positive spillover effects from the uninsured to Medicare beneficiaries are evident on AMI and CHF. These are different conditions than those that showed positive spillovers in the cross-sectional models. The hospital-level Medicaid

discharge rate has a strong and consistent negative effect on survival. In these models, this result indicates the within-market variation in discharge rates, but not a within-hospital change in the rate over time. In these markets, there is also some additional evidence to suggest a positive effect of the hospital-level Medicare discharge rate on Medicare outcomes.

Additional analysis was performed including lagged uninsurance rates in an attempt to determine whether or not there was a delay in the response by hospitals to uninsurance rate changes. These results are available in Table 4.6. The main conclusions remain very similar, but there is limited evidence that changes in uninsurance in earlier periods can have a delayed impact on Medicare outcomes. These changes vary in the direction of impact however. In some cases, increases in uninsurance in the previous period result in improvements in Medicare outcomes in the current period while in other cases the prior period uninsurance rate increase results in a decline in Medicare quality in the present.

Market-Level Models

The main outcomes models were estimated using logistic regressions on indicators of individual discharge-level mortality. These models control for individual, hospital and market characteristics in determining the effects of the local uninsurance rate. There are concerns however with using this approach because the variation of interest is at the market-level while the model is estimated at the discharge level. Standard errors are clustered at the MSA-level in order to control for the correlation in the error term between individuals in the same market, but this may not alleviate the

problem entirely. In order to address this concern, risk-adjusted market-level outcomes are used to perform the analysis at the market-level.

Individual-level logistic regressions were estimated on mortality controlling for individual characteristics and including MSA-specific intercepts. These intercepts are then converted to predicted probabilities of death and used as market-level risk-adjusted mortality rates. The risk-adjusted mortality rates are then regressed on a set of market-level characteristics including the uninsurance measure. These market-level models, like the individual-level models, were run both with and without the local race distribution as controls. These models do not adjust for the characteristics of the hospitals used by the Medicare beneficiaries in the market as the logistic regressions do however. The results of the market-level models are displayed in Tables 4.7 and 4.8.

In the baseline models, small markets had two significant negative spillovers on CABG and AMI. In the market level models, the CABG result is significant at the ten percent level while the AMI result is less significant but still indicates a negative spillover. In large markets, craniotomy, stroke and hip fracture saw positive spillovers in the logistic regressions. In the market-level models, the craniotomy and stroke results also indicate positive spillovers and are significant at least at the ten percent level. Hip fracture shows a very small positive effect without statistical significance.

Including the race distribution in these models has a similar impact on the results to doing so in the logistic regressions. More negative spillovers emerge in small markets which mirrors the logistic regression results. CHF, stroke and hip fracture show negative spillovers in both individual and market-level models while a negative result for

craniotomy disappears but another on CABG emerges in the market level models. A similar pattern emerges for the large markets. A significant positive spillover on stroke becomes only marginally significant in the market level model while two marginal results, craniotomy and pneumonia, from the individual models are significant in the market level models. While there is some loss of significance in the market-level models that could be consistent with underestimates of the standard errors on the market-level variables, the results remain generally consistent with those in the discharge level models.

Discussion

The analysis of the impact of local uninsurance rates on Medicare inpatient mortality reveals both positive and negative spillover effects from the uninsured to Medicare beneficiaries. This is not inconsistent with expectations as the hypothesis regarding the effect of local uninsurance on outcomes was ambiguous. The original results in small markets showed two significant negative spillovers from the uninsured to Medicare beneficiaries. When incorporating the effects of the race distribution into the models, however, the negative spillovers become more pronounced with four conditions exhibiting significant negative effects. In this case, it appears that the proportion Hispanic in the market exhibits a positive impact on survival for Medicare beneficiaries and in turn reveals the more negative impact of the uninsurance rate. Some concerns exist with including the highly correlated race and insurance distributions in the same model at the risk of introducing multicollinearity, but not including the additional variables does not allow us to isolate the impact of the uninsurance rate independent of the proportion minority. The results including the race distribution are thus interpreted

with caution, but also as the best estimate of the unique relationship between the local uninsurance rate and Medicare mortality.

Including the poverty rate in place of the uninsurance rate in an effort to address both measurement error and endogeneity concerns resulted in few significant results particularly in the presence of the race distribution. The differences across market size are also less pronounced when using the poverty rate as a proxy for uninsurance. These results indicate that the poverty rate and the racial distribution in the market are capturing very similar relationships with Medicare mortality. The uninsurance rate, on the other hand, appears to have a unique relationship with Medicare quality, at least somewhat independently of race and income. This relationship also varies very clearly by market size while the effects of poverty and race see less variation on this dimension.

As opposed to the negative spillovers in small markets, positive spillover effects were identified on three conditions in the baseline models in large markets, but again, adding the race variables resulted in more negative impacts of the uninsurance rate itself on Medicare mortality. Only one positive spillover effect remains when controlling for race. Further evidence of the negative spillovers in small markets and positive spillovers in large markets also emerges in models which identify the effects using changes in the local uninsurance rate over time. This introduces further endogeneity controls and while the results are somewhat weaker in both small and large markets, the general trends are consistent with the primary results. The same holds true for models which examine the effects of local uninsurance on risk-adjusted mortality rates at the market level. Again, these results are not as strong as the results on discharge-level mortality, but small

markets generally show more negative spillover effects while large markets are more likely to exhibit positive spillovers. Furthermore, the market-level models do not control for hospital characteristics and the results may indicate that Medicare beneficiaries in areas with more uninsured tend to frequent higher quality hospital types.

Overall, both the primary results and the sensitivity analyses are generally consistent with the expectation that negative spillover effects are more likely to occur in smaller markets. These spillover effects may be caused by reductions in shared quality in response to a lack of demand by uninsured individuals. This would be enhanced by the lower demand inherent in the smaller markets. The presence of positive spillover effects in larger markets may be the result of better access to care for Medicare beneficiaries in the presence of more uninsured or of increases in unique quality used to compensate for declines in shared quality in response to more uninsured. The possible mechanisms behind the results on outcomes will be investigated further in the following chapter.

One additional result of the outcomes models deserves further discussion however. The very consistent negative effect of the hospital-level Medicaid rate on Medicare mortality is quite interesting. It may indicate something unobserved about the income or health status of the Medicare beneficiaries themselves if those that share a hospital with a high proportion of Medicaid patients are lower-income or in poorer health. This seems less likely however due to the fact that the effect is far more consistent in large markets. This may indicate that hospitals in large markets have greater variation in the proportion of Medicaid beneficiaries they see thus indicating that those hospitals 'specializing' in Medicaid beneficiaries are in fact lower quality hospitals.

When Medicare beneficiaries choose such hospitals they suffer the consequences. This finding deserves much greater attention going forward.

Chapter 4 Tables

Table 4.1
The Effects of Local Uninsurance on Condition-specific Inpatient Mortality, 2001
By Market Size

	CABG		Craniotomy		AMI		CHF		Stroke		GI		Hip Fracture		Pneumonia	
	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val
All Markets																
Uninsurance Rate	1.011	0.071	0.982	0.013 *	0.998	0.566	0.994	0.213	0.988	0.001 *	0.993	0.144	0.985	0.003 *	0.997	0.389
Medicaid																
Hosp-level	1.005	0.018 *	1.005	0.133	1.008	0.000 *	1.003	0.001 *	1.007	0.000 *	1.005	0.002 *	1.007	0.000 *	1.005	0.000 *
Market-level	1.015	0.186	1.019	0.037 *	1.006	0.370	1.019	0.073	1.019	0.018 *	1.016	0.080	1.014	0.077	1.025	0.006 *
Medicare																
Hosp-level	0.999	0.579	0.999	0.650	1.002	0.050 *	1.000	0.752	0.997	0.027 *	1.002	0.256	1.000	0.999	1.000	0.679
Market-level	0.994	0.268	0.994	0.308	0.992	0.034 *	0.996	0.484	0.999	0.764	0.999	0.885	0.993	0.139	1.002	0.676
Small Markets																
Uninsurance Rate	1.032	0.003 *	1.019	0.063	1.010	0.032 *	1.011	0.114	1.005	0.362	1.001	0.913	1.013	0.217	1.006	0.421
Medicaid																
Hosp-level	0.999	0.882	1.005	0.334	1.008	0.006 *	1.007	0.028 *	1.005	0.065	1.008	0.047 *	1.000	0.999	1.002	0.538
Market-level	0.997	0.814	1.027	0.037 *	0.996	0.553	0.998	0.798	1.005	0.401	1.002	0.758	1.010	0.253	1.016	0.074
Medicare																
Hosp-level	0.998	0.760	1.004	0.566	0.999	0.592	1.003	0.256	0.998	0.509	1.000	0.970	0.996	0.358	0.998	0.282
Market-level	0.994	0.388	0.991	0.367	0.991	0.033 *	0.985	0.001 *	0.987	0.000 *	0.993	0.259	0.980	0.000 *	0.994	0.231
Large Markets																
Uninsurance Rate	1.010	0.177	0.978	0.015 *	0.997	0.615	0.995	0.434	0.988	0.003 *	0.995	0.413	0.985	0.013 *	0.998	0.735
Medicaid																
Hosp-level	1.007	0.002 *	1.005	0.173	1.008	0.000 *	1.003	0.007 *	1.007	0.000 *	1.005	0.004 *	1.008	0.000 *	1.006	0.000 *
Market-level	1.041	0.005 *	1.017	0.317	1.023	0.077	1.027	0.247	1.017	0.333	1.023	0.215	1.019	0.242	1.028	0.141
Medicare																
Hosp-level	0.998	0.447	0.997	0.323	1.003	0.046 *	0.999	0.422	0.996	0.033 *	1.002	0.280	1.000	0.966	1.000	0.732
Market-level	0.996	0.577	0.996	0.703	0.994	0.303	0.998	0.874	1.004	0.480	1.003	0.732	0.997	0.733	1.007	0.441

Table 4.2
The Effects of Local Uninsurance on Condition-specific Inpatient Mortality, 2001
By Market Size

	CABG		Craniotomy		AMI		CHF		Stroke		GI		Hip Fracture		Pneumonia	
	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val
Small Markets																
Uninsurance Rate	1.030	0.090	1.036	0.024 *	1.008	0.290	1.021	0.032 *	1.015	0.035 *	1.009	0.539	1.028	0.030 *	1.009	0.355
Medicaid																
Hosp-level	1.001	0.831	1.006	0.332	1.008	0.004 *	1.007	0.019 *	1.005	0.057	1.008	0.033 *	0.999	0.911	1.002	0.502
Market-level	0.993	0.616	1.032	0.015 *	0.996	0.514	1.000	0.965	1.005	0.328	1.003	0.590	1.012	0.110	1.017	0.050
Medicare																
Hosp-level	0.997	0.564	1.003	0.727	0.998	0.394	1.002	0.526	0.998	0.493	0.999	0.624	0.995	0.196	0.997	0.170
Market-level	0.999	0.877	0.989	0.281	0.994	0.177	0.987	0.006 *	0.986	0.000 *	0.994	0.360	0.981	0.000 *	0.996	0.342
Race																
Hispanic	0.996	0.490	0.994	0.385	0.999	0.736	0.993	0.029 *	0.996	0.116	0.995	0.186	0.992	0.032 *	0.997	0.390
Black	1.011	0.031 *	0.992	0.130	1.006	0.023 *	1.004	0.239	0.995	0.065	1.003	0.520	1.002	0.621	1.004	0.269
Other	1.013	0.000 *	0.989	0.002 *	1.004	0.013 *	1.003	0.016 *	1.003	0.014 *	1.002	0.311	1.004	0.056	1.006	0.000 *
Large Markets																
Uninsurance Rate	1.007	0.571	0.972	0.085	0.997	0.709	0.994	0.547	0.985	0.020 *	1.005	0.580	0.990	0.279	0.984	0.056
Medicaid																
Hosp-level	1.007	0.002 *	1.005	0.157	1.008	0.000 *	1.002	0.008 *	1.007	0.000 *	1.005	0.004 *	1.008	0.000 *	1.006	0.000 *
Market-level	1.041	0.003 *	1.018	0.245	1.025	0.020 *	1.026	0.247	1.013	0.441	1.023	0.162	1.024	0.103	1.028	0.127
Medicare																
Hosp-level	0.998	0.370	0.996	0.253	1.002	0.090 *	0.999	0.337	0.997	0.037 *	1.001	0.370	1.000	0.853	1.000	0.701
Market-level	0.997	0.648	0.997	0.786	0.996	0.434	1.001	0.914	1.007	0.244	1.005	0.480	0.999	0.892	1.011	0.192
Race																
Hispanic	1.001	0.804	1.002	0.775	0.998	0.560	0.998	0.652	0.998	0.519	0.992	0.070	0.996	0.379	1.004	0.297
Black	1.004	0.303	1.008	0.127	1.007	0.005 *	1.005	0.209	1.002	0.427	1.005	0.129	1.008	0.015 *	1.010	0.002 *
Other	1.002	0.828	1.007	0.405	1.009	0.142	1.010	0.188	1.015	0.002 *	1.012	0.113	1.006	0.318	1.018	0.002 *

Table 4.3
The Effects of Local Poverty on Condition-specific Inpatient Mortality, 2001
By Market Size

	CABG		Craniotomy		AMI		CHF		Stroke		GI Hemorrhage		Hip Fracture		Pneumonia	
	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val
Small Markets																
Percent in Poverty	1.022	0.121	0.991	0.576	1.011	0.072	1.005	0.361	1.002	0.723	0.992	0.281	0.988	0.168	0.997	0.729
Medicaid																
Hosp-level	0.998	0.782	1.005	0.382	1.008	0.003 *	1.007	0.024 *	1.005	0.071	1.009	0.036 *	0.999	0.748	1.002	0.541
Market-level	0.989	0.451	1.021	0.160	0.993	0.317	0.998	0.790	1.004	0.511	1.005	0.502	1.006	0.506	1.016	0.110
Medicare																
Hosp-level	0.998	0.711	1.003	0.674	0.999	0.577	1.003	0.278	0.998	0.482	1.000	0.960	0.996	0.277	0.997	0.254
Market-level	0.994	0.404	0.993	0.462	0.991	0.022 *	0.985	0.001 *	0.987	0.000 *	0.994	0.283	0.982	0.001 *	0.994	0.239
Large Markets																
Percent in Poverty	0.995	0.779	0.975	0.081	1.013	0.258	1.000	0.977	0.977	0.022 *	1.000	0.978	0.981	0.146	1.007	0.569
Medicaid																
Hosp-level	1.007	0.006 *	1.005	0.238	1.008	0.000 *	1.002	0.021 *	1.007	0.000 *	1.005	0.005 *	1.008	0.000 *	1.005	0.000 *
Market-level	1.030	0.110	1.027	0.128	1.017	0.128	1.021	0.316	1.023	0.186	1.020	0.231	1.027	0.064	1.018	0.320
Medicare																
Hosp-level	0.998	0.375	0.998	0.498	1.003	0.053	0.999	0.476	0.997	0.047 *	1.002	0.253	1.000	0.816	1.000	0.780
Market-level	0.991	0.253	1.004	0.703	0.995	0.354	1.000	0.986	1.009	0.165	1.004	0.595	1.002	0.797	1.008	0.387

Table 4.4
The Effects of Local Poverty on Condition-specific Inpatient Mortality, 2001
By Market Size

	CABG		Craniotomy		AMI		CHF		Stroke		GI Hemorrhage		Hip Fracture		Pneumonia	
	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val
Small Markets																
Percent in Poverty	1.021	0.419	0.982	0.479	1.009	0.395	1.015	0.145	1.013	0.176	0.996	0.737	1.003	0.804	0.999	0.907
Medicaid																
Hosp-level	1.001	0.813	1.005	0.383	1.008	0.002 *	1.007	0.016 *	1.005	0.086	1.009	0.028 *	0.998	0.712	1.002	0.464
Market-level	0.989	0.486	1.025	0.056	0.994	0.435	0.998	0.751	1.001	0.832	1.005	0.471	1.004	0.620	1.017	0.080
Medicare																
Hosp-level	0.997	0.528	1.003	0.715	0.998	0.453	1.002	0.377	0.998	0.483	0.999	0.762	0.995	0.169	0.997	0.219
Market-level	1.000	0.959	0.993	0.470	0.994	0.097	0.987	0.008 *	0.986	0.000 *	0.995	0.423	0.984	0.005 *	0.997	0.401
Race																
Hispanic	0.999	0.913	1.002	0.776	1.000	0.916	0.997	0.252	0.997	0.313	0.999	0.640	0.995	0.168	1.000	0.880
Black	1.014	0.005 *	1.000	0.996	1.007	0.006 *	1.006	0.049 *	0.996	0.108	1.005	0.194	1.006	0.160	1.006	0.080
Other	1.014	0.000 *	0.991	0.029 *	1.004	0.008 *	1.004	0.010 *	1.003	0.005 *	1.002	0.342	1.007	0.018 *	1.006	0.000 *
Large Markets																
Percent in poverty	0.969	0.141	0.992	0.780	1.026	0.106	1.019	0.427	1.000	0.995	1.023	0.337	0.997	0.832	1.008	0.701
Medicaid																
Hosp-level	1.007	0.005 *	1.005	0.170	1.008	0.000 *	1.002	0.018 *	1.007	0.000 *	1.005	0.005 *	1.008	0.000 *	1.005	0.000 *
Market-level	1.047	0.015	1.022	0.298	1.013	0.273	1.011	0.642	1.012	0.568	1.011	0.560	1.024	0.125	1.021	0.326
Medicare																
Hosp-level	0.998	0.455	0.996	0.331	1.002	0.093	0.999	0.299	0.997	0.042 *	1.001	0.417	1.000	0.881	1.000	0.763
Market-level	0.999	0.883	0.999	0.949	0.993	0.199	0.999	0.919	1.008	0.208	1.002	0.761	1.000	0.989	1.012	0.206
Race																
Hispanic	1.005	0.169	0.992	0.172	0.994	0.043 *	0.993	0.062	0.992	0.007 *	0.991	0.030 *	0.993	0.036 *	0.996	0.322
Black	1.008	0.041 *	1.004	0.577	1.003	0.194	1.001	0.799	1.000	0.905	1.003	0.390	1.006	0.068	1.006	0.134
Other	1.012	0.086	1.004	0.497	1.007	0.152	1.012	0.079	1.014	0.001 *	1.012	0.067	1.005	0.343	1.017	0.000 *

Table 4.5
The Effects of Local Uninsurance on Condition-specific Inpatient Mortality, 2001 to 2005
By Market Size

	CABG		Craniotomy		AMI		CHF		Stroke		GI Hemorrhage		Hip Fracture		Pneumonia	
	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val
All Markets																
Uninsurance Rate	0.996	0.668	1.003	0.773	0.990	0.031 *	0.990	0.013 *	1.001	0.791	0.993	0.393	1.003	0.678	0.998	0.692
Medicaid																
Hosp-level	1.009	0.000 *	1.011	0.000 *	1.008	0.000 *	1.003	0.000 *	1.006	0.000 *	1.007	0.000 *	1.008	0.000 *	1.005	0.000 *
Market-level	1.001	0.949	0.994	0.739	0.995	0.430	0.991	0.050 *	0.993	0.221	0.996	0.689	1.010	0.388	0.996	0.492
Medicare																
Hosp-level	0.999	0.396	0.996	0.191	1.001	0.573	0.998	0.004 *	0.995	0.000 *	1.001	0.217	0.999	0.402	0.999	0.057
Market-level	0.999	0.930	1.002	0.886	0.996	0.492	0.990	0.027 *	0.993	0.128	0.994	0.521	0.992	0.331	0.993	0.176
Small Markets																
Uninsurance Rate	1.001	0.900	1.074	0.007 *	0.999	0.961	0.987	0.198	1.014	0.203	1.002	0.875	1.009	0.436	1.007	0.419
Medicaid																
Hosp-level	1.007	0.056	1.017	0.007 *	1.009	0.000 *	1.006	0.003 *	1.007	0.000 *	1.007	0.008 *	1.001	0.851	1.004	0.044 *
Market-level	0.994	0.643	1.031	0.177	1.000	0.981	1.007	0.333	0.997	0.674	0.991	0.447	1.004	0.788	1.007	0.451
Medicare																
Hosp-level	1.001	0.831	1.006	0.185	0.999	0.526	0.998	0.095	0.997	0.028 *	1.000	0.902	0.996	0.068	0.999	0.301
Market-level	0.995	0.549	1.037	0.022 *	1.011	0.032 *	0.993	0.264	0.997	0.667	1.008	0.535	0.982	0.044 *	1.001	0.830
Large Markets																
Uninsurance Rate	0.997	0.822	0.986	0.230	0.986	0.009 *	0.990	0.023 *	0.996	0.509	0.992	0.425	1.002	0.796	0.996	0.393
Medicaid																
Hosp-level	1.009	0.000 *	1.011	0.001 *	1.008	0.000 *	1.003	0.000 *	1.006	0.000 *	1.007	0.000 *	1.009	0.000 *	1.005	0.000 *
Market-level	1.009	0.670	0.975	0.161	0.991	0.238	0.975	0.000 *	0.990	0.206	1.004	0.790	1.011	0.505	0.987	0.115
Medicare																
Hosp-level	0.998	0.336	0.994	0.090	1.001	0.440	0.998	0.018 *	0.995	0.000 *	1.002	0.207	0.999	0.709	0.999	0.104
Market-level	1.006	0.749	0.978	0.213	0.981	0.019 *	0.986	0.007 *	0.988	0.063	0.985	0.223	1.002	0.886	0.986	0.067

Table 4.6
The Effects of Local Uninsurance on Condition-specific Inpatient Mortality, 2001 to 2005
By Market Size

	CABG		Craniotomy		AMI		CHF		Stroke		GI Hemorrhage		Hip Fracture		Pneumonia	
	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val
All Markets																
Uninsurance Rate																
2001 to 2005	0.995	0.564	0.993	0.660	0.984	0.002 *	0.985	0.002 *	1.000	0.949	0.985	0.166	1.006	0.538	0.993	0.281
1999 to 2001	0.999	0.901	0.973	0.143	0.988	0.092	0.989	0.090	0.998	0.802	0.980	0.077	1.004	0.742	0.989	0.150
1995 to 1999	0.981	0.045 *	0.983	0.157	0.995	0.447	0.988	0.015 *	0.995	0.365	1.002	0.812	1.006	0.488	0.993	0.341
Medicaid																
Hosp-level	1.009	0.000 *	1.011	0.000 *	1.008	0.000 *	1.003	0.000 *	1.006	0.000 *	1.007	0.000 *	1.008	0.000 *	1.005	0.000 *
Market-level	0.999	0.952	0.990	0.519	0.991	0.177	0.988	0.016 *	0.993	0.230	0.993	0.485	1.011	0.345	0.993	0.332
Medicare																
Hosp-level	0.999	0.382	0.996	0.218	1.001	0.523	0.998	0.005 *	0.995	0.000 *	1.002	0.189	0.999	0.396	0.999	0.064
Market-level	0.994	0.486	1.004	0.771	0.996	0.465	0.989	0.018 *	0.992	0.134	0.998	0.867	0.993	0.466	0.993	0.161
Small Markets																
Uninsurance Rate																
2001 to 2005	1.003	0.832	1.040	0.096	0.990	0.341	0.984	0.138	1.011	0.435	1.003	0.861	1.024	0.135	1.008	0.340
1999 to 2001	0.994	0.632	0.905	0.000 *	0.989	0.309	0.985	0.204	0.989	0.356	1.015	0.453	1.042	0.004 *	0.994	0.668
1995 to 1999	0.989	0.322	0.947	0.002 *	1.001	0.927	0.989	0.236	0.996	0.628	1.022	0.181	1.034	0.004 *	0.996	0.749
Medicaid																
Hosp-level	1.007	0.058	1.018	0.005 *	1.009	0.000 *	1.006	0.003 *	1.007	0.000 *	1.007	0.007 *	1.000	0.905	1.004	0.054
Market-level	0.992	0.516	0.998	0.925	0.996	0.704	1.001	0.892	0.995	0.569	0.999	0.953	1.023	0.132	1.005	0.619
Medicare																
Hosp-level	1.001	0.851	1.006	0.124	0.999	0.564	0.998	0.097	0.997	0.030 *	1.000	0.906	0.996	0.059	0.999	0.292
Market-level	0.994	0.449	1.034	0.011 *	1.010	0.035 *	0.992	0.207	0.997	0.718	1.010	0.418	0.988	0.188	1.001	0.883
Large Markets																
Uninsurance Rate																
2001 to 2005	0.995	0.715	0.982	0.292	0.980	0.000 *	0.984	0.010 *	0.992	0.259	0.975	0.069	0.986	0.169	0.989	0.193
1999 to 2001	1.007	0.733	0.995	0.826	0.990	0.333	0.991	0.289	0.994	0.548	0.961	0.002 *	0.965	0.009 *	0.988	0.176
1995 to 1999	0.972	0.025 *	0.986	0.295	0.991	0.215	0.988	0.050 *	0.989	0.094	0.991	0.450	0.984	0.122	0.993	0.459
Medicaid																
Hosp-level	1.009	0.000 *	1.011	0.001 *	1.008	0.000 *	1.003	0.000 *	1.006	0.000 *	1.007	0.000 *	1.009	0.000 *	1.005	0.000 *
Market-level	1.011	0.587	0.975	0.133	0.989	0.165	0.974	0.000 *	0.990	0.188	0.997	0.829	1.005	0.748	0.986	0.101
Medicare																
Hosp-level	0.998	0.342	0.994	0.091	1.001	0.421	0.998	0.021 *	0.995	0.000 *	1.002	0.164	1.000	0.774	0.999	0.113
Market-level	0.993	0.698	0.975	0.145	0.981	0.014 *	0.984	0.008 *	0.986	0.040	0.993	0.572	1.006	0.643	0.987	0.124

Table 4.7
The Effects of Local Uninsurance on Risk-adjusted Market-level Mortality, 2001
By Market Size

	CABG		Craniotomy		AMI		CHF		Stroke		GI Hemorrhage		Hip Fracture		Pneumonia	
	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val
Small Markets																
Uninsurance Rate	0.0014	0.0660	-0.0006	0.6110	0.0009	0.2480	0.0006	0.1200	0.0009	0.2810	-0.0002	0.3650	0.0001	0.4580	0.0004	0.2300
Medicaid	0.0002	0.8290	0.0024	0.0310 *	0.0010	0.1720	0.0002	0.5170	0.0002	0.8400	0.0002	0.2680	-0.0001	0.6850	0.0009	0.0100 *
Medicare	-0.0003	0.6600	0.0003	0.7810	-0.0004	0.4690	-0.0005	0.1000	-0.0012	0.0960	0.0001	0.5820	-0.0002	0.0530	-0.0002	0.5830
Large Markets																
Uninsurance Rate	0.0008	0.0550	-0.0008	0.0730	0.0003	0.5270	-0.0003	0.2090	-0.0012	0.0390 *	0.0000	0.7620	-0.0001	0.1960	-0.0002	0.6160
Medicaid	0.0026	0.0100 *	0.0013	0.2170	0.0025	0.0100 *	0.0008	0.1650	0.0007	0.6190	0.0006	0.0190 *	0.0003	0.1120	0.0011	0.1490
Medicare	0.0002	0.7380	0.0006	0.4020	-0.0003	0.6140	-0.0002	0.6000	0.0002	0.7860	0.0000	0.8880	-0.0001	0.6000	0.0002	0.7550

Table 4.8
The Effects of Local Uninsurance on Risk-adjusted Market-level Mortality, 2001
By Market Size

	CABG		Craniotomy		AMI		CHF		Stroke		GI Hemorrhage		Hip Fracture		Pneumonia	
	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val
Small Markets																
Uninsurance Rate	0.0025	0.026 *	0.0019	0.279	0.0021	0.070	0.0014	0.017 *	0.0030	0.028 *	-0.0002	0.462	0.0004	0.057	0.0002	0.743
Medicaid	0.0002	0.763	0.0027	0.018	0.0010	0.157	0.0003	0.402	0.0005	0.570	0.0002	0.374	-0.0001	0.673	0.0008	0.021 *
Medicare	-0.0001	0.904	-0.0001	0.911	-0.0005	0.422	-0.0005	0.072	-0.0013	0.078	0.0001	0.530	-0.0003	0.023 *	-0.0001	0.857
Race																
Hispanic	-0.0005	0.116	-0.0010	0.077	-0.0005	0.126	-0.0003	0.052	-0.0008	0.043 *	0.0000	0.899	-0.0001	0.049 *	0.0001	0.701
Black	0.0002	0.615	0.0001	0.902	0.0002	0.543	0.0000	0.929	-0.0008	0.114	0.0001	0.323	0.0001	0.171	0.0002	0.202
Other	0.0008	0.005 *	-0.0003	0.539	0.0003	0.296	0.0001	0.439	0.0003	0.343	0.0001	0.439	0.0000	0.404	0.0003	0.017 *
Large Markets																
Uninsurance Rate	0.0006	0.406	-0.0017	0.043 *	-0.0002	0.762	-0.0006	0.218	-0.0015	0.150	0.0001	0.423	-0.0001	0.536	-0.0011	0.037 *
Medicaid	0.0025	0.015 *	0.0011	0.318	0.0021	0.018 *	0.0007	0.236	0.0004	0.773	0.0006	0.014 *	0.0003	0.091	0.0008	0.276
Medicare	0.0002	0.723	0.0007	0.318	-0.0001	0.860	-0.0001	0.732	0.0004	0.643	0.0000	0.924	-0.0001	0.614	0.0003	0.458
Race																
Hispanic	0.0001	0.785	0.0003	0.351	-0.0001	0.835	0.0000	0.899	-0.0001	0.739	-0.0001	0.247	0.0000	0.602	0.0003	0.183
Black	0.0001	0.628	0.0004	0.138	0.0006	0.021 *	0.0003	0.114	0.0005	0.168	0.0001	0.125	0.0001	0.042 *	0.0006	0.002 *
Other	0.0001	0.877	0.0005	0.341	0.0011	0.016 *	0.0004	0.253	0.0009	0.183	0.0001	0.574	0.0000	0.709	0.0009	0.021 *

Chapter 5: Local Uninsurance and Shared and Unique Quality

In the previous chapter, we considered the effect of local uninsurance rates on outcomes of a variety of conditions and procedures for Medicare beneficiaries. The results showed some evidence of spillover effects, both negative and positive, but the results could not be considered staggering. The conceptual framework described in Chapter 2 suggested that there were a number of mechanisms through which the uninsured could affect the delivery of care to Medicare beneficiaries. A high local uninsurance rate is predicted to reduce the shared quality of care delivered to all payers while increases in the unique quality of care provided to Medicare beneficiaries are expected. This chapter will investigate these individual mechanisms by examining how the uninsurance rate affects shared quality in the form of the availability of hospital services in a market and how it affects unique quality by exploring the utilization of care by Medicare beneficiaries.

Effects on Shared Quality

Because uninsured individuals have lower demand for health care services, it was hypothesized that areas with more uninsured will not have sufficient demand to support certain services and that this may result in a reduction in shared quality for Medicare beneficiaries. Such an effect is likely to be especially significant in smaller markets. Furthermore, the uninsured may not only affect the number of services available, but likely the service mix as well. The potential effect in this case is less clear however. While the uninsured themselves demand lower cost and potentially less profitable services, the reduced demand that they inflict on the hospital may also enhance a

provider's incentives to offer more profitable services in an effort to subsidize losses due to the uninsured. This section will investigate the impact of the local uninsurance rate on the provision of a variety of services at the hospital level.

As in Chapter 4, the primary analysis uses the cross-sectional variation in the uninsurance rate to identify the effects on hospital service availability. A sensitivity analysis using a long-difference approach and thus using the changes in uninsurance over time to identify the effects is also performed. Unlike the previous analysis, most of the analysis in this section is performed at the hospital-level using data from the American Hospital Association (AHA) annual survey. A sensitivity analysis using the provision of services at the market-level is also explored.

Based on work by Horwitz (2005) and Horwitz and Nichols (2009), a set of 15 profitable and 9 unprofitable services are defined. Profitable services include PICU, NICU, catheterization labs, cardiac surgery, a variety of imaging technology as well as women's centers, sports medicine and fitness centers. Unprofitable services include obstetrics, burn units, substance abuse treatment units, emergency departments, trauma centers, AIDS units and a variety of psychiatric services. The full list of services is available in Table 3.7.

Using the AHA data on all community hospitals in the 100 sample MSAs, I estimate the following model to determine the impact of the local uninsurance rate on the provision of hospital services.

$$Y_{jm} = A + B_1 U_m + B_2 H_j + B_3 M_m + e_{ijm};$$

Y is the number of hospital services provided by hospital j, grouped into several categories. All twenty-four services are collapsed into nine categories (0, 1-3, 4-6, 7-9, 10-12,13-15,16-18, 19-21, 22-24). The fifteen profitable services are grouped into six categories and the nine unprofitable services are grouped into four categories in the same manner as described above. The models are then estimated using an ordered logit technique. H_j is a set of hospital characteristics including ownership, bed size, specialty status, and teaching status. The Medicaid and Medicare discharge rates at the hospital level are also included. M_m is a set of market-level characteristics including the Medicare and Medicaid rates, per capita income, the number of hospitals and the population. Standard errors are clustered at the MSA-level to account for correlation between the error terms of hospitals in the same market. Separate models are estimated for all services, profitable services and unprofitable services as well for markets with over and under one million people.

Baseline Results

The results of the ordered logit models are displayed in Table 5.1. The results for all services in all markets indicate a negative relationship between the uninsurance rate and the number of services provided by a hospital in the market. When broken down by market size, large markets also show a negative and significant effect of the uninsurance rate on the number of services provided by a hospital. Small markets however show a negative but insignificant effect of the uninsurance rate on the provision of hospital services. These results vary somewhat when the services are disaggregated into a set of profitable and unprofitable services. No significant effect of the uninsurance rate on the provision of profitable services emerges in small or large markets, but a consistent

negative effect of the uninsurance rate on the number of unprofitable services exists across market sizes. In fact, the magnitude of the effect of the uninsurance rate on the provision of unprofitable services is almost twice as large in small markets as it is in large markets.

In small markets, the hospital-level Medicaid rate is associated with more profitable and unprofitable services. The market-level Medicaid rate is associated with fewer profitable services however. In large markets, the hospital-level Medicaid rate is associated with fewer profitable services and more unprofitable services. The hospital Medicare rate is associated with fewer of both types of services.

Table 5.2 examines the results of the same set of ordered logit models with the addition of the market-level race distribution as covariates. Including the race distribution in these models as a means to better isolate the effects of the uninsurance rate on the provision of hospital services reveals substantially different results. The uninsurance rate no longer exhibits any significant relationship with the provision of hospital services when all services are analyzed together. This result appears to be driven by the significant negative association between the proportion minority in the market and the provision of hospital services. In all markets combined, the proportion other race has a significant negative effect on the provision of services while the proportion black and Hispanic have marginally significant negative effects. In small markets, only the proportion other race is statistically significant while in large markets all three minority race proportions have a negative effect on the provision of services. As was the case in the models without the race distribution, there are no significant effects of the proportion

uninsured on the provision of profitable services in any market size. The inclusion of the race variables does reverse the sign of the coefficients on the uninsurance rate in the models of profitable service provision however. Previously, the effects of uninsurance on profitable services appeared negative but insignificant while in the presence of the race variables the relationship is positive but still insignificant. Again, this appears to be driven by negative effects of the proportion minority on the provision of profitable services. This relationship is more pronounced in large markets than in small.

The association between the uninsurance rate and the provision of unprofitable services remains negative and significant in the presence of the race distribution when examining all market combined. The results are still negative, but no longer significant in small and large markets however. The magnitude of the effect in small markets is still much larger than that in large markets however and far closer to standard levels of statistical significance with a p-value of 0.126.

Sensitivity Analysis

Poverty as a proxy for uninsurance

As in the analysis in Chapter 4, both measurement error and endogeneity concerns related to the uninsurance rate encourage a sensitivity analysis that replaces the uninsurance rate in the models of service provision with the poverty rate in the market. The two measures are highly correlated and collinearity concerns prevent them from being used in the same models. The poverty rate however is measured without error using Census data thus eliminating measurement error. Its ability to alleviate any endogeneity concerns that unobservable market-level characteristics are correlated with both the uninsurance measure and the provision of services may be less convincing than

in the case of the outcomes models however. Nonetheless, this analysis provides further evidence of the impact of low market demand on the provision of services in the market using the poverty rate to identify this low demand.

Table 5.3 displays the results of the analysis using the poverty rate as a proxy for uninsurance. As was the case for uninsurance rates, the poverty rate has a negative impact on the provision of the set of all services. The magnitudes of the effects of poverty rates are considerably larger than those for uninsurance however and the negative effect in small markets is significant for poverty where it was not for uninsurance. This general trend holds true when disaggregating the set of services into profitable and unprofitable services as well. The poverty rate has negative effects on the provision of both profitable and unprofitable services although the effects on both types in small markets are marginally significant at best. Like the results for uninsurance, the negative effects on unprofitable services are stronger. Unlike the results on uninsurance however, the effect of poverty on the provision of unprofitable services is larger in large markets.

Including the race distribution in these models captures some of the negative effects of the poverty rate much as it did in the models using uninsurance. These results are displayed in Table 5.4. The effects of the poverty rate are diminished in the presence of controls for market-level race characteristics. Significant negative effects of the poverty rate remain on the provision of unprofitable services, but again, these effects are strongest in large markets unlike in the models using the uninsurance measure.

Long Difference Models

In an effort to further explore the relationship between the local uninsurance rate and the provision of hospital services, long-difference models were estimated on the set of general hospitals that were present in both 2001 and 2005. The change in the number of services provided by a hospital is estimated by OLS as a function of initial period hospital characteristics and changes in the local insurance rates and hospital discharge rates as well as market-level population and income. These models will identify the response of hospital service provision to the change in the uninsurance rate from 2001 to 2005.

The results are in Table 5.5. The findings are fairly unimpressive and the models themselves are quite weak. The change in the uninsurance rate is not a significant predictor of the change in the number of services provided of any type or in any market size. In fact, the lone coefficient of interest is the hospital-level Medicaid discharge rate. As the proportion of Medicaid discharges in the hospital grows over time, the number of profitable services a hospital offers increases in all markets combined. No significant results remain when the markets are split by size however.

Market-level service provision

The results above are all estimated at the hospital-level and identify the effects of the market-level characteristics on a hospital's provision of services. In the interest of gaining a better understanding of the effect of the local uninsurance rate on the availability of services in the market as a whole, market-level models of the provision of individual services are estimated. A subset of the services used in the hospital-level models is used for this analysis. The chosen set of services includes obstetrics services, emergency departments, psychiatric services, AIDS services, cardiac catheterization

services, cardiac surgery, MRIs and CT scanners. These services were chosen in part because they are a mix of profitable and unprofitable services but also because these services had desirable statistical properties for linear estimation. The sum of the number of hospitals in the market providing a service is obtained and adjusted to reflect the service provision per 10,000 residents. The service provision per capita is then used as the dependent variable in OLS models of market-level service availability controlling for the insurance distribution, per capita income, and the number of hospitals at the market-level. The results of these models are displayed in Table 5.6.

In all markets and in large markets, four of the eight services examined show reduced availability in markets with higher uninsurance rates. These are predominantly services that were categorized as unprofitable, OB, psych and AIDS, but also include CT scans which were categorized as part of the profitable service group. Interestingly, in smaller markets no significant effects of uninsurance on service provision emerge. These models are also run with controls for the local race distribution as covariates and the results are shown in Table 5.7. The findings are quite interesting. In the presence of controls for the race distribution, the effect of the uninsurance rate on market-level service provision is generally positive and is at least marginally significant for six of eight services in small markets (p-values below 0.12). Unlike the models at the hospital-level, these models do not control for the characteristics of the hospitals themselves but only for the market-level characteristics discussed. When adding some controls for the distribution of hospital types in the market (not shown), the positive effects of

uninsurance disappear. This result is driven by a stronger presence of for-profit hospitals in small markets with high levels of uninsurance.

Discussion

The above analyses of the effect of the local uninsurance rate on the provision of hospital services reveal some interesting patterns. Most generally, there is evidence of a negative association between uninsurance at the market-level and the provision of hospital services. This is consistent with the expectation that a higher uninsurance rate and thus lower demand for services would result in reductions in shared quality. The negative effects of uninsurance on the number of services provided by a hospital appear to be driven primarily by a reduction in the number of unprofitable services provided. While no formal hypothesis emerged regarding the effects of uninsurance on the mix of services provided, this result is intuitively appealing. If a hospital is forced to cut back on shared elements of quality in response to more uninsured, the services generating the least excess revenue would seem a logical choice.

Controlling for the distribution of races at the market-level in an effort to isolate the unique effect of uninsurance on hospital service provision, further enhances our understanding of this relationship. The negative relationship between uninsurance and service provision is significantly diminished when controlling for the race distribution. It appears that the percent minority in a market captures much of the negative impact that the uninsurance rate displayed in the original models. The effects are particularly pronounced however on the provision of profitable services. The uninsurance rate alone exhibited negative but insignificant effects on profitable services. In the presence of the race distribution however, the effects are opposite in sign though still insignificant.

These results seem to indicate that the purer effect of the uninsurance rate is positive on profitable services but still negative on unprofitable services. In other words, the uninsurance rate is affecting not just sheer numbers of services but is having an impact on service mix as well.

Substituting poverty for uninsurance in these models also reveals more about these relationships. The effects of poverty on hospital service provision are stronger and in many cases more significant than those of uninsurance. When the race distribution is controlled for in these models however the significance of the negative effects does decline. The positive, though insignificant, effects of uninsurance on profitable services, particularly in small markets are not nearly as pronounced in models using poverty as a proxy. As was the case in the outcomes models in the previous chapter, the results indicate that the uninsurance rate is capturing a relationship with hospital services that is not perfectly correlated with the effects of race and poverty. In this case, it appears that the uninsurance rate has a stronger effect on the mix of profitable versus unprofitable services than the other market level characteristics. This result is further confirmed in the market-level models which find marginally significant positive effects of the uninsurance rate on the provision of several individual services.

Long-difference models do not show any effects of a change in the uninsurance rate on the change in the number of services provided at the hospital-level. This may be due to the fact that this is a relatively short timeframe over which changes in the distribution of services would be unlikely. Altogether, these results suggest that the uninsurance rate does have an effect on shared quality that is not limited to a negative

impact on the total number of services provided. Instead, the uninsurance rate appears to influence the mix of services provided with consistent negative effects on unprofitable services and some evidence of positive effects on profitable services.

Effects on Unique Quality

This chapter explores the mechanisms driving any potential spillover effects of uninsurance. The previous section examined the relationship between local uninsurance rates and hospital service availability in an effort to determine the effect of uninsurance on the shared quality available in a market. This section will address the question of how local uninsurance rates affect the unique quality delivered to Medicare beneficiaries by analyzing their utilization patterns.

Chapter 2 suggested at least two ways in which local uninsurance rates could affect Medicare utilization. When uninsurance rises and private coverage falls, a provider may respond by effectively lowering the price at which they will accept Medicare patients or shifting some of their capacity towards Medicare. This could result in increased Medicare utilization. Furthermore, if a high uninsurance rate decreases the level of shared quality available, a provider may compensate Medicare beneficiaries for the loss of shared quality by increasing their unique quality. This is likely to include additional utilization of variable cost elements of quality. Exploring the effects of the uninsurance rate on Medicare utilization may also aid in understanding one of the mechanisms behind the results on outcomes. Furthermore, the analysis of Medicare utilization will tie this analysis to the work on geographic variations in care. Much research has discussed the geographic variations in utilization by Medicare beneficiaries,

but no studies have considered whether the local insurance distribution contributes to these variations.

The utilization measures used to test the hypothesis on unique quality are limited in that they must be obtained from the Medicare discharge data. Three utilization measures are included among the AHRQ Quality Indicators as indicators of potential overuse of services. These are laparoscopic cholecystectomy (LC), incidental appendectomy and bilateral catheterization. The other measures used in this analysis are obtained from the discharge data and include ICU use and several indicators for the use of diagnostic technology. These elements were chosen because they are often discussed in the work on geographic variations as elements of care that are overused and driven by supply with no associated improvement in outcomes. This section explores whether any of the variation in use may be explained by the insurance distribution. Market-level measures of hospital admissions and the proportion of those admissions from Medicare and Medicaid are also considered as measures of market-level utilization.

The primary analysis in this section will explore the relationship between local uninsurance rates and individual-level measures of Medicare utilization. I estimate several discharge-level logistic regression models using individual inpatient utilization as the dependent variable. This analysis uses the variation in uninsurance rates across our 100 sample MSAs in 2001 to identify the effect on Medicare utilization. Separately for each of seven utilization measures, I estimate the model below;

$$Y_{ijm} = Alpha + Beta_1 U_m + B_2 P_i + B_3 H_j + B_4 M_m + e_{ijm};$$

Y is a binary variable indicating inpatient utilization of a particular service. P_i are a set of discharge-level controls including age, sex, race and indicators for 30 co-morbidities designed to control for patient risk (Elixhauser 1998). Indicators for the patient's Medicare coverage through disability, managed care and dual coverage by Medicaid are also included. H_j are a set of hospital controls which include hospital ownership, size, and teaching and specialty status. Also included are measures of the proportion of Medicare and Medicaid discharges at the hospital-level. M_m are market-level controls which include the local rates of Medicare and Medicaid coverage as well as per capita income and the number of hospitals in the area. The variable of interest is the MSA-level uninsurance rate, U_m. Separate models are estimated on MSAs with over and under 1 million residents and standard errors are clustered at the MSA-level.

Baseline Results

Table 5.8 displays the results of the discharge-level utilization models for Medicare beneficiaries. These models, as described above, test the relationship between a high uninsurance rate and the probability of using a variety of services. In the models where all markets are pooled together, the local uninsurance rate has a positive relationship with utilization for three of the seven services modeled; LC, ICU and other imaging. These results are relatively consistent across market size although the significance level is lost for LC in small markets.

The hospital-level Medicaid percentage has a negative impact on use in two of seven models with the results pooled across market size and in three of seven models in large markets. The results are significant for LC and CT scan and for other imaging only in large markets. In small markets however, no significant results emerge with the

exception of one marginally significant positive result on diagnostic radiology. Market-level Medicaid had no impact on utilization measures.

As in the analysis of inpatient outcomes and hospital service provision, the race distribution is added to these models as a covariate in an attempt to further isolate the impact of the uninsurance rate on utilization by Medicare beneficiaries. The results of these models are shown in Table 5.9. Adding the race distribution diminishes the positive effects of uninsurance on utilization. In small markets, only two measures exhibit marginally significant positive effects after controlling for race while in large markets no significant positive effects of uninsurance remain. One marginally significant negative effect of uninsurance on use emerges in large markets on the appendectomy measure.

Sensitivity Analysis

Poverty as proxy for uninsurance

In order to address issues of measurement error and endogeneity as well as to be consistent with the previous analyses, the poverty rate is again used as a proxy for the uninsurance rate in an additional set of analyses. The models that do not control for the distribution of race show somewhat stronger evidence of a positive effect of the poverty rate on Medicare utilization than was the case when using the uninsurance rate. These results are more consistent in large markets and are shown in Table 5.10. Including the race distribution leads to fewer positive and significant effects of the poverty rate on Medicare utilization and also identifies several negative and significant impacts of poverty on use in smaller markets. These results are displayed in Table 5.11.

Fixed effects models

To deal with the possible endogeneity of the insurance measure as well as to better understand the relationship between local uninsurance rates and utilization, the change in the uninsurance rate over time is also used to identify the effects on utilization in a set of fixed effects models. The model is virtually the same as the cross-sectional model with the addition of MSA and year specific intercepts. These intercepts control for time-invariant characteristics of the market and general trends in utilization. The analysis thus identifies the effect of local uninsurance rates on Medicare utilization using the change in the MSA-level uninsurance rate from 2001 to 2005. All controls are as above.

The results of the MSA fixed effects models are shown in Table 5.12 They are much less consistent across market size as well as within individual measures than the cross-sectional results. For all markets together, the effect of the local uninsurance rate on utilization is negative for the two models on ICU use and incidental appendectomy. In smaller markets, one positive effect of uninsurance on use emerges for bilateral catheterization, while in large markets, the effects are negative for incidental appendectomy and diagnostic radiology.

Hospital-level Medicaid discharge percentages also show a negative relationship with Medicare utilization on three of the seven measures; LC, CT scan and other imaging. None of the measures show a significant relationship with hospital Medicaid rates in smaller markets. In larger markets, the three measures noted above along with diagnostic radiology all show a negative association. Market-level Medicaid rates show two negative effects in all markets with only one being significant in small markets and none in large markets.

Market-level utilization

The above analyses primarily test the hypothesis that the unique quality delivered to Medicare beneficiaries is higher in the presence of more uninsured. By examining market-level admissions and the distribution of those admissions by payer type, this sensitivity analysis will also examine the hypothesis that more uninsured in a market increases access for Medicare beneficiaries or shifts capacity toward these beneficiaries. The first element of the analysis seeks to determine whether a larger proportion of uninsured individuals in the market affects the total number of hospital admissions in the market. We know that uninsured individuals use less care than their insured counterparts so we might expect the total number of admissions controlling for population size to be lower in markets with more uninsured. In order to examine this question, I estimate the model below of the total number of admissions in the MSA as a function of the insurance distribution in the area, the per capita income, the population and the racial distribution.

$$Admit_m = U_m + Care_m + Caid_m + Pop_m + Race_m + Inc_m + e_m;$$

The dependent variable is the logged number of admissions in the market. The model is estimated by OLS and the variables of interest are the proportions of uninsured, U_m, Medicaid, $Caid_m$, and Medicare, $Care_m$, in the market. This is obviously a simple model and importantly leaves out any measures of the health status of the population. Nonetheless, it is considered an interesting exploration of the issue of how uninsurance might affect market-level utilization. Similar models are estimated using the proportion of admissions from Medicare and Medicaid as the dependent variable.

The results of the market-level analysis on total usage are presented in Table 5.13. They suggest that total utilization is largely determined by population in the market. The Medicare rate in the market does have a positive impact on use likely owing to the age of the population and its health status which is not otherwise controlled for in this model. The uninsurance rate does not have a significant impact on the total number of admissions in the market. This might suggest that a lower level of utilization for the uninsured is compensated for by higher levels of use for other payers leaving total use unchanged. The second and third columns of Table 5.13 display the results of the local uninsurance rate on the proportion of admissions in the market from Medicare and Medicaid, respectively. Neither shows a significant increase in response to a higher uninsurance rate. In fact, the impact of the local uninsurance rate on the proportion of admissions from Medicare is negative with a p-value of 0.129, not unreasonably far from standard definitions of statistical significance. An increase in the proportion of admissions from the privately insured in response to more uninsured is thus a possibility.

The market-level Medicaid rate also has no impact on the total number of admissions in the market. Interestingly enough, it does have an impact on both the proportion of admissions from Medicaid, as would be expected, but also on the proportion of admissions from Medicare. This is similar to the result we might have expected for the uninsured. An increase in the proportion of Medicaid in the market seems to have a spillover effect on utilization by Medicare beneficiaries. These results do not exhibit particularly meaningful differences across market size however.

Discussion

The analysis of the impact of the local uninsurance rate on utilization by Medicare beneficiaries reveals some consistencies with expectations as well as a few discrepancies. An increase in use in response to more uninsured was predicted if shared quality in the market declines in response to the uninsured or if providers increase access for Medicare beneficiaries in the presence of fewer private payers. The results on market-level admissions show no evidence that access is enhanced for Medicare beneficiaries in response to more uninsured. The most general result on individual utilization shows that in the cross-section Medicare beneficiaries in areas with more uninsured use more services, but the significance of this result in diminished when controlling for the race distribution.

The sensitivity analysis using poverty as a proxy for uninsurance showed stronger positive effects of poverty on utilization in the absence of the race distribution, but weaker evidence of these effects when race is included in the model, compared to the models using the uninsurance rate. In fact, the poverty rate exhibits a significant negative impact on utilization of three services by Medicare beneficiaries in the presence of controls for race. Given the lack of negative effects of the uninsurance rate, it does appear that uninsurance is capturing a more positive relationship with utilization than would be indicated by poverty and race alone. This is more evident in small markets than in large. Furthermore, the fixed effects models also indicate more positive effects of the local uninsurance rate on utilization in small markets and more negative impacts in large markets. Therefore, the analysis, as a whole, exhibits weak support for the hypothesis

that the local uninsurance rate is associated with higher utilization by Medicare beneficiaries.

Conclusions

This chapter explored the relationship between local uninsurance rates and the provision of hospital services as well as the utilization of specific services by Medicare beneficiaries. The prediction that higher uninsurance rates will result in lower shared quality, as measured by the availability of hospital services, is generally supported by this analysis. The local uninsurance rate has a negative association with the provision of hospital services and this relationship is driven primarily by a reduction in the provision of unprofitable services in response to more uninsured. While the evidence of an effect of the uninsured on service provision is weaker after controlling for the distribution of race in the market, negative effects on the provision of unprofitable services remain significant.

In addition to the effect on the number of unprofitable services provided, the results also provide weaker evidence that the uninsurance rate has a positive effect on the number of profitable services provided by a hospital. This indicates that hospitals in markets with more uninsured may respond to financial pressure not only by reducing service provision but by shifting the mix of services provided to a more profitable set. The net effect on the shared quality in the market is therefore ambiguous especially given that the services analyzed here are merely a subset of the many services that hospitals must choose to provide or not provide to their patients.

In the presence of reductions in the shared quality of care provided, increases in the unique quality provided to Medicare beneficiaries were predicted. The analysis in this chapter shows some evidence that those Medicare beneficiaries in markets with more uninsured use more services including ICU days and other imaging technology. Again, these results are weaker when the effects of the race distribution in the market are also controlled for in the analysis. The results are relatively consistent with the results on shared quality however in that small markets show stronger evidence of a decline in the provision of unprofitable services and in turn also show stronger evidence of the possibly compensating increases in service use by Medicare beneficiaries. Large markets exhibit less significant effects on both the hospital provision of unprofitable services and on the individual utilization of specific services. The result that indicates an increase in the provision of profitable services in the presence of more uninsured may also have an effect on the individual utilization of specific services. This result is at least plausibly consistent with the evidence for increased utilization in the presence of more uninsured.

This chapter provides suggestive evidence that supports the proposed mechanisms by which the uninsured can affect the quality of care delivered to Medicare beneficiaries. A higher uninsurance rate is associated with some reductions in the provision of shared quality as well as some increases in the provision of unique quality to Medicare beneficiaries. The following chapter will summarize and discuss these results in conjunction with the findings on the impact of uninsurance on the outcomes of care for Medicare beneficiaries.

Chapter 5 Tables

Table 5.1
The Effect of Local Uninsurance on Hospital Service Availability
By Market Size

	All Services			Profitable Services			Unprofitable Services		
	Coef.	P-val		Coef.	P-val		Coef.	P-val	
All Markets									
Uninsurance rate	-0.046	0.000	*	-0.021	0.123		-0.061	0.000	*
Medicaid									
Hospital-level	0.012	0.122		-0.008	0.212		0.034	0.000	*
Market-level	-0.017	0.445		-0.032	0.000	*	-0.044	0.110	
Medicare									
Hospital-level	-0.030	0.000	*	-0.015	0.519		-0.015	0.009	*
Market-level	0.002	0.933		0.010	0.672		0.022	0.378	
Small Markets									
Uninsurance rate	-0.035	0.247		-0.002	0.962		-0.096	0.005	*
Medicaid									
Hospital-level	0.061	0.000	*	0.050	0.006	*	0.061	0.007	*
Market-level	-0.057	0.034	*	-0.060	0.022	*	-0.072	0.118	
Medicare									
Hospital-level	-0.010	0.334		-0.016	0.122		-0.001	0.964	
Market-level	-0.047	0.045	*	-0.037	0.177		-0.022	0.384	
Large Markets									
Uninsurance rate	-0.045	0.001	*	-0.018	0.246		-0.055	0.006	*
Medicaid									
Hospital-level	0.008	0.321		-0.014	0.023	*	0.034	0.000	*
Market-level	-0.038	0.404		-0.010	0.802		-0.058	0.180	
Medicare									
Hospital-level	-0.033	0.000	*	-0.035	0.000	*	-0.017	0.014	*
Market-level	0.019	0.566		0.024	0.487		0.044	0.159	

Table 5.2
The Effect of Local Uninsurance on Hospital Service Availability
By Market Size

	All Services			Profitable Services			Unprofitable Services		
	Coef.	P-val		Coef.	P-val		Coef.	P-val	
All Markets									
Uninsurance rate	-0.012	0.542		0.013	0.585		-0.058	0.011	*
Medicaid									
Hospital-level	0.012	0.117		-0.008	0.210		0.034	0.000	*
Market-level	-0.006	0.762		-0.005	0.816		-0.041	0.111	
Medicare									
Hospital-level	-0.031	0.000	*	-0.033	0.000	*	-0.016	0.008	*
Market-level	-0.004	0.856		0.007	0.757		0.016	0.529	
Race									
Hispanic	-0.013	0.114		-0.015	0.101		0.004	0.674	
Black	-0.013	0.082		-0.010	0.229		-0.006	0.484	
Other	-0.028	0.000	*	-0.011	0.029	*	-0.031	0.010	*
Small Markets									
Uninsurance rate	0.002	0.967		0.037	0.577		-0.098	0.126	
Medicaid									
Hospital-level	0.060	0.001	*	0.050	0.007	*	0.061	0.009	*
Market-level	-0.047	0.051		-0.053	0.053		-0.066	0.129	
Medicare									
Hospital-level	-0.012	0.276		-0.017	0.121		-0.002	0.895	
Market-level	-0.059	0.014	*	-0.043	0.144		-0.029	0.272	
Race									
Hispanic	-0.012	0.375		-0.015	0.361		0.003	0.869	
Black	-0.006	0.665		0.005	0.811		-0.005	0.734	
Other	-0.025	0.000	*	-0.009	0.145		-0.025	0.000	
Large Markets									
Uninsurance rate	0.025	0.260		0.038	0.202		-0.024	0.401	
Medicaid									
Hospital-level	0.009	0.274		-0.014	0.026	*	0.035	0.000	*
Market-level	-0.033	0.374		-0.015	0.692		-0.043	0.317	
Medicare									
Hospital-level	-0.034	0.000	*	-0.035	0.000	*	-0.018	0.011	*
Market-level	0.012	0.678		0.024	0.448		0.030	0.315	
Race									
Hispanic	-0.026	0.005	*	-0.026	0.022	*	0.000	0.984	
Black	-0.029	0.000	*	-0.023	0.010	*	-0.017	0.121	
Other	-0.048	0.001	*	-0.014	0.425		-0.069	0.002	*

Table 5.3
The Effect of Local Poverty on Hospital Service Availability
By Market Size

	All Services			Profitable Services			Unprofitable Services		
	Coef.	P-val		Coef.	P-val		Coef.	P-val	
All Markets									
Percent poverty	-0.091	0.001	*	-0.045	0.083		-0.117	0.000	*
Medicaid									
Hospital-level	0.012	0.116		-0.008	0.205		0.034	0.000	*
Market-level	0.016	0.481		0.000	0.997		-0.003	0.890	
Medicare									
Hospital-level	-0.030	0.000	*	-0.032	0.000	*	-0.015	0.011	*
Market-level	0.020	0.384		0.018	0.428		0.044	0.088	
Small Markets									
Percent poverty	-0.050	0.039	*	-0.041	0.129		-0.062	0.094	
Medicaid									
Hospital-level	0.062	0.000	*	0.051	0.006	*	0.059	0.009	*
Market-level	-0.046	0.108		-0.052	0.092		-0.058	0.242	
Medicare									
Hospital-level	-0.010	0.355		-0.016	0.146		-0.001	0.922	
Market-level	-0.043	0.067		-0.037	0.170		-0.016	0.611	
Large Markets									
Percent poverty	-0.152	0.000	*	-0.074	0.048	*	-0.172	0.000	*
Medicaid									
Hospital-level	0.007	0.325		-0.014	0.020	*	0.033	0.000	*
Market-level	0.013	0.718		0.012	0.759		-0.004	0.910	
Medicare									
Hospital-level	-0.033	0.000	*	-0.035	0.000	*	-0.017	0.016	*
Market-level	0.041	0.141		0.033	0.290		0.070	0.016	

Table 5.4
The Effect of Local Poverty on Hospital Service Availability
By Market Size

	All Services			Profitable Services			Unprofitable Services		
	Coef.	P-val		Coef.	P-val		Coef.	P-val	
All Markets									
Percent poverty	-0.028	0.489		0.016	0.716		-0.092	0.054	
Medicaid									
Hospital-level	0.012	0.126		-0.009	0.186		0.034	0.000	*
Market-level	-0.004	0.875		-0.019	0.501		-0.011	0.688	
Medicare									
Hospital-level	-0.031	0.000	*	-0.033	0.000	*	-0.015	0.008	*
Market-level	-0.002	0.951		0.003	0.921		0.030	0.272	
Race									
Hispanic	-0.016	0.049	*	-0.015	0.109		-0.006	0.476	
Black	-0.013	0.111		-0.011	0.241		-0.007	0.471	
Other	-0.025	0.000	*	-0.009	0.061		-0.028	0.001	*
Small Markets									
Percent poverty	-0.022	0.690		-0.041	0.580		0.004	0.943	
Medicaid									
Hospital-level	0.060	0.001	*	0.051	0.008	*	0.059	0.010	*
Market-level	-0.045	0.131		-0.048	0.182		-0.066	0.182	
Medicare									
Hospital-level	-0.011	0.295		-0.016	0.129		-0.001	0.900	
Market-level	-0.058	0.015	*	-0.037	0.232		-0.037	0.185	
Race									
Hispanic	-0.010	0.434		-0.001	0.945		-0.023	0.092	
Black	-0.003	0.833		0.016	0.435		-0.020	0.078	
Other	-0.024	0.000	*	-0.007	0.189		-0.026	0.000	*
Large Markets									
Percent poverty	-0.079	0.168		0.013	0.839		-0.178	0.005	*
Medicaid									
Hospital-level	0.008	0.313		-0.014	0.021	*	0.034	0.000	*
Market-level	-0.021	0.591		-0.030	0.489		0.000	0.998	
Medicare									
Hospital-level	-0.034	0.000	*	-0.035	0.000	*	-0.018	0.013	*
Market-level	0.020	0.531		0.018	0.600		0.057	0.069	
Race									
Hispanic	-0.014	0.169		-0.018	0.122		0.003	0.789	
Black	-0.016	0.071		-0.018	0.077		-0.002	0.850	
Other	-0.025	0.076		-0.002	0.895		-0.039	0.007	*

Table 5.5
The Effect of Local Uninsurance on Hospital Service Availability
Long difference, 2001 to 2005

	All Services		Profitable Services			Unprofitable Services	
	Coef.	P-val	Coef.	P-val		Coef.	P-val
All Markets							
Uninsurance rate	0.016	0.689	-0.007	0.824		0.024	0.118
Medicaid							
Hospital-level	3.279	0.107	2.843	0.028	*	0.436	0.614
Market-level	-0.001	0.089	-0.001	0.135		0.000	0.206
Medicare							
Hospital-level	-0.386	0.508	-0.265	0.503		-0.121	0.667
Market-level	0.000	0.963	0.000	0.636		0.000	0.341
Small Markets							
Uninsurance rate	0.065	0.455	0.017	0.790		0.048	0.161
Medicaid							
Hospital-level	6.363	0.364	5.157	0.191		1.206	0.710
Market-level	0.000	0.979	0.000	0.920		0.000	0.875
Medicare							
Hospital-level	-0.050	0.951	0.124	0.813		-0.173	0.595
Market-level	0.001	0.250	0.000	0.451		0.000	0.060
Large Markets							
Uninsurance rate	0.003	0.949	-0.012	0.750		0.015	0.393
Medicaid							
Hospital-level	2.482	0.234	2.138	0.126		0.344	0.682
Market-level	-0.001	0.177	0.000	0.400		0.000	0.169
Medicare							
Hospital-level	-1.063	0.400	-0.942	0.299		-0.121	0.830
Market-level	-0.001	0.089	-0.001	0.083		0.000	0.773

Table 5.6
The Effects of Local Uninsurance on Hospital Services Per Capita, 2001
By Market Size

	Obstetrics Services			Emergency Department			Psychiatric Services			AIDS Services			Catheterization Services			Cardiac Surgery Services			MRI			CT Scan		
	Coef.	P-val		Coef.	P-val		Coef.	P-val		Coef.	P-val		Coef.	P-val		Coef.	P-val		Coef.	P-val		Coef.	P-val	
All Markets																								
Uninsurance Rate	-0.0017	0.031	*	-0.0016	0.093		-0.0018	0.001	*	-0.0017	0.008	*	0.0001	0.924		0.0005	0.393		-0.0008	0.250		-0.0019	0.032	*
Medicaid	-0.0013	0.195		-0.0023	0.077		0.0002	0.744		-0.0003	0.702		-0.0023	0.017	*	-0.0012	0.161		-0.0015	0.106		-0.0019	0.104	
Medicare	-0.0006	0.490		0.0004	0.688		0.0011	0.083		0.0004	0.597		0.0000	0.958		-0.0005	0.489		-0.0007	0.398		-0.0001	0.914	
Small Markets																								
Uninsurance Rate	-0.0015	0.364		-0.0004	0.851		-0.0018	0.084		-0.0007	0.588		0.0013	0.371		0.0015	0.228		-0.0001	0.972		-0.0012	0.484	
Medicaid	-0.0023	0.169		-0.0032	0.097		-0.0003	0.736		-0.0003	0.799		-0.0031	0.038	*	-0.0018	0.129		-0.0023	0.118		-0.0027	0.112	
Medicare	-0.0003	0.821		0.0002	0.903		0.0008	0.378		-0.0004	0.696		-0.0002	0.896		-0.0009	0.365		-0.0010	0.414		-0.0002	0.877	
Large Markets																								
Uninsurance Rate	-0.0016	0.014	*	-0.0018	0.057		-0.0013	0.052		-0.0017	0.001	*	-0.0004	0.546		0.0008	0.205		-0.0009	0.241		-0.0017	0.063	
Medicaid	0.0003	0.830		0.0002	0.937		0.0013	0.370		-0.0004	0.717		0.0000	0.984		0.0007	0.613		0.0013	0.437		0.0019	0.354	
Medicare	-0.0019	0.050	*	-0.0006	0.668		0.0013	0.180		0.0013	0.062		-0.0008	0.467		-0.0006	0.554		-0.0007	0.501		-0.0011	0.398	

Table 5.7
The Effects of Local Uninsurance on Hospital Services Per Capita, 2001
By Market Size

	Obstetrics Services		Emergency Department		Psychiatric Services		AIDS Services		Catheterization Services		Cardiac Surgery Services		MRI		CT Scan	
	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val	Coef.	P-val
All Markets																
Uninsurance Rate	0.0013	0.274	0.0018	0.238	-0.0001	0.931	-0.0011	0.264	0.0021	0.065	0.0021	0.035 *	0.0013	0.260	0.0011	0.416
Medicaid	-0.0004	0.661	-0.0013	0.305	0.0008	0.254	0.0000	0.979	-0.0017	0.078	-0.0007	0.380	-0.0009	0.352	-0.0010	0.387
Medicare	-0.0010	0.239	0.0001	0.951	0.0008	0.152	0.0002	0.814	-0.0002	0.791	-0.0006	0.406	-0.0009	0.250	-0.0004	0.638
Race																
Hispanic	-0.0012	0.003 *	-0.0014	0.007 *	-0.0007	0.012 *	-0.0002	0.541	-0.0009	0.020 *	-0.0007	0.038 *	-0.0009	0.021 *	-0.0012	0.008 *
Black	-0.0007	0.113	-0.0008	0.113	0.0000	0.927	0.0003	0.405	0.0000	0.933	-0.0003	0.417	-0.0002	0.663	-0.0005	0.271
Other	-0.0008	0.047 *	-0.0007	0.215	-0.0005	0.118	-0.0007	0.040 *	-0.0001	0.722	0.0000	0.954	-0.0004	0.307	-0.0006	0.177
Small Markets																
Uninsurance Rate	0.0039	0.108	0.0063	0.032 *	0.0006	0.683	0.0006	0.772	0.0044	0.054	0.0032	0.106	0.0036	0.116	0.0046	0.072
Medicaid	-0.0015	0.332	-0.0021	0.245	-0.0002	0.867	-0.0002	0.877	-0.0028	0.056	-0.0017	0.182	-0.0017	0.234	-0.0017	0.286
Medicare	-0.0010	0.420	-0.0006	0.709	0.0004	0.627	-0.0009	0.440	-0.0005	0.700	-0.0011	0.305	-0.0014	0.238	-0.0009	0.491
Race																
Hispanic	-0.0021	0.006 *	-0.0025	0.005 *	-0.0010	0.037 *	-0.0005	0.447	-0.0013	0.070	-0.0007	0.243	-0.0014	0.045 *	-0.0022	0.006 *
Black	-0.0008	0.365	-0.0018	0.080	0.0005	0.386	0.0005	0.512	0.0002	0.848	0.0000	0.982	-0.0007	0.371	-0.0017	0.058
Other	-0.0008	0.167	-0.0008	0.264	-0.0004	0.299	-0.0008	0.109	0.0000	0.984	0.0000	0.969	-0.0004	0.421	-0.0008	0.174
Large Markets																
Uninsurance Rate	-0.0004	0.712	-0.0004	0.794	0.0003	0.743	-0.0015	0.066	0.0013	0.310	0.0016	0.171	0.0005	0.670	-0.0001	0.938
Medicaid	0.0009	0.506	0.0009	0.658	0.0021	0.148	0.0001	0.956	0.0007	0.684	0.0009	0.531	0.0019	0.240	0.0027	0.162
Medicare	-0.0022	0.022 *	-0.0009	0.495	0.0010	0.300	0.0011	0.101	-0.0011	0.316	-0.0006	0.509	-0.0010	0.348	-0.0015	0.239
Race																
Hispanic	-0.0003	0.498	-0.0003	0.621	-0.0005	0.272	0.0002	0.525	-0.0006	0.225	-0.0003	0.471	-0.0005	0.343	-0.0004	0.517
Black	-0.0001	0.710	0.0000	0.941	-0.0002	0.665	0.0002	0.601	-0.0001	0.782	0.0000	0.924	0.0002	0.637	0.0002	0.732
Other	-0.0015	0.043 *	-0.0019	0.101	-0.0017	0.023 *	-0.0013	0.028	-0.0014	0.121	-0.0003	0.660	-0.0013	0.134	-0.0020	0.051

Table 5.8
The Effects of Local Uninsurance on Service Utilization by Medicare beneficiaries
By Market Size, 2001

	Laparoscopic Cholesystectomy		Incidental Appendectomy		Bi-lateral Catheterization		ICU		Diagnostic Radiology		CT Scan		Other Imaging	
	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val
All Markets														
Uninsurance Rate	1.022	0.001 *	0.996	0.631	1.000	0.979	1.032	0.000 *	1.008	0.148	0.999	0.859	1.011	0.008 *
Medicaid														
Hosp-level	0.993	0.004 *	0.997	0.382	1.004	0.307	1.001	0.726	0.995	0.132	0.997	0.028 *	0.998	0.073
Market-level	0.978	0.057	0.999	0.914	0.989	0.677	0.982	0.191	0.996	0.583	0.998	0.687	0.998	0.696
Medicare														
Hosp-level	1.003	0.223	0.999	0.681	0.989	0.091	0.997	0.248	1.001	0.373	0.998	0.008 *	0.999	0.527
Market-level	1.004	0.580	1.006	0.548	1.036	0.000 *	0.983	0.072	1.007	0.136	1.006	0.142	1.001	0.710
Small Markets														
Uninsurance Rate	1.027	0.174	0.991	0.537	0.996	0.868	1.044	0.005 *	1.000	0.981	0.997	0.593	1.025	0.002 *
Medicaid														
Hosp-level	1.003	0.642	0.989	0.199	0.984	0.144	1.008	0.379	1.007	0.055	1.003	0.212	1.000	0.947
Market-level	0.978	0.151	0.993	0.573	0.981	0.642	0.988	0.402	0.994	0.501	1.005	0.391	0.991	0.200
Medicare														
Hosp-level	1.013	0.007 *	1.003	0.740	0.958	0.000 *	1.009	0.223	1.004	0.155	1.001	0.422	0.997	0.128
Market-level	0.999	0.929	1.017	0.043 *	1.025	0.076	0.978	0.087	1.012	0.003 *	1.001	0.779	0.996	0.261
Large Markets														
Uninsurance Rate	1.022	0.001 *	0.992	0.428	1.007	0.732	1.029	0.004 *	1.008	0.241	0.999	0.789	1.011	0.027 *
Medicaid														
Hosp-level	0.993	0.001 *	0.999	0.794	1.008	0.023 *	1.001	0.761	0.994	0.070	0.996	0.007 *	0.998	0.048 *
Market-level	0.976	0.110	1.002	0.910	0.989	0.780	1.017	0.528	1.006	0.684	0.990	0.369	1.007	0.482
Medicare														
Hosp-level	1.002	0.587	0.997	0.439	0.999	0.842	0.995	0.047 *	1.001	0.631	0.998	0.011 *	0.999	0.483
Market-level	1.005	0.603	0.985	0.292	1.053	0.004 *	0.982	0.180	1.005	0.554	1.015	0.001 *	1.004	0.547

Table 5.9
The Effects of Local Uninsurance on Service Utilization by Medicare beneficiaries
By Market Size, 2001

	Laparoscopic Cholesystectomy			Incidental Appendectomy			Bi-lateral Catheterization			ICU			Diagnostic Radiology			CT Scan			Other Imaging		
	OR	P-val		OR	P-val		OR	P-val		OR	P-val		OR	P-val		OR	P-val		OR	P-val	
Small Markets																					
Uninsurance Rate	1.006	0.755		0.983	0.359		0.999	0.987		1.041	0.072		0.997	0.829		0.998	0.854		1.016	0.085	
Medicaid																					
Hosp-level	1.004	0.541		0.990	0.184		0.984	0.138		1.008	0.376		1.007	0.047	*	1.003	0.195		1.000	0.914	
Market-level	0.976	0.090		0.991	0.439		0.982	0.648		0.987	0.387		0.994	0.458		1.005	0.322		0.991	0.175	
Medicare																					
Hosp-level	1.012	0.004	*	1.001	0.859		0.959	0.000	*	1.008	0.248		1.003	0.227		1.000	0.734		0.998	0.260	
Market-level	1.004	0.710		1.022	0.016	*	1.022	0.160		0.979	0.119		1.013	0.000	*	1.003	0.410		0.995	0.231	
Race																					
Hispanic	1.006	0.326		1.000	0.918		0.999	0.939		1.001	0.915		1.000	1.000		0.998	0.475		1.004	0.110	
Black	1.018	0.027	*	1.012	0.006	*	0.989	0.420		1.005	0.593		1.005	0.238		1.004	0.188		0.999	0.906	
Other	1.002	0.632		1.006	0.125		1.007	0.310		1.000	0.932		1.001	0.420		1.002	0.232		0.997	0.265	
Large Markets																					
Uninsurance Rate	1.005	0.641		0.971	0.081		0.964	0.278		0.996	0.834		1.010	0.238		1.000	0.959		0.998	0.858	
Medicaid																					
Hosp-level	0.993	0.001	*	0.999	0.774		1.007	0.037	*	1.001	0.820		0.994	0.084		0.996	0.010	*	0.998	0.044	*
Market-level	0.977	0.104		1.006	0.769		0.985	0.673		1.013	0.570		1.018	0.157		0.998	0.783		1.012	0.218	
Medicare																					
Hosp-level	1.002	0.605		0.997	0.409		0.999	0.859		0.996	0.072		1.000	0.836		0.997	0.000	*	0.999	0.258	
Market-level	1.006	0.573		0.984	0.284		1.055	0.005	*	0.983	0.129		1.000	0.963		1.012	0.001	*	1.003	0.612	
Race																					
Hispanic	1.009	0.066		1.014	0.048	*	1.024	0.019	*	1.018	0.041	*	1.005	0.125		1.003	0.338		1.008	0.005	*
Black	1.004	0.408		1.005	0.406		0.992	0.599		0.999	0.844		1.007	0.045	*	1.005	0.046	*	1.006	0.020	*
Other	0.999	0.890		0.989	0.194		0.996	0.872		0.998	0.860		0.973	0.000	*	0.984	0.000	*	0.992	0.080	

Table 5.10
The Effects of Local Poverty on Service Utilization by Medicare beneficiaries
By Market Size, 2001

	Laparoscopic Cholesystectomy		Incidental Appendectomy		Bi-lateral Catheterization		ICU		Diagnostic Radiology		CT Scan		Other Imaging	
	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val
Small Markets														
Poverty Rate	1.049	0.003 *	1.033	0.012 *	0.965	0.113	0.986	0.444	1.005	0.640	0.991	0.062	1.019	0.008 *
Medicaid														
Hosp-level	1.000	0.969	0.991	0.261	0.988	0.211	1.009	0.380	1.008	0.045 *	1.004	0.120	0.999	0.856
Market-level	0.963	0.015	0.992	0.555	1.005	0.899	0.990	0.544	0.996	0.720	1.009	0.086	0.989	0.195
Medicare														
Hosp-level	1.013	0.007 *	1.003	0.725	0.959	0.000 *	1.008	0.282	1.004	0.142	1.001	0.402	0.997	0.108
Market-level	0.997	0.794	1.012	0.147	1.025	0.071	0.981	0.211	1.011	0.007 *	1.001	0.690	0.996	0.226
Large Markets														
Poverty Rate	1.051	0.001 *	0.994	0.751	0.969	0.575	1.068	0.017 *	1.037	0.003 *	1.004	0.682	1.046	0.000 *
Medicaid														
Hosp-level	0.993	0.002 *	0.999	0.838	1.007	0.032 *	1.001	0.679	0.994	0.071	0.996	0.006 *	0.998	0.054
Market-level	0.956	0.007 *	1.010	0.614	0.988	0.819	1.000	0.988	0.995	0.754	0.989	0.236	0.992	0.479
Medicare														
Hosp-level	1.001	0.711	0.998	0.477	0.999	0.777	0.994	0.019 *	1.001	0.727	0.998	0.014 *	0.999	0.353
Market-level	0.997	0.752	0.988	0.365	1.048	0.016 *	0.972	0.055	1.002	0.811	1.015	0.002 *	1.000	0.988

Table 5.11
The Effects of Local Poverty on Service Utilization by Medicare beneficiaries
By Market Size, 2001

	Laparoscopic Cholesystectomy		Incidental Appendectomy		Bi-lateral Catheterization		ICU		Diagnostic Radiology		CT Scan		Other Imaging	
	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val
Small Markets														
Poverty Rate	1.036	0.226	1.045	0.028 *	0.923	0.033 *	0.931	0.009 *	0.998	0.902	0.988	0.206	0.988	0.300
Medicaid														
Hosp-level	1.002	0.696	0.991	0.248	0.987	0.199	1.010	0.302	1.008	0.032 *	1.004	0.088	1.000	0.972
Market-level	0.967	0.050 *	0.991	0.494	1.013	0.711	0.999	0.944	0.998	0.851	1.010	0.064	0.993	0.374
Medicare														
Hosp-level	1.012	0.005 *	1.001	0.902	0.961	0.000 *	1.010	0.186	1.004	0.169	1.001	0.498	0.998	0.430
Market-level	1.002	0.878	1.015	0.110	1.027	0.055	0.989	0.417	1.013	0.002 *	1.003	0.282	0.997	0.539
Race														
Hispanic	1.002	0.724	0.996	0.325	1.014	0.088	1.018	0.016 *	1.002	0.583	1.001	0.770	1.010	0.001 *
Black	1.015	0.049	1.006	0.181	0.998	0.862	1.019	0.026 *	1.005	0.221	1.005	0.117	1.003	0.512
Other	1.002	0.549	1.003	0.385	1.004	0.439	1.002	0.471	1.000	0.912	1.001	0.554	0.998	0.340
Large Markets														
Poverty Rate	1.013	0.440	0.961	0.125	0.913	0.217	1.003	0.918	1.011	0.354	0.990	0.419	1.024	0.065
Medicaid														
Hosp-level	0.993	0.001 *	0.999	0.832	1.007	0.042 *	1.001	0.701	0.994	0.077	0.996	0.009 *	0.998	0.055
Market-level	0.974	0.102	1.028	0.304	1.012	0.818	1.029	0.312	1.011	0.391	0.999	0.933	1.005	0.684
Medicare														
Hosp-level	1.001	0.626	0.998	0.462	1.000	0.963	0.996	0.079	1.000	0.767	0.997	0.001 *	0.999	0.239
Market-level	1.004	0.696	0.990	0.485	1.064	0.001 *	0.983	0.145	0.998	0.838	1.013	0.001 *	1.001	0.921
Race														
Hispanic	1.010	0.005 *	1.009	0.094	1.019	0.072	1.020	0.005 *	1.006	0.005 *	1.003	0.180	1.006	0.005 *
Black	1.003	0.360	1.004	0.564	0.995	0.617	0.998	0.807	1.007	0.023 *	1.006	0.023 *	1.003	0.217
Other	0.997	0.638	0.985	0.095	1.003	0.861	0.988	0.219	0.975	0.000 *	0.986	0.000 *	0.988	0.004 *

Table 5.12
The Effects of Local Uninsurance on Service Utilization by Medicare beneficiaries, 2001 to 2005
By Market Size

	Laparoscopic Cholesystectomy		Incidental Appendectomy		Bi-lateral Catheterization		ICU		Diagnostic Radiology		CT Scan		Other Imaging	
	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val	OR	P-val
All Markets														
Uninsurance Rate	1.000	0.976	0.969	0.000 *	1.024	0.070	0.978	0.027 *	0.987	0.074	1.002	0.585	0.992	0.133
Medicaid														
Hosp-level	0.993	0.000 *	0.997	0.227	1.003	0.328	0.999	0.758	0.996	0.104	0.997	0.010 *	0.998	0.043 *
Market-level	0.981	0.007 *	0.979	0.031 *	0.992	0.578	1.002	0.840	1.003	0.626	1.002	0.545	1.004	0.397
Medicare														
Hosp-level	1.002	0.262	1.000	0.920	0.996	0.367	0.995	0.012 *	1.000	0.709	0.997	0.000 *	0.998	0.052
Market-level	1.015	0.012 *	0.998	0.830	1.007	0.504	0.983	0.025 *	0.993	0.258	1.001	0.743	1.002	0.656
Small Markets														
Uninsurance Rate	1.006	0.727	0.970	0.086	1.058	0.024 *	0.987	0.331	0.996	0.514	1.008	0.074	0.995	0.505
Medicaid														
Hosp-level	0.997	0.467	1.001	0.912	1.001	0.901	1.013	0.116	1.005	0.081	1.002	0.226	1.001	0.594
Market-level	0.978	0.060	0.972	0.025 *	1.010	0.620	1.005	0.571	0.999	0.829	1.003	0.481	0.999	0.934
Medicare														
Hosp-level	1.007	0.006 *	1.006	0.087	0.983	0.000 *	1.002	0.457	1.000	0.839	0.999	0.367	0.999	0.327
Market-level	1.013	0.077	1.002	0.813	1.025	0.112	0.976	0.001 *	1.000	0.961	1.001	0.700	0.997	0.626
Large Markets														
Uninsurance Rate	1.002	0.801	0.969	0.000 *	1.010	0.245	0.979	0.088	0.983	0.045 *	1.001	0.851	0.991	0.187
Medicaid														
Hosp-level	0.993	0.000 *	0.997	0.110	1.005	0.119	0.998	0.486	0.995	0.050 *	0.996	0.002 *	0.998	0.021 *
Market-level	0.986	0.102	0.985	0.396	0.976	0.065	0.997	0.786	1.003	0.756	1.001	0.873	1.006	0.384
Medicare														
Hosp-level	1.001	0.619	0.997	0.506	1.001	0.826	0.993	0.006 *	1.000	0.775	0.996	0.000 *	0.998	0.073
Market-level	1.017	0.046 *	0.993	0.651	0.988	0.292	0.987	0.305	0.984	0.096	1.000	0.984	1.006	0.431

Table 5.13
The Effects of Local Uninsurance rate on Market-level Hospital Utilization, 2001
By Market Size

	Total admissions			Proportion Medicare			Proportion Medicaid		
	Coef.	P-val		Coef.	P-val		Coef.	P-val	
All Markets									
Uninsurance rate	0.005	0.361		-0.003	0.129		0.001	0.467	
Medicaid rate	0.003	0.597		0.005	0.003	*	0.004	0.000	*
Medicare rate	0.014	0.001	*	0.009	0.000	*	-0.001	0.338	
Small Markets									
Uninsurance rate	-0.003	0.786		-0.003	0.478		0.000	0.839	
Medicaid rate	-0.001	0.837		0.005	0.016	*	0.004	0.003	*
Medicare rate	0.014	0.017	*	0.009	0.000	*	-0.001	0.628	
Large Markets									
Uninsurance rate	0.001	0.900		-0.003	0.264		0.002	0.248	
Medicaid rate	0.017	0.120		0.006	0.031	*	0.003	0.121	
Medicare rate	0.017	0.019	*	0.007	0.000	*	-0.001	0.488	

Chapter 6: Summary and Conclusions

The previous two chapters explored the effects of the local uninsurance rates on various measures of health care access, utilization and outcomes for Medicare beneficiaries. This chapter summarizes those results and draws some conclusions by bringing all parts of the analysis together. It also discusses some of the caveats in interpreting the results of this work. Finally, it will conclude with some directions for future research based on the conclusions of this work.

The goal of this research was to discover the market-level effects of local uninsurance on the availability and delivery of care to Medicare beneficiaries. The conceptual framework pointed out a variety of ways in which the local uninsurance rate might affect the availability of care, the utilization of care and the ultimate outcomes for Medicare beneficiaries. We tested the various hypotheses using data on hospital services and Medicare inpatient discharges in 100 sample MSAs. Analyses were performed using both cross-sectional methods that relied on the variation in uninsurance across areas to identify the desired effects as well as panel data methods that focused on the changes in uninsurance within a market over time. The results were in some cases consistent with expectations while in other cases they generated additional questions. Some of the most interesting results were on the impact of Medicaid on the outcomes and use for Medicare beneficiaries which may lead to an additional line of questioning going forward.

The findings on the effects of the local uninsurance rate were relatively consistent with the hypotheses generated from our conceptual framework. A higher local

uninsurance rate was found to be associated with the provision of fewer services by hospitals in the area and specifically of services considered to be unprofitable. This result was consistent across small and large markets, but was stronger in magnitude in the smaller markets examined. The result was diminished however in the presence of controls for race. This result is consistent with the prediction that a lack of demand from uninsured individuals may result in a cutting back on shared elements of quality such as the availability of particular services. The stronger result in small markets is also consistent with this idea as the smaller population would already result in lower demand in these markets. The cut in unprofitable services specifically may be the result of lower demand for all services leaving less revenue to subsidize these less profitable service lines. The selection of services that were analyzed, both profitable and unprofitable, was merely a subset of possible shared elements of quality. These results are therefore taken as suggestive evidence that high uninsurance rates can result in reductions in shared elements of quality and that these reductions may come from among the less profitable service offerings or other elements of care. Some evidence also emerges to indicate that uninsurance is related to increased provision of profitable services. This suggests a differentiation response in small markets and deserves greater attention going forward.

One possible consequence of a reduction in the shared quality by a provider suggested by the conceptual framework was a compensating increase in the unique quality provided to a particular payer. If a high uninsurance rate results in the need to cut back on certain elements of shared quality therefore, it is predicted that providers may compensate Medicare beneficiaries with increases in the unique quality provided to them.

It is difficult to know how to measure 'unique quality' and our options are relatively limited by the use of discharge data only. This analysis however looked at several measures of utilization to determine whether or not Medicare beneficiaries in areas with more uninsurance had higher utilization possibly indicating some compensation by providers for a drop in shared quality. We found some evidence that this was the case. Medicare beneficiaries in areas with higher uninsurance rates were more likely to use the ICU and certain diagnostic services. The results were not consistently significant across all measures and the significance dropped after including the race distribution. These results seem to be consistent with the fact that as shared quality declines, utilization, as a proxy for unique quality, might increase. It should be noted however that the elements of shared quality that were shown to decline and those utilization measures that appear to increase were not chosen to be complementary elements of care for any particular disease or condition. These results are merely suggestive of more general trends in access and use.

The original question of interest was how local uninsurance rates affected the quality of care delivered to Medicare beneficiaries. Outcomes of care, in this case mortality from a variety of specific procedures and conditions, were used as the ultimate measure of the quality of care. As noted above, it was suggested that ultimate quality could be impacted in a number of ways, both positive and negative, by the presence of more uninsured individuals. The analysis of the impact of local uninsurance rates on outcomes was designed to determine if, regardless of the mechanisms involved, the probability of death for Medicare beneficiaries was related to local uninsurance. The

results were again mixed, but show some consistency with the mechanisms that have already been discussed. Beneficiaries in smaller markets were more likely to see an increased probability of death, a negative spillover, in response to higher uninsurance rates although again the result was not consistent across all measures. Those in larger markets were more likely to see a reduced probability of death, or a positive spillover, where there were more uninsured.

While both negative and positive spillovers were plausible based on the conceptual framework, the mechanisms discussed above may aid in explaining the different results by market size. In small markets, as was noted, the decrease in shared quality in the form of unprofitable services in response to more uninsured was nearly twice as big as that in large markets. The increased probability of use was also slightly larger in small markets. One possible explanation for the different outcomes results across markets would be that the effects on shared quality dominate the effects on outcomes in small markets. In larger markets, the increases in utilization may better compensate for the shared quality loss and actually result in quality gains. Again, the three sets of analyses are not truly equipped to derive these types of conclusions. To do so, it would be important to choose elements of shared quality, utilization and outcomes that were specifically related to one another. This was not the case here as the goal was to establish the more general responses to a high uninsurance rate rather than its impact on individuals with a specific condition.

The results of the effects of the uninsurance rate on access, use and outcomes based on cross-sectional analysis are at least relatively consistent with the conceptual

framework. Because cross-sectional studies often face criticism based on the many unobservables that may be correlated with the outcomes of interest, this study also performed some analysis on the same questions using multiple years of data and panel data methods. This analysis bases its conclusions regarding the effects of uninsurance on changes in the uninsurance rate over time within an individual MSA. The results of these analyses show some consistencies with the cross-sectional results, but also reveal some differences.

One of the main differences in the panel data analysis was in the effect of the uninsurance rate on the provision of profitable and unprofitable services. While the cross-sectional analysis showed consistently that hospitals in areas with higher uninsurance rates provided fewer unprofitable services, no comparable result emerged in the panel data analysis. In fact, these models that estimated the change in the number of services at a given hospital over the study period as a function of the change in uninsurance at the market level were quite weak in general. Very little of significance emerged in predicting the changes in service provision. The changes in market-level characteristics that were used to predict changes in service provision occurred roughly concurrently. It may be the case that it takes a hospital more time to respond to changes in market conditions with changes in their service offerings and thus, the lack of significant results.

The effects of changing uninsurance rates on the utilization of services by Medicare beneficiaries showed some consistency with the cross-sectional results in that beneficiaries in smaller markets experienced at least some increased use in markets with

larger uninsurance growth. The results in larger markets however showed that Medicare beneficiaries in areas with a larger growth in uninsurance used less of certain elements of care. This is the opposite of the results in the cross-sectional models. These results however are not necessarily inconsistent with expectations either. The reason that higher use was predicted in response to more uninsurance was due to a reduction in shared quality and therefore an incentive for providers to increase the unique quality provided to Medicare beneficiaries. In this case, no evidence emerges of the reduction in shared quality and thus it should not be surprising to see no positive effects on use. If the effects on shared quality are delayed in response to changes in uninsurance, so might be the associated changes in utilization. The negative effects on use that emerge in these models may be the result of some unobserved characteristics of individuals in these markets that are correlated with higher uninsurance and a lower demand for care such as lower incomes or less supplemental coverage.

Interestingly enough, the results on outcomes are actually consistent in their direction with those of the cross-sectional models although somewhat weaker. The results show again that smaller markets are more likely to see a negative spillover on outcomes, but in this case only one of the conditions is significant as opposed to two in the cross-sectional models without race controls and four in those controlling for race. Similarly, in larger markets, where the results are significant they show evidence of positive spillover effects of the uninsured to Medicare beneficiaries. The relative consistency of the results on the ultimate outcomes of care suggest that while we have not completely established the mechanisms by which these spillovers occur, small markets

seem more likely to exhibit negative spillover effects and larger markets seem more likely to experience positive spillover effects.

The results on positive spillover effects, while initially somewhat surprising, are consistent with the conceptual framework if providers compensate Medicare beneficiaries for a reduction in shared quality by raising their unique quality of care in response to more uninsured. Another explanation behind the positive spillover effects and one that might be more plausible in larger markets relates to the concepts of product differentiation. The theory suggests that a provider can gain profit by gaining market share or limiting price competition. In larger markets, a provider may choose to invest heavily in quality in one or more service areas in an effort to negotiate higher prices from payers. They may be willing to sacrifice some market share in order to extract these higher prices. This strategy may become more profitable as the insurance distribution becomes more diffuse and it becomes less profitable to compete for the individuals at the lower end of the distribution. In small markets however, this approach is less likely to be possible because there may not be enough demand for the higher quality services to support the investment. Thus, it is possible that a positive spillover effect could emerge as more hospitals in large markets are induced to use this strategy and quality rises for those willing to pay for it.

Altogether, the results on the market-level effects of uninsurance are somewhat mixed in their effects on availability of care, utilization and outcomes of care. Hospitals in markets with more uninsured appear to offer fewer unprofitable services though this result disappears when examining within-market effects over time. Some evidence exists

that hospitals in markets with more uninsured provide more profitable services however. Utilization by Medicare beneficiaries is somewhat higher in markets with more uninsured. Over time however, large markets that show an increase in the uninsured show lower utilization of certain services. Finally, Medicare beneficiaries in small markets with high or rising uninsurance seem to be somewhat more likely to die from at least two conditions. In larger markets, beneficiaries in similar markets show a slightly lower probability of death. While the results do not point to a serious or widespread negative externality being imposed on the Medicare population by the uninsured in their community, they do suggest that some spillover effects do exist. This opens up a line of inquiry regarding other market-level effects of insurance. In controlling for the effects of Medicaid in all of our analyses, for instance, several interesting results emerged. These will be discussed further below.

Before discussing some avenues for future research, we must address some of the shortcomings of the present approach. This study was limited by availability of local uninsurance rates to a sample of 100 relatively large MSAs. As has been discussed, we would expect to see the spillover effects of a large uninsured population more prominently in a smaller market with fewer hospitals and thus fewer opportunities for differentiation. Currently, data is being collected using the American Community Survey which will allow for data on uninsurance at a much finer level of geographic detail. Using this data to perform a similar analysis would be a natural extension of this work.

Despite attempting to control for many of the individual, hospital and market characteristics that might contribute to an individual's use of care or probability of death,

the use of discharge data did not allow for detailed information on individual income or supplemental insurance. Assuming that Medicare beneficiaries in areas with more uninsured would be lower income and have less supplemental coverage, this could bias the results towards finding a negative spillover effect on use or mortality. We did find some negative spillover effects on mortality in small markets, but the effects on use were generally positive. The exception was the panel data approach in large markets which has been discussed.

One additional and important caveat with regard to this work is related to its interpretations. The results here cannot be interpreted as evidence of a causal relationship between changes in the local uninsurance rate and the probability of death, the probability of use or the number of services provided by a given hospital. These reduced form models attempt to establish the relationship between the variables of interest and to control for possible confounders of that relationship, but are not designed to produce causal estimates.

Despite its shortcomings, this work has produced some interesting results on the relationship between local uninsurance rates and various measures of access, utilization and outcomes. Some of the most interesting results in this study however came as the unintended consequences of controlling for the proportion of Medicaid beneficiaries both within the market and within the hospital. These proportions, specifically the hospital-level Medicaid rate, showed a consistent negative relationship with outcomes across conditions, market sizes and analysis approaches. In other words, the results strongly suggest that Medicare beneficiaries in hospitals with a higher proportion of Medicaid

discharges, have a higher probability of death from a variety of conditions. The impacts on utilization are less consistent, but also tend be negative indicating less use by Medicare beneficiaries in hospitals with a high Medicaid burden. Finally, the hospital Medicaid rate has a variety of significant impacts on the number of profitable and unprofitable services provided by hospitals.

The Medicaid results are particularly interesting because they point to another type of spillover effect that may be much stronger than the one from the uninsured. These results may be related to the additional subsidies that Medicaid provides to hospitals. They may also be related to the provider payments from Medicaid which are known to be considerably lower than other payers. This could result in spillovers with a similar set of mechanisms as those described for the uninsured. The fact that Medicaid beneficiaries have insurance however, and are thus more likely to use care, may contribute to the strength of the effects. As the two major public providers of insurance coverage in the US, the interactions between Medicaid and Medicare at the hospital level could be a very interesting area for future research. This is particularly true in the context of current proposals for health reform, all of which include a substantial expansion of the Medicaid program. If a strong Medicaid presence at the hospital level has significant negative spillovers on Medicare beneficiaries, it may be important to monitor these effects.

In conclusion, the results on the spillover effects of the uninsured are not so dramatic as to suggest that an intervention to cover the uninsured would result in significant gains for Medicare beneficiaries through this mechanism. The results were

strong enough however to generate further interest in the market-level effects of health insurance and to pursue some extensions of this research.

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